

REVISTA
AMAZONIA
Investiga

February 2024. Vol. 13 Issue 74

ISSN 2322-6307
www.amazoniainvestiga.info



Periodicity
Monthly
Since: 2012

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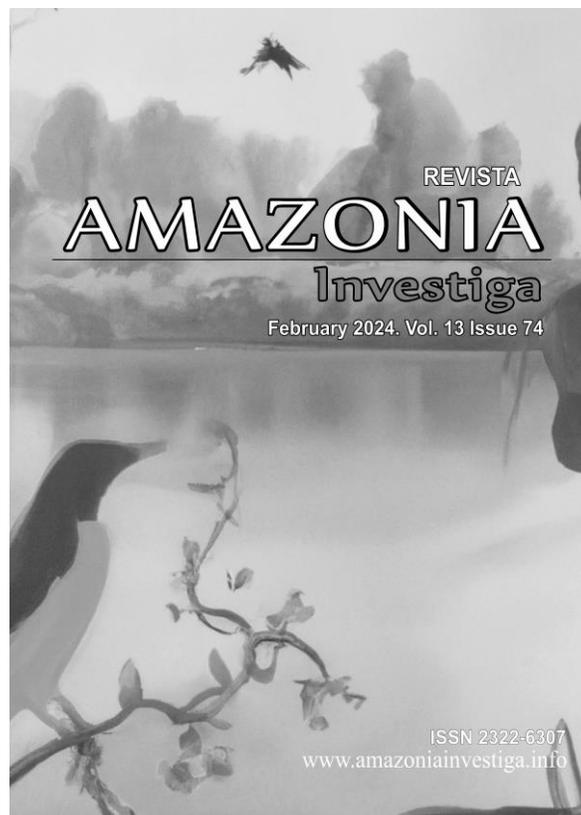


AMAZONIA

Investiga

Virtual, multidisciplinary and monthly scientific publication

VOLUME 13 - ISSUE 74



Cover image

Based on the work of master Wilgberto Ramírez



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DOI: <https://doi.org/10.34069/AI/2024.74.02.1>

How to Cite:

Akansu, V., & Kaya, N. (2024). The conversion of the reinforced concrete post-war brownfield sites into greenfields: Green line buffer zone of Cyprus. *Amazonia Investiga*, 13(74), 9-21. <https://doi.org/10.34069/AI/2024.74.02.1>

The conversion of the reinforced concrete post-war brownfield sites into greenfields: Green line buffer zone of Cyprus

Savaş Sonrası Betonarme Kahverengi Alanların Yeşil Alanlara Dönüştürülmesi: Kıbrıs'ın Yeşil Hat Tampon Bölgesi

Received: January 5, 2024

Accepted: February 25, 2024

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Abstract

Brownfield areas are hazardous areas that arise as a result of the disuse of industrial, commercial, and residential buildings, which pose an obstacle to planning and decision-making mechanisms for the regions in which they are located in terms of environment and energy, and are a global problem for settlements. In planning studies where sustainability principles are taken into account, both abandoned reinforced concrete structures and abandoned traditional structures that contribute to natural life should be considered together.

Brown field structures built with traditional and reinforced concrete materials can be seen in the green line region of the island of Cyprus. Converting abandoned building areas built from concrete material remaining in the unused buffer zone after the war on the island into green corridors is important to ensure sustainability.

In this context, the study was evaluated in line with the Wheeler Sustainability Principles, the weight of each marker was determined in line with the literature review and local expert reports, and a road map that could be used to transform brown areas into green areas was created. This study both contributes to the limited existing literature and reveals the effects of energy and environmental sustainability in abandoned areas.

Keywords: Brownfield, greenfield, renewable-energy, environment, green-line, Cyprus.

ÖZET

Kahverengi alanlar, endüstriyel, ticari ve konut yapılarının kullanılmaması sonucu ortaya çıkan, çevre ve enerji açısından buldukları bölgeler için planlama ve karar alma mekanizmalarına engel teşkil eden, yerleşimler için küresel bir sorun olan tehlikeli alanlardır. Sürdürülebilirlik ilkelerinin dikkate alındığı planlama çalışmalarında hem terk edilmiş betonarme yapılar hem de doğal hayata katkı sağlayan terkedilmiş geleneksel yapılar birlikte düşünülmelidir.

Kıbrıs adasının yeşil hat bölgesinde geleneksel ve betonarme malzemelerle inşa edilen kahverengi alan yapıları görülmektedir. Adada savaş sonrasında kullanılmayan ara-bölge içerisinde kalan beton malzemeden inşa edilen terkedilmiş yapı alanlarının yeşil koridorlara dönüştürülmesi, sürdürülebilirliğin sağlanması için önemlidir.

Bu bağlamda çalışma Wheeler Sürdürülebilirlik İlkeleri doğrultusunda değerlendirilmiş, literatür taraması ve yerel uzman raporları doğrultusunda her bir işaretçinin ağırlığı belirlenmiş ve kahverengi alanların yeşil alanlara dönüştürülmesinde kullanılabilecek bir yol haritası oluşturulmuştur. Bu çalışma hem mevcut sınırlı literatüre katkı sağlamakta hem de terk edilmiş alanlarda enerji ve çevresel sürdürülebilirliğin etkilerini ortaya koymaktadır.

Anahtar Kelimeler: Kahverengi-Alan, Yeşil-Alan,, Yenilenebilir Enerji, Çevre, Yeşil Hat, Kıbrıs.

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Introduction

Brownfield areas negatively affect rural and urban living spaces and create a lot of pressure on living spaces in terms of decreasing environmental resources (Dubey & Narayanan, 2010). Therefore, it is revealed through literature research that globalization and modernization trends that started in the last century brought serious environmental disasters in settlements (Asilsoy et al., 2017; Yıldırım et al., 2020; Akansu & Karaman, 2023). At this point, the concept of brownfield emerges as an environmental disaster experienced in settlements during deindustrialization and suburbanization processes (Tang & Nathanail, 2012). Brownfields are defined by the US Environmental Protection Agency (1997) as “abandoned, idle, or underutilized industrial and commercial facilities where expansion or redevelopment is complicated by actual or perceived environmental pollution” (Alker et al., 2000). Additionally, brownfields in legislation may also reflect the approaches used by countries. European countries with higher population densities promote the efficiency of land recycling, while countries with lower population densities focus on cleaning (Oliver et al., 2005).

Accordingly, the increase in abandoned construction sites in recent years has damaged energy and environmental sustainability. There are many abandoned concrete structures on the Cyprus Green Line, which has been under UN control since 1974, negatively affecting the environment and human health. This study aims to evaluate the feasibility of transforming these areas into green corridors and analyze their effects on energy and environmental values.

Accordingly, the increase in abandoned construction sites in recent years has damaged energy and environmental sustainability. There are many abandoned concrete structures on the Cyprus Green Line, which has been under UN control since 1974, negatively affecting the environment and human health. This study aims to evaluate the feasibility of transforming these areas into green corridors and analyze their effects on energy and environmental values.

Abandoned buildings on the island of Cyprus emerge as a result of war, affect cities and rural settlements in terms of energy recovery, and reduce the quality of life by negatively affecting environmental parameters such as soil, air and water.

Research conducted in this context reveals that traditional structures provide the formation of habitats necessary for the protection of biological diversity (Francis, 2010). However, the damage that reinforced concrete structures, especially abandoned structures, cause to nature is indisputable. The materials used in these structures do not allow the protection of flora and fauna, on the contrary, they fill the land unnecessarily (Akansu & Gertik, 2018).

Former industrial areas appear as settlements with degraded ecological and natural areas and low livable limits. These areas can only be accepted into society if they are considered as a whole within the settlements. For this purpose, ecological sustainability can be achieved by using non-industrial areas together with the natural and architectural environment, climate characteristics, biodiversity (flora-fauna), topographic structure and natural resources. Ecological, cultural, social and economic resources of the areas to be restored are important factors in non-industrial regional area planning studies (Akansu & Gertik, 2018).

At this point, energy and environmental values are evaluated in terms of ecosystem life of living things and human health through Wheeler's Sustainability Principles (Wheeler, 1998). For this reason, Wheeler's Sustainability Principles will be used to measure the impact of brownfield conversion in the continuity of work. It is hoped that this study will contribute to the revitalization of these places and thus to the search for a solution to the political and ethnic conflict in Cyprus.

The research questions that will guide the study are:

How does the conversion of unused construction areas on the Cyprus Green Line into green corridors affect energy and environmental values?

What benefits and challenges does transforming abandoned spaces into green corridors present?

The methodology of the study includes the evaluation of environmental and energy indicators, as well as the socioeconomic analysis of the region. The expected results are the creation of a road map for the transformation of abandoned areas into green corridors and recommendations for the implementation of

public policies that promote sustainability in the region.

What makes Cyprus Green Line a worthy and important case to examine within the concept of a brownfield site is that the studies such as this one are promising in contributing to the revival of these sites and furthermore, to the resolution of the political and ethnic conflict that has been going on for more than 40 decades.

A critical evaluation has been put forward by discussing the benefits and drawbacks of converting unused concrete fields into completely green corridors on Cyprus Green Line which is designated as the study area. The potential environmental and energy impact of transforming and redesigning unused brownfield sites into greenfield sites has been discussed in this study

This study is an important contribution to the urban transformation and environmental sustainability literature. Its results are expected to be beneficial to local governments, environmental organizations, and society in general.

Theoretical framework of study

The method of the study was an important factor in the formation of the theoretical framework. In this context, brownfield-greenfield sites, ecological green corridors, and sustainability concepts are important for the theoretical aspect of this study.

The Brownfield concept is used as the opposite terminology of greenfield, which describes uncontaminated or undeveloped rural lands. These sites are dangerous areas that mostly result from the non-use of industrial, commercial, and residential buildings (Maczulak, 2009). They are identified as crucial areas which pose a threat to the sustainability of energy and the environment. Sustainable approaches evidenced the associated issues, problems, and potentials of brownfield sites and also helped all stakeholders to understand the importance of this issue (Beer & Higgins, 2000). It is important to transform these concrete, abandoned sites which became unused after the war, into green corridors to ensure the sustainability of the habitat and to provide them for the use of society.

The ecological green corridors, which are transformed from being reinforced concrete sites to a greenfield sites, contribute to protect the environment and providing quality living space

for people. Furthermore, it helps to protect the habitats of the flora and fauna living in that region. New planning approaches such as; ecological corridors, green infrastructure and green roads, serve with a protective aim through directing urban development, controlling erosion and surface flows, reducing environmental pollutants, regulating microclimate, and providing habitats for wildlife (Yaman & Doygun, 2014).

Thus, while forming green corridors, implementation of suitable renewable energy resources (solar, wind, hydraulic, geothermal, biomass, and sea and ocean energy) has inevitable effects on the sustainability of a habitat's environmental values, its energy gains and human health.

Wheeler's Sustainability Principles are very crucial in guiding the applicability and development of sustainable environments and sustainable energy of areas that are left unused after a war. In line with these principles, the energy gains and environmental values are as follow:

1. It demonstrates its use for the protection of flora and fauna in ecosystems in compact and balanced land use. Brownfield sites represent areas with unused, abandoned buildings and their surroundings, and these sites are problematic in terms of utilisation of the land because they do not contain green spaces that would allow the development of ecosystem flora and fauna.
2. Vehicle use and easy access is a sustainability principle which demonstrates that driving a motorised personal vehicle would cause air pollution, thus supporting the use of bicycle, battery-powered vehicles or walking. The areas that are currently defined as brownfields and are closed for public use are problematic regions because they adversely affect sustainable energy and environmental value.
3. It supports rational use of resources, waste reduction, prevention of environmental pollution, minimised use of non-renewable energy resources and to support the use of renewable energy resources which protect the environment.
4. The restoration of natural systems lead to renewal and protection of open areas, valleys, canals, creeks, green corridors, topographic features of natural structure of the environment It supports the development of post-war from brownfield to green spaces.

5. It is an approach that supports the preservation of good housing and living environments, traditional building areas and natural building values. In the brownfield areas, good housing and living environments are replaced by waste sites and hampering the preservation of environmental values.
6. Healthy social ecology is a principle that aims to ensure social equality, meet the basic needs of people, create adequate jobs and conditions for social life. Sites that are closed to the public after a war, are problematic regions in terms of healthy social ecological values.
7. Sustainable economy is put forward through creating conditions in which future generations will not have difficulties to use resources, produce policies and distribute social welfare equally. Brownfield areas are also problematic in terms of healthy sustainable economic values.
8. Public participation is one of the principles which supports the public to have a say in the production of policies that will ensure equality, equal distribution of resources and welfare to all. Areas that are closed for public use are also problematic in terms of environmental sustainable values.
9. It supports the preservation of local culture and social values, agricultural production, natural resources and texture of local architecture. Brownfield settlements pose problems in development of local architectural texture, and the protection of local values and social values, natural resources and agricultural production.

Accordingly, the need for brownfield regions, which impact negatively on energy resources and environmental parameters, to be converted to green areas and the need for further studies in this field is put forward.

Methodology

The study method consists of revising the existing approaches in the literature to determine the context; the documentary analysis included reports prepared by public officials and experts within this field. Visual data was also employed which included maps and photographs. Maps were derived through satellite views secondary data on abandoned sites were derived through photographs taken by others and content analysis was applied.

Within the context of energy and environmental sustainability, the conceptual framework is formed through the use of renewable energy

concepts proposed in Wheeler's Sustainability Principles and through concepts developed on brownfield sites as well as literature on the use of renewable energy in ecological green corridors.

Besides, the research was conducted in the last quarter of 2022 by reportage (questions and answers) to participants consisting of 50 experts (architects, engineers, urban planners, environmental scientists, non-society organizations). When preparing questions from participants within the framework of 9 principles published by wheller in 1998:

1. Compact, balanced land use
2. Vehicle use and easy Access
3. Rational use of resources, reducing waste, preventing environmental pollution
4. Restoration of natural systems
5. Good housing and living environment
6. Healthy social ecology.
7. Sustainable economy
8. Community involvement
9. Preservation of local culture and social values. Brownfield asked for opinions from the sample regions on energy and environmental values.

Moreover, to conduct an assessment of the current state of the region, the reports and publications prepared by city and regional planners, architects, engineers and individuals who have been actively working for many years in North Cyprus, have been analysed.

The life of ecosystem-living beings and human health data cross-assessment matrix was created from data derived from this study in accordance with Wheeler's Sustainability Principles in line with the study of energy and environmental values. The advantages and disadvantages of renewable energy resource utilisation and the conversion of the existing concrete structures into completely ecological green corridors were evaluated through this matrix.

Results and discussion

Island of Cyprus Green Line Formation, Development and Assessment of the Current Situation

Cyprus has been home to various civilizations such as Catholic, Archaic, Classical, Hellenistic, Roman, Byzantine, Arab Navy, Frankish, Lusignan, Genoese, Venetian, Ottoman, and British administrations. It is still an island where political, social, cultural, and architectural differences are being experienced. Cyprus was



under British rule during 1878-1960. After the establishment of the Republic of Cyprus, the Island was co-administered by Turkish and Greek Cypriots. However, due to political conflicts, it was divided into two regions in 1974. The line that divides the Island into two parts is

called the Green Line. (Figure 1) The United Nation controlled Green Line occupies approximately %3 of the landmass of the Island of Cyprus (Grichting, 2010a). Frozen in a military status quo for the past 43 years, this strip of land swallows up abandoned settlements.

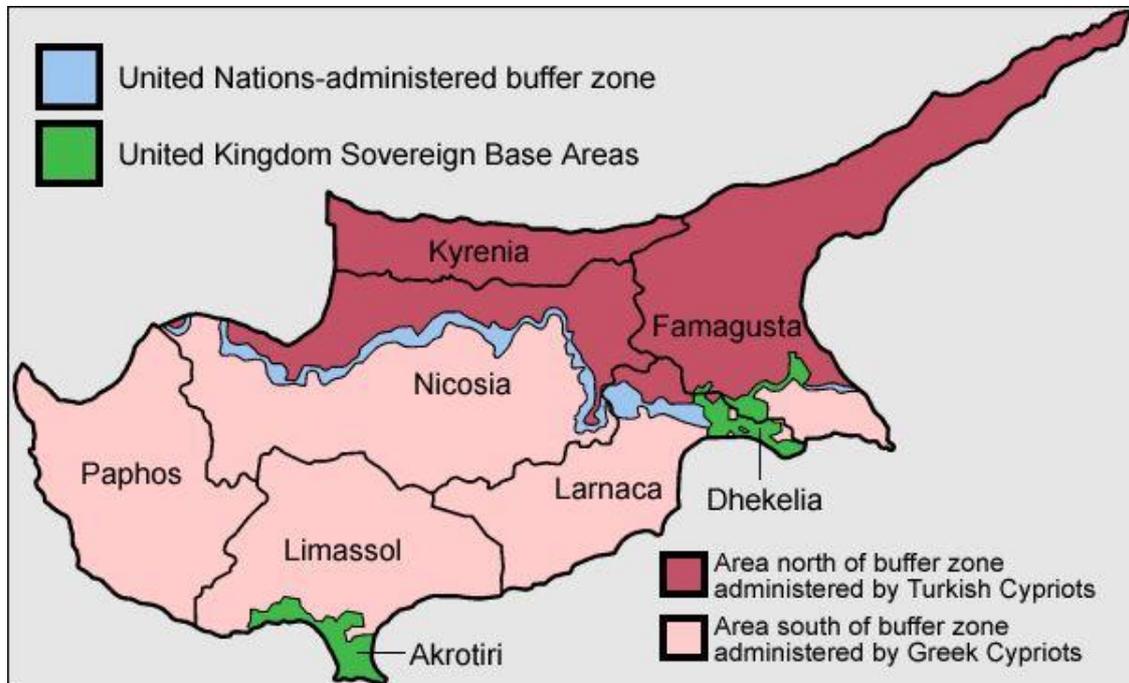


Figure 1. Cyprus Buffer Zone (Collet, 2023)

The present boundaries of the Green Line was determined in 1974 by the Cyprus Peace Operation. It is used to determine the region which separates the Turkish Republic of Northern Cyprus (de facto) and the Greek Cypriot Administration in Cyprus. It was first introduced in 1964 by Peter Young, commander of the United Nations “peacekeeping forces”. General Young, who sent his forces to different parts of Nicosia, drew a line on the map with a green pencil. This line is then called the “Green Line” and determines the borders between the North and the South (Borowiec, 2000). Initially, the Green Line was under British control which later on was controlled by the military of the United Nations (Christofides, 2007). Assuming Nicosia as the center, the area that the line that divides through the East and the West regions, truly reflects Cyprus in terms of ecological values and landscape.

From the river deltas and sandy beaches of the East Coast (Famagusta-Varosha), it connects with the rocky shores of the West Coast (Kokkina Enclave), passing through wetlands, fertile plains, and hills, and following the crest of mountains, it stops in Troodos (Grichting, 2010a). Investigations into the unexpected

flourishing of nature on the Green Line (flowers, birds, insects, and mammals) were undertaken by scientists from both Turkish and Greek Cypriot communities confirmed that the so-called ‘Dead Zone’ of Cyprus was in fact, a thriving landscape of biodiversity (Gucel et. al, 2008).

However, many structures are not used within the region that is known as the Buffer Zone which is under the United Nations administration. Although parts of these structures that are built with traditional materials help preserve and develop biological diversity, it is observed that there are problems in the areas constructed with reinforced concrete materials. These problematic constructions, which are referred to as brownfields, have a negative impact not only on people visually but also in terms of the sustainability of energy and the environment. The area of the Green Line is similar to other military buffer zones around the world as in the examples of the Korean Demilitarised Zone. This is because, due to its isolation, the Green Line became really green and it has become a haven of biodiversity (Grichting, 2010b).

Cyprus green line brownfield site study

Part of the areas within the borders of Cyprus Green Line consists of greenfield areas. Assuming Nicosia is the center, greenfield areas are mostly observed on the western part of the Island, from the hills of Lefka to the hills of Troodos Mountain. There are some greenfield areas to the east of Nicosia. This area extends to the village of Pyla, the British Sovereign Bases, and Varosha city known as the ghost city.

The investigation conducted for this study suggested that the density of the brownfield areas increases in Nicosia, the industrial areas of Lefka Cyprus Mine Corporation, and Varosha. In this respect, this study focuses on;

- Settlements in the Nicosia region,
- Varosha Region in the East of Nicosia, and
- Unused area of CMC in the West region of Nicosia.

Settlements in the Nicosia region

Besides traditional material and concrete buildings and commercial areas, one of the biggest airports of its time, Nicosia International Airport is also in The Green Line region in Nicosia. Historic Nicosia center is 5 km away from the abandoned airport, which constitutes one of its widest sections. (Figure 2)

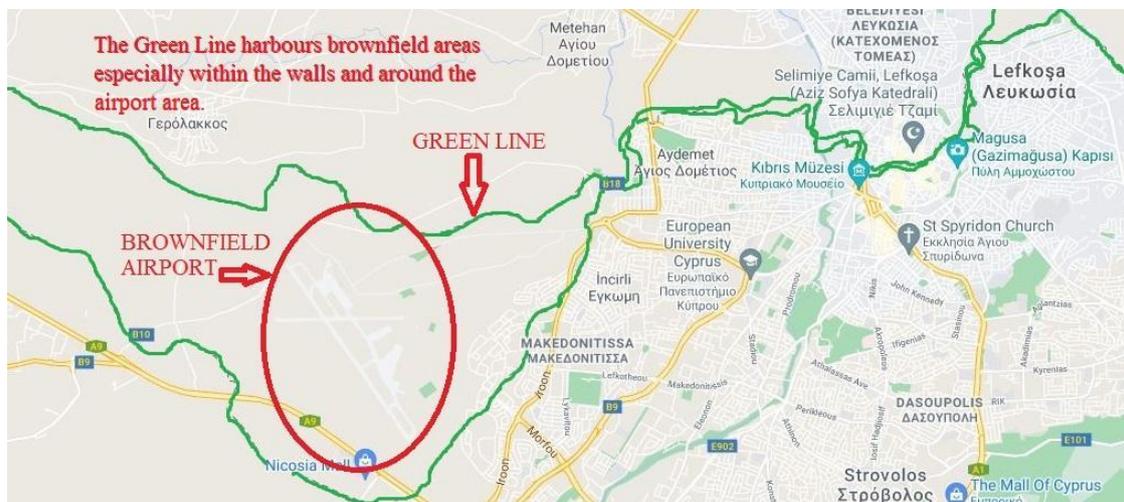


Figure 2. Nicosia Green Line and Important Brownfield Areas (by Authors)

Nicosia International Airport was built in 1939 from reinforced concrete material and after 1947 it became the only international airport on the island (Milliyet Newspaper, 2014). Despite its

active use during 1947-1974, it still causes a problem in terms of energy and environment as it occupies thousands of acres of land (Figure 3).





Figure 3. Present Day Nicosia International Airport Left Unused (Milliyet Newspaper, 2014)

Varosha region in the east of Nicosia

Varosha, one of the settlements of Famagusta once was a trade and tourism center. However, this situation has only been sustained for 15 years. From time to time, political and economic factors can create changes in cities and the Varosha region is one of the examples that experienced the change (Akansu & Duman, 2022). In other words, Varosha evidences the contradicting political desires

and economic expectations and it is involved in negotiations for political reconciliation in Cyprus (Pyla & Phokaides, 2020). The situation is not very different in Varosha.

The settlement which is located within the borders of Famagusta city was left in the Green Line region after 1974 and is not being used ever since except for a couple of buildings (Figure 4)

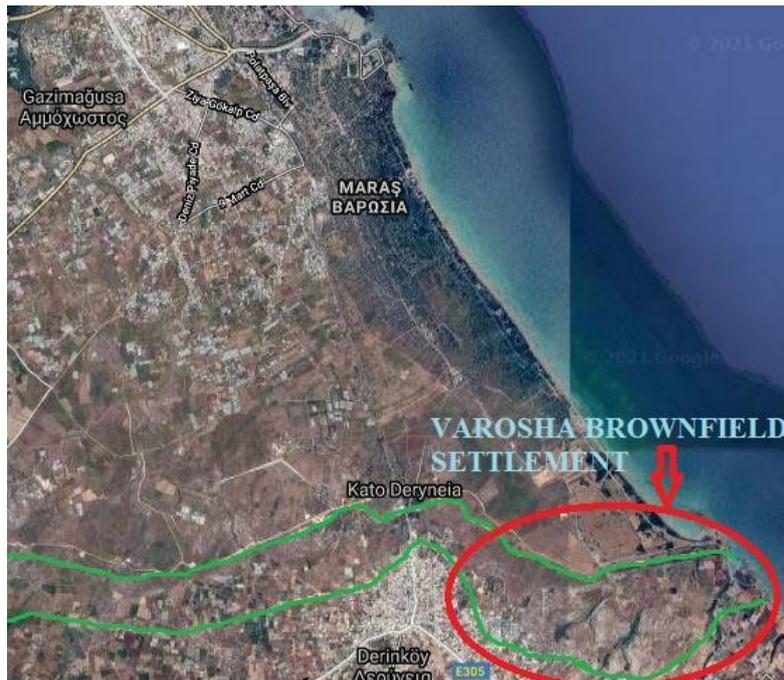


Figure 4. Varosha brownfield settlement within the borders of Famagusta city (BY Authors)

Varosha was a very popular holiday destination until 1974, thus it harbors many touristic facilities and commercial buildings that became

brownfield areas today. This area is observed as a problematic area in terms of energy and environmental destruction (Figure 5).



Figure 5. Varosha Brownfield's view (NTV, 2020)

Unused area of CMC in the west region of Nicosia

Besides the aforementioned settlements, part of Cyprus Mining Corporation (CMC) settlements passes through the Green Line. During the industrialization period, CMC was one of the

first industrial examples located in Lefka which is on the west of Nicosia. This area is not only known to be an environmental problem for the Mediterranean but also it is among the areas that pose an environmental problem because it is unused. (Figure 6)



Figure 6. Brownfield settlement of CMC in Lefka (By Authors)

Part of Nicosia, CMC settlements, and Varosha are observed as brownfield areas after 1974 due to political reasons. As a result of studies conducted, it can be said that these settlements are problematic in terms of visual, energy and environmental sustainability.

Varosha, CMC settlement area in Lefka and part of Nicosia city are considered as after-war brownfield areas resulting from political reasons. It is observed that these unused settlements were concluded as problematic sites not only visually

but also in terms of sustainability of energy and environment.

The Evaluation of Energy and Environment of Brownfield Site

The buildings in brownfield sites were built by reinforced concrete material, which was widely started to be used on the Island during the 1950s. Studies have shown that reinforced concrete structures, which are not in use today, increase carbon emission and adversely affect the living life in the environment by increasing greenhouse

effect and disrupt the balance of the ecosystem. In this respect, these buildings in the buffer zone were evaluated through Wheeler’s Sustainability Principles in order to determine the current state

of energy and environment. Also assessments and recommendations were also made on the ecosystem, life of living and human health on the presented table (Table 1).

Table 1.
Energy and Environment Evaluation of Wheeler’s Sustainability Principles in Brownfield Assessment.

EVALUATION OF CYPRUS GREEN LINE AFTER WAR			Recommendation-Assessment Ecosystem, Living-life and Human Health
Wheeler’s Sustainability Principles	BROWNFIELD ASSESSMENT		
	Energy	Environment	
1. Compact, balanced land use	Unused concrete materials increase the greenhouse effect and it does not allow the land to be used in order to provide an opportunity to use renewable energy sources.	Unused buildings, situated on these lands cause irregularity of green area formation which would have provided an opportunity for the development of flora and fauna.	It is not possible to observe this principle in brownfield areas. These areas pose a threat to ecosystem-living life and human health. Brownfield areas should be re-introduced to the usage of the society by taking into account the environmental and energy values.
2. Vehicle use and easy access	The fact that the region is closed to public access constitutes an obstacle in making decisions regarding the use of renewable energy sources.	It is observed that today, plants grow irregularly and unhealthily through buildings and transportation axes.	It is not possible to observe this principle in brownfield areas. Unhealthy development of flora and fauna led to the loss of pedestrian and vehicle axes. Visually, this impacts on human psychology negatively.
3. Wise use of the sources, reduction of wastes, prevention of environmental pollution	The region should be put into use in order to be able to propose nature protecting renewable energy resources.	The prevention of environmental pollution caused by unused structures in the region is possible through regional planning towards the utilisation of the area.	It is not possible to observe this principle in brownfield areas. In order to ensure human health and ecosystem diversity, the region should be freed from environmentally polluting brownfields, and planning efforts that support renewable energy resources should be put into practice.
4. The restoration of natural systems	Natural building areas that may be suitable for the use of renewable energy sources are not perceived.	Topographical features, open spaces, valleys, canals, creeks, and green corridors in the natural structure of the environment have disappeared.	In brownfields, this principle irregularly develops in inside and outside of buildings. Topographical features in the natural structure of the environment, open spaces, valleys, canals, creeks, and green corridors should be identified and a planning system which supports environmental and energy sustainability should be established.
5. Good housing and living environment	The use of renewable energy systems is important for the creation of good living spaces and environments.	The conversion of unused buildings into natural areas has a great importance for the local community.	It is not possible to observe this principle in brownfield areas. Green Line harbours unused buildings and is environmentally problematic for those living in the North and the South of this line.

6. <i>Healthy social ecology.</i>	-	People's negative feelings caused by abandoned and unused areas, adversely affect the formation of a healthy social life.	It is not possible to observe this principle in brownfield areas. In order to create healthy social areas and positive human psychology, the region should be cleansed from unused areas.
7. <i>Sustainable economy</i>	The required budget should be provided so that necessary renewable energy systems can be used in order to be able to maintain sustainability.	It is necessary to create conditions and develop policies in which future generations will not have difficulties to use resources.	It is not possible to observe this principle in brownfield areas. The programmes which provide necessary economic support to increase ecological diversity and healthier development of future generations, through the use of renewable energy, should be supported.
8. <i>Community participation</i>	Ensuring the equal distribution of renewable energy resources to be used in converting the abandoned areas for society use.	Necessity to get the opinion of experts and the public when decisions are made on abandoned areas and related environmental problems.	It is not possible to observe this principle in brownfield areas. To support planning decisions which would encourage public say on decisions that are related with human health and ecosystem.
9. <i>Protection of the local culture and social values</i>	-	Brownfield settlements adversely affect the necessary environmental development in the preservation of local culture and social values.	It is not possible to observe this principle in brownfield areas. To support planning activities on abandoned areas in terms of development of human health, and preservation of ecosystem, local culture and social values.

(Created as a table By Authors)

Within the context of this study, when Wheeler's Sustainability Principles are assessed, since the abandoned areas and the living areas around them are not used actively, the renovation of these areas will be possible only through large economic investments. However, by doing so, would also lead to the loss of biodiversity that currently exists around traditional abandoned structures. Evaluating the overall benefits it would provide, it is suggested as appropriate to form ecological green corridors which are thought to be beneficial for the settlement areas in North and South in the Green Line region and also to take action for planning on renewable energy sources.

Discussion

The study and the observations conducted reveal that it is necessary to carry out planning studies for the conversion of abandoned areas to green areas. In this study, the approach that supports

the use of renewable energy sources in the process of converting the existing green areas into green corridors along with the abandoned areas has been put forward. In this respect, the advantages and disadvantages of the unused areas on the Green Line in Cyprus are determined as follows (Table:2).

As a result of the assessments and observations, it is concluded that there is a need to have planning activities towards transformation of abandoned sites into green areas. In this study, it is suggested that use of renewable energy resources is supported by transforming brownfield sites into greenfield sites and considering them as integrated with greenfield sites which exist both in the North and in the South. In this respect, the benefits and the drawbacks of the current situation in the unused areas that exist on the Green Line have been discussed in Table 2.

Table 2.
Benefits and Drawbacks of the Current Situation of the Green Line

Benefits	Drawbacks
<p>The presence of both brownfield and greenfield areas on the Green Line border.</p> <p>That the Green Line runs through both the sea and mountain slopes.</p> <p>The existence of natural habitat between the divided North and South Cyprus. Particularly observed in areas without any structures or in areas with only abandoned traditional structures.</p> <p>Excluding brownfield sites, observation of normal development of fauna and flora in greenfield areas where there is no settlement.</p> <p>Within the context of planning activities, greenfield sites can turn into green areas and proposes a potential renewable energy.</p>	<p>Brownfield areas' coverage has a negative impact on sustainability of energy and environment.</p> <p>The dense existence of abandoned structures in areas with special importance.</p> <p>Although reinforced concrete structures in the Green Line region are not used, along with the developing settlements outside the buffer zone, there is an increased greenhouse effect.</p> <p>Brownfield areas poses an impediment against the normal development of flora and fauna.</p> <p>The need for some improvements in transforming the brownfield areas into green areas.</p>

(Created as a table By Authors)

Furthermore; it has been demonstrated that the environmental values in the area are suitable for ecology, environmental sustainability, and the use of renewable resources. Harboring lands with different features at sea and mountain levels played an important factor when this argument was put forward. Another important detail is the fact that the

areas outside the identified abandoned areas on the Green Line are greenfield areas, which are considered to be an important opportunity. The benefits and drawbacks of decontamination of the concrete area and its conversion to a completely green area are presented in Table 3.

Table 3.
Potential benefits and drawbacks of future transformation of brownfield areas to greenfield areas on the Green Line

Benefits	Drawbacks	Discussion	
<p>Flora and fauna is expected to show a balanced development in terms of biological diversity in the coming years.</p>	<p>It is expected to take some time for the area to be purified from abandoned buildings and to be transformed into green areas, and for nature to adapt itself within a period of time.</p>	<p>By purifying the area from brownfields, the amount of oxygen will increase, the amount of carbon dioxide will decrease; thus the greenhouse effect will decrease accordingly.</p>	
<p>Studies will be made towards the usage of renewable energy resources by determining the natural resources of the area.</p>	<p>The fact that the unused buildings and the area are furnished with unrenovable energy that cannot be renewed.</p>	<p>The abandoned areas which are proposed to be transformed are suitable for positioning wind turbines and solar energy panels that can be used by both North and South Cyprus.</p>	<p><i>Suggestion:</i> <i>Brownfield site sustainability</i></p>
<p>An arrangement taking renewable energy resources into account, which would make it possible to transform abandoned areas into an area jointly used by both South and North settlements.</p>	<p>It will be insufficient to apply Wheeler's Sustainability Principles only on the abandoned buildings on the Green Line.</p>	<p>A large amount of financial support is needed to introduce regulations and planning which would encourage the use of renewable energy resources or to re-utilise abandoned areas within the region.</p>	<p><i>1. Restoration of natural System</i> <i>2. Wise use of sources, reduction of wastes, prevention of environmental pollution</i></p>

(Created as a table By Authors)

According to the findings, it is argued that the abandoned buildings on the Green Line can be successfully re-used with a planning approach that would be developed in line with Wheeler's Sustainability Principles and keeping the whole Island of Cyprus in focus, and not only the Green Line region. This can be achieved by allocating a certain budget and joint action by two communities. When the current socio-political situation is considered it is suggested that it would be beneficial to plan the transformation of abandoned concrete areas into green areas which would allow the protection of biological diversity given the fact that;

- Majority of the Green Line is made up of greenfields
- The necessary conditions for renewable energy and
- It would be easily applicable under the control of the United Nations.

Suitable renewable energy sources for the region's conditions should be identified (i.e.: solar and wind energy) and used. Thus, the area which is currently problematic in terms of energy and environment will contribute to human health and living beings through the use of environmentally friendly renewable energy.

Conclusion

Brownfields are a global problem that poses an obstacle to planning and decision-making for the regions in which they are located in terms of environment and energy. A conceptual approach is needed to make this controllable and manageable. Restoration works that take sustainability principles into account lead to the destruction of biological diversity; Because in such planning studies, both abandoned reinforced concrete structures and abandoned traditional buildings that contribute to natural life need to work together.

However, the situation in Cyprus is that the Green Line (Settlements in the Nicosia region, Varosha Region in the East of Nicosia, and Unused area of CMC in the West region of Nicosia.) is closed to the public and has been under the administration of the United Nations since the post-war period. Therefore, it requires the development of different approaches. Thus, since there is no evidence of biodiversity in abandoned, reinforced concrete structures, they can be transformed into an ecological green corridor that includes green areas.

In this context, a planning approach is proposed

that will provide the opportunity to create an ecological green corridor where solar and wind energy sources from renewable sources that may be especially suitable for Cyprus can be implemented. To ensure the applicability of the planning approach, firstly after the cleaning of the brownfield areas in the region.

Solar energy panels and wind roses are recommended to be installed in the region. In addition to this, designing pedestrian and bicycle axles in the revival of the area without users is another important suggestion.

Thus, it is expected to contribute to the protection of biodiversity as well as energy production by using renewable resources that can be used by both Northern and Southern Cyprus.

Accordingly, these benefits are expected to be achieved by transforming unused building areas into ecological green corridors;

- Cleaning the area from abandoned concrete structures that create environmental pollution,
- Reducing the greenhouse effect,
- Elimination of psychological pressure caused by visual impact,
- Emergence of lands suitable for the use of renewable energy resources.
- Cleaning the area that prevents the development of flora and fauna,
- There is an expectation that environmental and energy values will increase, biodiversity will increase, and positive effects will be provided to human health and living things.

In this study, the importance of using renewable energy and using ecological corridors for human health and the continuation of the ecosystem by benefiting from existing biological diversity and bringing lost ecological features to abandoned and reinforced areas is discussed. by cleaning them.

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DOI: <https://doi.org/10.34069/AI/2024.74.02.2>

How to Cite:

Dorantes-Benavidez, H., Martínez-Cruz, M.A., Chávez-Pichardo, M., Arenas-Reséndiz, T., & Trejo-Martínez, A. (2024). Sistema evolutivo de simulación de tráfico vehicular en dos intercepciones. *Amazonia Investiga*, 13(74), 22-34. <https://doi.org/10.34069/AI/2024.74.02.2>

Sistema evolutivo de simulación de tráfico vehicular en dos intercepciones

Evolutionary vehicle traffic simulation system in two interceptions

Received: January 5, 2024

Accepted: February 27, 2024

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Resumen

Esta investigación propone dar una solución óptima a los problemas que existen en materia de tráfico vehicular, ya que no se trata de un problema local sino global. Los resultados son alentadores y muestran que el algoritmo matemático programado en una interfaz para un sistema de dos intercepciones. Se proponen diferentes cargas vehiculares en la plataforma de simulación NetLogo para que el algoritmo sea capaz de sincronizar de manera óptima el cambio de luces de la interfaz (semáforo) considerando las diferentes cargas vehiculares aleatorias en ambos cruces. Se realizaron un total de tres mil quinientos (3,500) experimentos, utilizando el método de Monte Carlo para determinar probabilidades sobre las variables de tiempo y velocidad media, considerando las múltiples combinaciones realizadas en el simulador. Por último, se describe la programación de la

Abstract

This research proposes to provide an optimal solution to the problems that exist in terms of vehicular traffic, since it is not a local problem but a global one. The results are encouraging and show that the mathematical algorithm programmed into an interface for a two-intercept system. Different vehicular loads are proposed in the NetLogo simulation platform so that the algorithm is able to optimally synchronize the change of interface lights (traffic light) considering the different random vehicle loads at both junctions. A total of three thousand five hundred (3,500) experiments were conducted, using the Monte Carlo method to determine probabilities on the variables of time and mean speed, considering the multiple combinations performed in the simulator. Finally, the programming of the interface is described, as well as the optimal overall behavior of the system graphically and mathematically.

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interfaz, así como el comportamiento global óptimo del sistema de manera gráfica y matemáticamente.

Palabras clave: tráfico vehicular, flujo vehicular, método monte carlo, plataforma de simulación netlogo, combinaciones.

Introducción

Vivimos en un mundo globalizado y competitivo donde las ciudades se enfrentan a serios problemas de movilidad, por lo que es importante el control inteligente del tráfico vehicular. El presente trabajo propone una solución al tema de movilidad, ya que no es un problema local sino de índole mundial, la falta de una óptima sincronización en los semáforos genera un flujo cada vez más denso en horas pico. Los resultados son alentadores ya que muestran el algoritmo matemático programado en una interfaz que cumple con el objetivo de optimizar el flujo vehicular en dos intersecciones, para ello se utilizó una plataforma informática basada en entornos evolutivos multiagente NetLogo considerando todas las combinaciones de carga vehicular de manera aleatoria en ambos cruces. Se realizaron 3,500 experimentos, utilizando el método de Monte Carlo para determinar probabilidades sobre las variables de tiempo y velocidad media, considerando las diferentes cargas vehiculares en el simulador. Por último, se describe la programación de la interfaz, así como el comportamiento global óptimo del sistema de manera gráfica y matemática.

Los semáforos inteligentes permiten un buen grado de control sobre los flujos de tráfico dentro de una ciudad o área, con el objeto de mejorar los desplazamientos diarios y busca reducir la congestión y mejorará los sistemas de transporte. Los semáforos y las señales inteligentes son fichas importantes en el panorama general. Por lo general, en las grandes ciudades, el tráfico está controlado por semáforos que usan temporizadores, mientras que, en los suburbios, pueblos pequeños y carreteras, prefieren los sensores de señales de tráfico porque no solo administran el flujo de tráfico inestable de manera efectiva, sino que también detectan cuando los automóviles llegan a las intersecciones. (Miz & Vladimir, 2014). Algunos estudios muestran que las ciudades con alta densidad de población tienden a tener problemas con el flujo de tráfico; por ejemplo, en la Ciudad de México, de acuerdo con el índice TomTom en 2022, se observó un aumento en los niveles de congestión en la Ciudad de México. Los datos sugieren que el tiempo medio de viaje aumentó

Keywords: Vehicular traffic, vehicular flow, monte carlo method, netlogo simulation platform, combined.

en 1 minuto al día. Un nivel de congestión del 38% significa que, en promedio, los tiempos de viaje fueron un 38% más largos que durante las condiciones de referencia sin congestión. Esto significa que un viaje de 30 minutos en condiciones de flujo libre tomará 11 minutos adicionales cuando el nivel de congestión sea del 38%. (TomTom, 2022).

Revisión de literatura

La teoría general de sistemas comprende un conjunto de varios enfoques que difieren en estilo y propósito, entre los que se encuentra la teoría de conjuntos (Mesarovic), la teoría de redes (Rapoport), la cibernética (Wiener), la teoría de la información (Shannon y Weaver), la teoría de autómatas (Turing), la teoría de juegos (Von Neumann), entre otras. La práctica sobre el análisis de sistemas aplicados tiene que aplicarse a diversos modelos, de acuerdo con la naturaleza del caso y con criterios operacionales, etc. Son ampliamente aplicables a los sistemas materiales, psicológicos, socioculturales y de movilidad. (Flórez & Thomas, 1993).

Se utilizó el método Monte Carlo, siendo una técnica numérica para calcular probabilidades, utilizando secuencias de números aleatorios. Para el caso de una sola variable el procedimiento es la siguiente: Generar una serie de números aleatorios, r_1, r_2, \dots, r_m , uniformemente distribuidos en $[0,1]$ Usar esta secuencia para producir otra secuencia, $\mathbf{x}^1, \mathbf{x}^2, \dots, \mathbf{x}^m$, distribuida de acuerdo a la función en la que estamos interesados. Usar la secuencia de valores \mathbf{x} para estimar alguna propiedad de $f(\mathbf{x})$. Los valores de \mathbf{x} pueden tratarse como medidas simuladas y a partir de ellos puede estimarse la probabilidad de que los \mathbf{x} tomen valores en una región. El método (MC) sin embargo es útil para integraciones multidimensionales. (Illana, 2013)

De manera que, si la interfaz se programa correctamente, los cambios de luz optimizarán el sistema considerando las diferentes cargas vehiculares que puedan presentarse en un sistema de dos intersecciones. Considerando como

propuesta innovadora la presente investigación respondiendo a la problemática vehicular.

Los modelos macroscópicos describen las relaciones entre velocidad, intensidad y densidad, variables que competen a todo el conjunto de vehículos en el flujo de tráfico. Las zonas que se simulan con estos modelos son mucho más amplias que las microscópicas y pueden ser áreas reales, donde exista una semaforización en una o varias vías. Desarrollos realizados recientemente han conducido a la modelización de flujos a través de la micro simulación lo cual permite establecer relaciones entre ambas clases de modelos. Una explicación técnica sobre la causa fundamental de la congestión es la fricción o interferencia entre los vehículos en el flujo de tránsito. Hasta un cierto nivel de tránsito, los vehículos pueden circular a una velocidad relativamente libre, determinada por los límites de velocidad, la frecuencia de las intersecciones, y otras condicionantes. Sin embargo, a volúmenes mayores, cada vehículo adicional estorba el desplazamiento de los demás, es decir, comienza el fenómeno de la congestión. Entonces, una posible definición objetiva sería: “la congestión es la condición que prevalece si la introducción de un vehículo en un flujo de tránsito aumenta el tiempo de circulación de los demás” (Thomson & Bull, 2002).

Utilizando un nuevo Método de Calibración de la Demanda de Tráfico en SUMO, la elaboración, validación y optimización del Vehicle to Everything (V2X), la conducción conectada y automatizada, junto con los sistemas de transporte inteligentes (ITS) requieren escenarios de simulación de tráfico que pueden caracterizar de manera eficiente la movilidad vehicular a nivel macroscópico y niveles microscópicos. (Rezzai et al., 2018).

La propuesta sobre el desarrollo de sensores avanzados con diferentes aplicaciones y servicios inteligentes orientados al transporte por carretera, están basados sobre la arquitectura de referencia de software (ISO) de estaciones sobre los sistemas inteligentes de transporte (ITS). (Mohammadian, 2006).

En áreas urbanas densas, existen diversas opciones para mejorar el flujo de tráfico vehicular. Llamado Re-RouTE que se fundamenta en la teoría de la ingeniería de tráfico. Al identificar rutas congestionadas, el objetivo principal de Re-RouTE se fundamenta en la densidad de vehículos en las carreteras y emplea el modelo macroscópico de ingeniería de tráfico de la densidad de flujo. La representación

de las carreteras es posible mediante una gráfica ponderada, la cual se emplea para identificar rutas, atascos y con un pequeño incremento en la distancia recorrida. (Alam & Guo, 2023).

En México la forma en que nos movemos. Según datos del INEGI, muestran que en el año 2000 había alrededor de 10 millones de automóviles particulares en el país y cerca de 300,000 motocicletas. En las últimas dos décadas, la población creció un 30%. La movilidad en México es cada vez compleja al momento de desplazarse de un punto a otro. (Maksat et al., 2023).

La presente investigación, Optimal Extreme Learning Machine based Traffic Congestion Control System in Vehicular Network, desarrolla un sistema óptimo de control de la congestión de tráfico basado en un aprendizaje automático extremo (OELM-TCCS) en redes vehiculares, con una precisión del 99.17%, logrando un nuevo modelo ELM para llevar a cabo el proceso de clasificación. (Ziang et al., 2023). En diferentes estudios se han propuesto modelos matemáticos basados en intervalos de tiempo que determinan el flujo de tráfico vehicular en carreteras. La propuesta del modelo toma tres parámetros principales: velocidad máxima de flujo libre, una longitud de seguridad típica de los vehículos y un valor promedio del intervalo de tiempo de los datos de tráfico durante condiciones de congestión. (Tulay et al., 2019). La simulación sobre tráfico vehicular describe la complejidad de la infraestructura y educación vial. El modelo de tráfico se puede dividir en micro simulación describiendo todo el sistema y su relación interna entre los diferentes agentes que lo componen. (Bani Younes & Boukerche, 2016). El modelo de micro simulación considera el movimiento de cada vehículo individual en el espacio dentro de una red de carreteras. Su función principal es describir la correlación entre los agentes vehiculares, así como considerar la infraestructura vial y las diferentes regulaciones o legislaciones en el sistema. (Bakar et al., 2018). El diseño en su topología y arquitectura basada en sistemas multiagente para el control de señales de tráfico, la propuesta del algoritmo Reinforcement Learning RL es un enfoque de inteligencia artificial que permite el control adaptativo en tiempo real en las intersecciones del sistema autónomo, capaz de aprender de su entorno y tomar decisiones para optimizar el tráfico en un conjunto de tres intersecciones. La interfaz se ajusta de manera línea en función del tráfico real que se acerca a cada intersección. (Rezzai et al., 2018) (Mohammadian, 2006).

El algoritmo propuesto calcula analíticamente las trayectorias de referencia CAV basadas en un modelo de vehículo de segundo orden, de modo que todos los cálculos se pueden realizar en tiempo real. Los dos núcleos de este marco son un método digital de conocimiento de la situación del tráfico basado en el espacio aéreo y un modelo de selección de trayectorias aéreas y terrestres (Alam & Guo, 2023) (Maksat, Ece, & Klaus Werner, 2023) (Ziang et al., 2023). Sin duda alguna la preocupación sobre el tema, genera diferentes propuestas de solución al tráfico vehicular, de manera que los sistemas de vigilancia hoy en día funcionan con sistemas tradicionales mediante cableados que necesitan de una inversión costosa, la propuesta que hace el trabajo Urban Traffic Monitoring via Machine Learning utiliza un método de seguimiento del tráfico para entornos urbanos, mediante señales RF enviadas en una red vehicular utilizando algoritmos de aprendizaje autónomo utilizando un receptor vehicular como vía de comunicación (Tulay et al., 2019). La programación del semáforo, utiliza un algoritmo de control inteligente de semáforos (ITLC). La propuesta es interesante en el trabajo Algoritmos de control de semáforos inteligentes mediante redes vehiculares tiene como objeto programar las fases de cada semáforo aislado de manera eficiente, considerando características en tiempo real sobre los flujos de tráfico en carreteras intercomunicadas controladas por ambos semáforos. (Bani Younes & Boukerche, 2016). Existen nuevas investigaciones sobre el tema uno de ellos hace mención sobre un modelo de simulación de baja densidad por eventos discretos y reducción de cuellos de botella (Bakar et al., 2018). Las comunicaciones vehiculares como desarrollo tecnológico y de comunicación 5G son un factor clave para los nuevos servicios vehiculares en un futuro respondiendo el problema vehicular en todo el mundo no obstante quedara como propuesta futurista (Ortiz et al., 2022).

Metodología

El uso de NetLogo es beneficioso para la representación de sistemas complejos que cambian con el tiempo. Los implementadores de modelos pueden instruir a cientos o miles de agentes para que operen de forma independiente, entre sí y con el entorno. Su estado actual es suficiente para convertirlo en una poderosa herramienta de investigación en el campo mencionado.

Sus características de esta plataforma cuentan con herramientas y funciones que, al mismo

tiempo, permiten la modelación y evaluación de fenómenos socio físicos con gran precisión y eficiencia en términos de tiempo; De esta manera, NetLogo es la herramienta perfecta para estudiar y modelar un fenómeno como el tráfico vehicular; más aún, cuando este programa cuenta con un simulador de flujo vehicular (Wilinsky, 2003).

Por su parte, el Método Monte Carlo es una técnica que combina conceptos estadísticos, como el muestreo aleatorio, con la capacidad de los ordenadores para generar números cuasialeatorios y automatizar cálculos. John Von Neumann lo desarrollo a finales de la década de 1940 posteriormente, este método se ha empleado en numerosas áreas como una alternativa a los modelos matemáticos exactos, o incluso como el único medio para calcular sistemas o problemas complejos.

Monte Carlo está presente en todos los ámbitos en los que los comportamientos aleatorios o probabilísticos juegan un papel fundamental, ya que se pueden encontrar modelos que utilizan este método en áreas como la informática, la economía, los negocios, la industria e incluso en las ciencias sociales, la estadística y la computación para emular el comportamiento aleatorio de sistemas dinámicos reales mediante el uso de modelos matemáticos. En este tipo de simulación, la tarea fundamental es crear un modelo matemático del sistema y encontrar las variables de entrada cuya composición aleatoria determinará el comportamiento general del sistema y se completan los siguientes pasos:

- Mediante el apoyo de un dispositivo electrónico (Ordenador) se generan muestras aleatorias (o valores específicos) para las variables de entrada.
- Analizar el comportamiento del sistema con los valores de entrada generados.
- Una vez repetido el experimento (n) veces, se realizarán una serie de observaciones sobre el comportamiento del sistema; con el fin de entender cómo funciona. La precisión de este análisis será directamente proporcional al número n de experimentos que se estén llevando a cabo en el sistema.

Desde una perspectiva teórica, el apartado anterior se basa en la Ley de los Grandes Números y el Teorema del Límite Central, dos resultados muy significativos que forman parte del estudio de diversas ramas de las matemáticas. Constituyen una parte del estudio de diversas ramas de las matemáticas, como la probabilidad y la estadística; Esta es la razón principal por la

que se decidió llevar a cabo el presente experimento con no menos de 3,500 simulaciones que forman parte del estudio. El presente estudio sugiere un análisis multiagente de la problemática vehicular; El modelo propuesto es novedoso porque determina el punto óptimo de flujo vehicular en un sistema de dos uniones utilizando una herramienta de información basada en un entorno programable multiagente que está orientado a modelos multiagente. El sistema de "molienda de tráfico" se utilizó dentro de la plataforma de simulador NetLogo. (Wilinsky, 2003)

El problema del tráfico vehicular es un sistema complejo al trasladarse de una ciudad a otra. Se generaron 3,500 simulaciones para cada combinación de vehículos en el eje X y el eje Y (X, Y); El número de ciclos se determinó mediante el siguiente procedimiento:

$$S_t = \sum_{t=1}^{99} \sum_{t=1}^T \frac{t(t+1)}{2} \quad (1)$$

Dónde S_t es el número de combinaciones óptimas realizadas en la interfaz, considerando el cambio de la luz verde por donde cruza la mayor carga vehicular en el sistema, t muestra el tiempo de la luz verde en el rango de $0 < t < T$ y T el tiempo máximo de cruce vehicular.

De la siguiente manera se determina el número total de combinaciones sobre las diferentes cargas vehiculares para ambos ejes x (C_i) se determina utilizando la siguiente ecuación.

$$C_i = \sum_{i=1}^{99} \frac{i(i+1)}{2} \quad (2)$$

Donde (C_i) es el número de combinaciones óptimas de vehículos en el eje x , se determina utilizando en un rango de $0 < i < 99$, de manera similar se define el número de combinaciones para el eje y ; Sin embargo, al tratarse de un proceso simétrico, se descarta el estudio de sus

combinaciones.

En general, tenemos el número total de combinaciones programadas en el semáforo mediante la siguiente formula:

$$S_{tc_i} \quad (3)$$

Las variables analizadas se muestran en la Tabla 1. Se describe a continuación las columnas que se muestran en la tabla mencionada: La primera columna muestra el número de simulaciones realizadas a manera de una combinación realizada así sucesivamente por cada combinación; la siguiente columna muestra el tiempo total del semáforo, la tercera columna muestra el tiempo complementario al realizar el cambio de la luz verde a la luz roja; la siguientes dos columnas muestran el número de vehículos que se encuentran en ambos ejes (x, y), y finalmente las dos columnas restantes muestran la carga vehicular promedio para ambos ejes al momento de cruzar las intercepciones.

Estructura de la programación del simulador

Las listas son una estructura de datos empleadas para almacenar información de manera ordenada, cabe resaltar que este tipo de estructura es dinámica a comparación de los arreglos, una lista, por ejemplo, es una estructura de datos que tiene un comportamiento muy bien definido: pueden insertársele nuevos elementos, recorrérsela, encontrar el primer y último elemento. Al implementar la lista como un Tipo Abstracto de Datos (ADT: Abstract Data Type en inglés), el programador decide cuáles procedimientos se necesitan para manipular una lista, y define su interrelación. Un usuario del tipo de datos "lista" no necesitará entonces conocer cómo se interrelacionan (a nivel de implementación) los datos ni los procedimientos que manipulan listas pues le bastará usar las operaciones de la lista para manejarla.

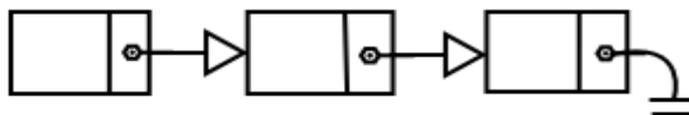


Figura 1. Se elaboró el esquema sobre la estructura de listas en el simulador.

Las listas nos otorgan la posibilidad de editar, eliminar y agregar nuevos elementos a la estructura, por otro lado, los arreglos cuentan con un número finito de casillas y no es posible

realizar operaciones más que la inserción de datos sin superar el número de casillas. (Di Mare, 1993)

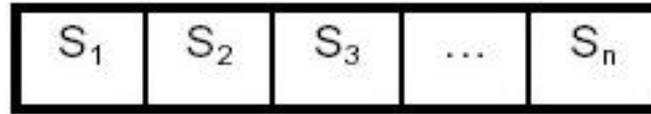


Figura 2. Se elaboró el esquema sobre los arreglos en el simulador.

Validación del modelo

Las variables se definen de la siguiente manera:
Num-autosX, Num-autosY, Full_time,
Increment, MediaX, MediaY, Ncarsstop,

Averagespeed, Waitcars, Med-velocidad, Total-waitcars, para ambos cruces. Se analizo el intervalo [1,50] con la finalidad de validar el punto óptimo del modelo.

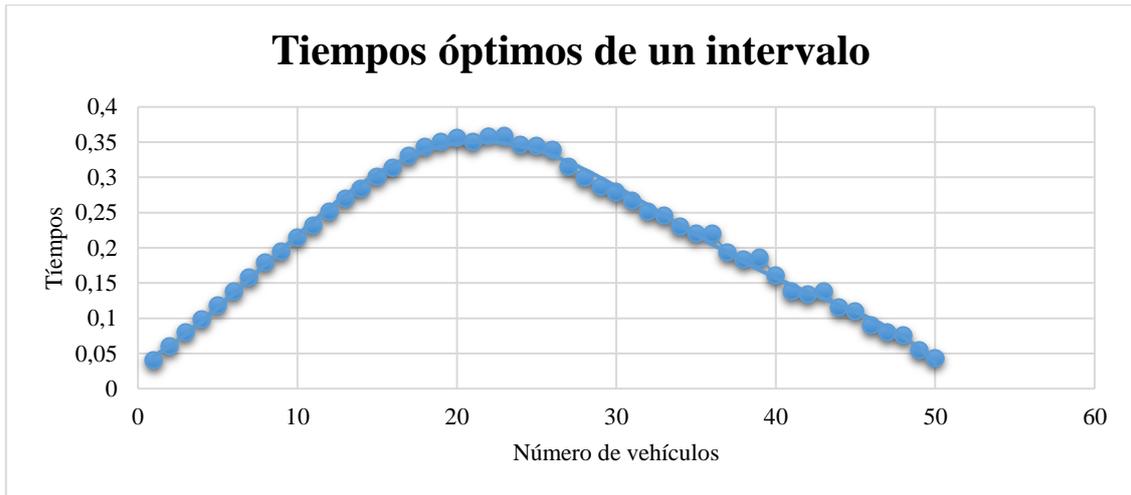


Figura 3. Combinación óptima de un intervalo.

Se elaboro el siguiente gráfico tomando en cuenta la siguiente coordenada o punto óptimo dentro del sistema de dos intercepciones (21,0.3510), mismo que se encuentra en la cresta de la curva, para ello se realizaron múltiples combinaciones aleatorias donde cruza la mayor carga vehicular, a continuación, se muestra la validación del punto óptimo.

Determinación la función.

$$f(x) = -4E^{-10}\chi^6 + 3E^{-8}\chi^5 + 7E^{-7}\chi^4 - 0.0001\chi^3 + 0.002\chi^2 + 0.0069\chi + 0.0398$$

Como la función $f(x) = (\chi, y)$ de clase C^6 Esta en un conjunto abierto U en R^2 , podemos calcular un punto (X_0, Y_0) Como maximo local de $f(x)$ de acuerdo a $f(x) \leq f(x_0)$ para $X \in A$ localizando los puntos críticos. Por lo tanto, derivando $f(x)$ obtenemos:

$$f'(x) = -2E^{-9}\chi^5 + 1.5E^{-7}\chi^4 + 2.8E^{-6}\chi^3 - 0.0003\chi^2 + 0.004\chi + 0.0069$$

El punto crítico que se analizo es (21,0.3510) en el sistema de dos intercepciones, posteriormente se obtiene la segunda derivada, fundamentándolo

en qué.

$$F'' = \lim_{x \rightarrow z} \frac{F'(x) - F'(z)}{x - z} = \lim_{x \rightarrow z} \frac{F'(x)}{x - z} > 0$$

Por lo tanto: $\exists, \delta > 0 \lim_{x \rightarrow z} \frac{F'(x)}{x - z} > 0, \forall x \in |z - \delta, z + \delta| x \neq z$

Y en particular se obtiene:

$$F'(x) < 0 \forall x \in |z - \delta, z - \delta|$$

$$F'(x) > 0 \forall x \in |z - \delta, z + \delta|$$

Por lo que se obtiene la segunda derivada:

$$f''(x) = -1E^{-8}\chi^4 + 6E^{-7}\chi^3 + 8.4E^{-6}\chi^2 - 0.0006\chi + 0.004$$

Sustituyendo en z obtenemos:

$$f''(21) = -2.60581E^{-3}$$

Al cambiar de signo de positivo a negativo encontramos un máximo, sustituyendo en z en la función original se obtiene:

$$f(x) = 0.3510$$

Obteniendo el punto máximo de la gráfica: (21, 0.3510), lo que nos da un valor aproximado al valor de la función. (Dominguez & Cortínez,

2012) Un método continuo- Discreto para el diseño óptimo de sistemas de transporte urbano.

Table 1.

La siguiente tabla se elaboró con los resultados óptimos obtenidos en el simulador considerando las diferentes cargas vehiculares en el sistema de dos intercepciones.

[Número de ejecución]	full_time	increment	num_autosx	num_autosy	Mediay	mediay
1	5	1	1	1	0.103448	0.034482
2	5	2	1	2	0.103489	0.103412
3	5	3	1	3	1.103667	1.103779
4	5	4	1	4	2.10355	2.10366
5	5	5	1	5	3.10449	3.10549

Fuente: (Elaboración propia)

Las simulaciones muestran varios escenarios óptimos y los resultados son alentadores. La interfaz se programó con diferentes ciclos al cambiar las luces y diferentes períodos de tiempo óptimos ya normalizados donde la mayor

cantidad de vehículos logran cruzar el sistema de dos cruces. La figura 4 muestra el tiempo mínimo para cambiar las luces con respecto a la carga del vehículo del sistema.

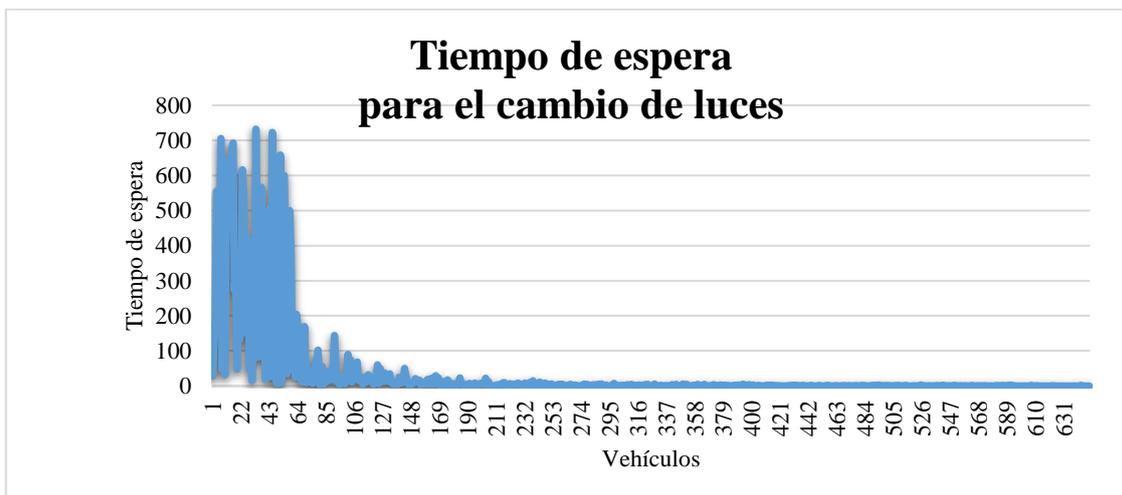


Figura 4. Con los datos obtenidos se elabora la siguiente gráfica donde se muestra la carga vehicular, así como el cambio de luces en el semáforo. (Elaboración propia)

Los resultados obtenidos en el simulador en los ejes de intercepción (Cars_x y Cars_y); Se programa la variable (full-time (t_T)), siendo el tiempo total década ciclo al momento de realizar el cambio de luces de la interfaz, a través del comando increment (tp) proporciona el tiempo óptimo normalizado de la interfaz, la variable (time) proporciona el total de combinaciones finitas del sistema en dos intercepciones.

Mediante una simulación Monte Carlo utilizando un modelo probabilístico, se obtuvo un elemento de predicción aleatoria, con el cual se obtuvieron las probabilidades del flujo vehicular, así como el tiempo óptimo normalizado dentro del sistema.

La Figura 5. Se muestra una tendencia de distribución normal sobre el número total de combinaciones realizadas por cada uno de ellos considerando sus diferentes cargas vehiculares en ambos ejes (X, Y). El semáforo, también llamada (interfaz), considera un tiempo relativo tp/t_T (Increment_time/Full_time) con una media 0.199872 y desviación estándar 0.098762 Como resultado de las tres mil quinientas simulaciones realizadas por cada combinación del modelo propuesto, se obtuvo una combinación óptima programable para La interfaz (35, 25, 70, 35) [Cars_x, Cars_y, Full_time se muestra Incremento_tiempo].

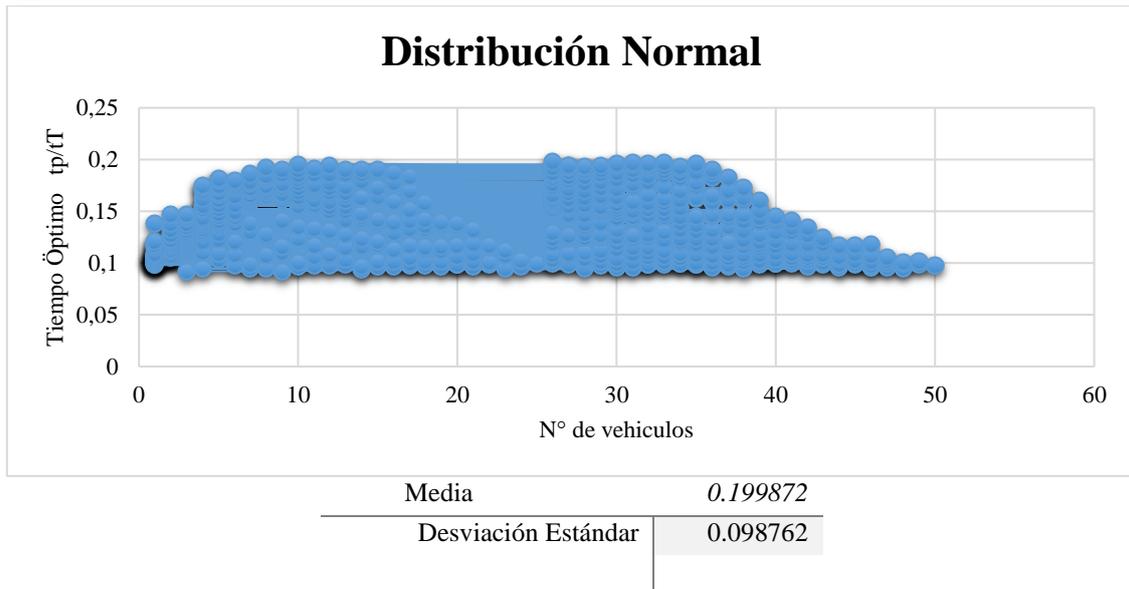


Figura 5. Se muestra el tiempo óptimo de una sola combinación, así como las medidas de tendencia en un sistema de dos intercepciones. (Elaboración propia)

Los resultados obtenidos tras realizar 3,500 simulaciones para cada punto óptimo se denominan el punto óptimo donde se cruza la mayor carga vehicular en ambos ejes. Teniendo en cuenta la probabilidad de éxito de que un evento de este tipo ocurra en un escenario del

mundo real. Las múltiples simulaciones realizadas en el simulador NetLogo muestran el algoritmo matemático para programar la interfaz con las diferentes cargas vehiculares en ambos ejes (X, Y), evitar los problemas de congestión vial como se muestra en la tabla 2.

Table 2.
Programación óptima de semáforos en un sistema de dos cruces.

ID	X	Y	Full Time (s)	Increment (s)	Probabilidad de éxito
1	2	1	4	2	0.09081633
2	2	2	10	5	0.08959184
3	2	3	24	10	0.09863946
4	2	4	10	5	0.80040816
5	2	5	2	5	0.90657771
6	2	6	25	7	0.60673469
7	2	7	24	8	0.80602041
8	2	8	24	8	0.70557823

Notas: 1. (s) Representa la unidad de medida en segundos. (Elaboración propia)

En la tabla siguiente se describe el contenido de la siguiente tabla: La primera columna muestra un (ID) como identificador De las múltiples combinaciones realizadas en el simulador, la segunda y tercera columnas muestran la carga vehicular en ambos cruces (X, Y), La cuarta y

quinta columnas determinaron el tiempo total en segundos para cambiar las luces de la interfaz, finalmente se determinó la probabilidad de éxito de cada evento en un escenario real. La Fig. 6 muestra el comportamiento óptimo de la interfaz en un sistema de dos intersecciones.

Comportamiento del sistema con diferentes cargas vehiculares

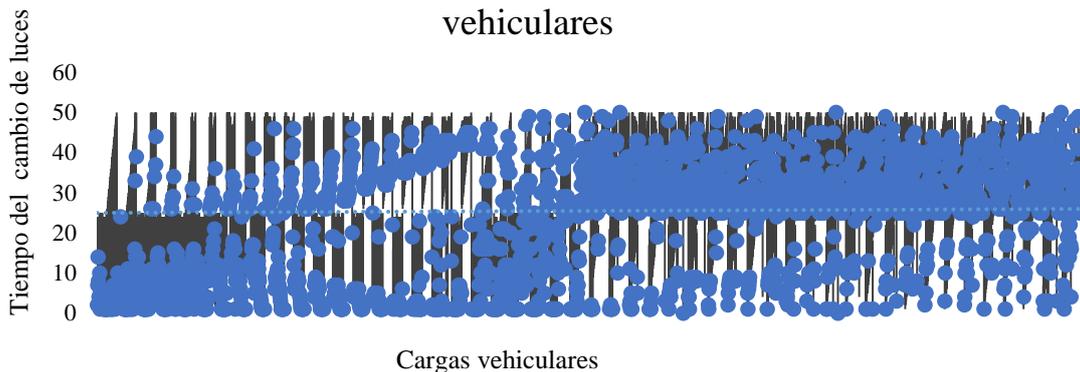
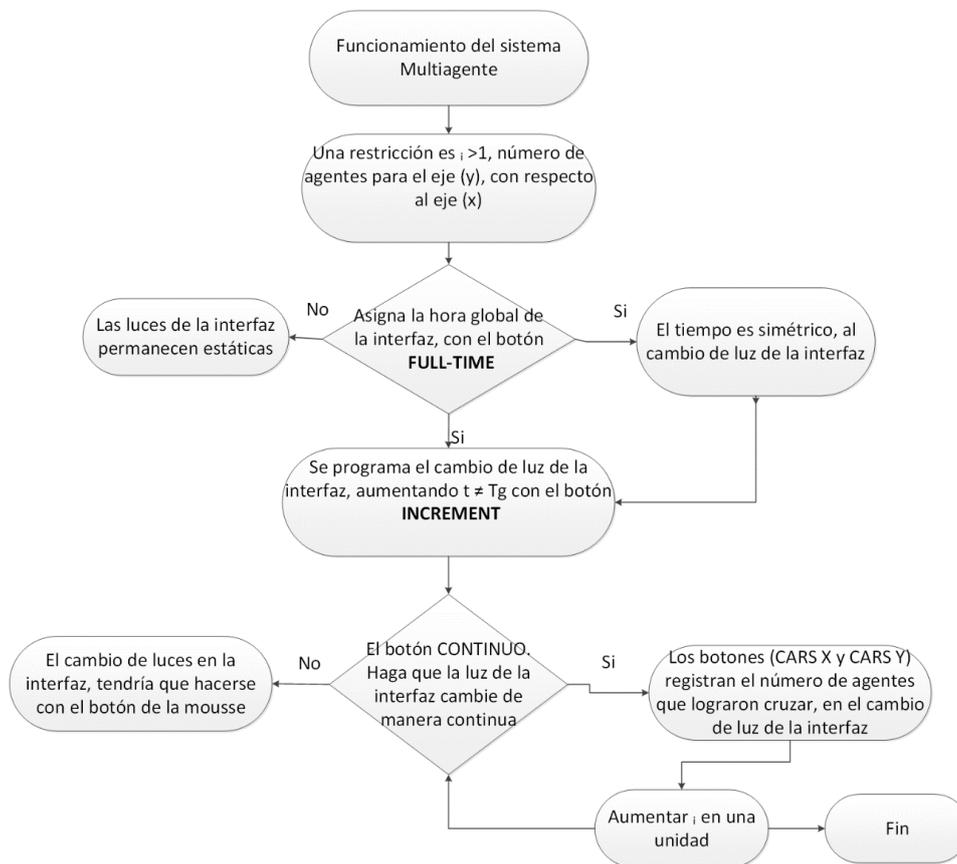


Figura 6. Comportamiento óptimo de la interfaz (semáforo) considerando sus diferentes cargas en un sistema de dos cruces. (Elaboración propia)

A continuación, se presenta el diagrama de flujo del funcionamiento del programa NetLogo, facilitando el proceso de simulación.



NOMENCLATURA :

- i = Agente (Vehículo)
- t = tiempo
- T_g = Tiempo global

Figura 7. Diagrama de flujo del sistema multiagente NetLogo en un sistema de dos intercepciones. (Elaboración propia)

Resultados y discusión

El presente trabajo muestra una solución al problema vehicular, donde fueron consideradas las múltiples combinaciones en el simulador NetLogo, se presentan los resultados óptimos que podrán ser programadas en un futuro en una interfaz (Semáforo). Se realizaron 3,500 simulaciones para cada punto óptimo. Los resultados son contundentes sobre la densidad vehicular en un sistema de dos intercepciones, Con el objetivo de programar los tiempos óptimos globales de mayor afluencia vehicular (T.O.). Total de cruces vehiculares max (CcT), controlando las diferentes cargas vehiculares en el sistema, así como el cambio de las luces definida por $\max\{CcT/(tp/tT)\} \max(CcT)$; con respecto al tiempo Optimo; es decir, $T.O.(\max [Cc] _T) = \{t \in T / [Cc] _T \text{ es el valor máximo}\}$. Observamos que existen básicamente dos tipos de comportamientos, el primero es donde se obtiene un punto óptimo, el segundo comportamiento es donde se obtienen varios puntos óptimos es fácil de justificar ya que existe un cierto nivel de tránsito, los vehículos pueden circular a una velocidad relativamente libre, determinada por los límites de velocidad aleatorias dentro del sistema multiagente. Sin embargo, al ponderar un vehículo adicional en ambos ejes el desplazamiento entre vehículos comienza el fenómeno de la congestión. La propuesta es muy interesante ya que el modelo presenta diferentes tiempos óptimos es un escenario que se ofrece cuando los automóviles

tienen un menor tiempo de espera, por lo que en estos casos consideramos el tiempo óptimo (T.O) como tiempo mínimo.

La congestión de los sistemas de vialidad en todo el mundo es una de las causas principales al conflicto de movilidad. Sin embargo, algunos avances en inteligencia artificial y agentes autómatas han fracasado en el intento de utilizar vehículos de navegación al ser tripulados por agentes o sistemas inteligentes, sin embargo, la falta de equipamiento tecnológico en algunas partes del mundo hace que dicha propuesta tenga o presente problemas de adaptabilidad a las nuevas propuestas. La propuesta que plantea la investigación desarrollada consiste en programar un micro chip el cual contenga los resultados obtenidos y dar solución a la problemática planteada.

Con el fin de obtener nuevos hallazgos en un futuro se pretende dar continuidad a la investigación, modelando los resultados ya obtenidos sobre los tiempos óptimos en un sistema de múltiples intercepciones o cruces controlados por semáforos. Es necesario invertir en los equipos necesarios adaptados a escenarios reales donde la amplitud de variables que no fueron consideradas pueda ser tomadas en cuenta y proporcionar nuevos resultados que den respuesta al problema del tráfico vehicular.

En la figura 8. Se muestra el proceso de simulación de dos intercepciones en la plataforma NetLogo.

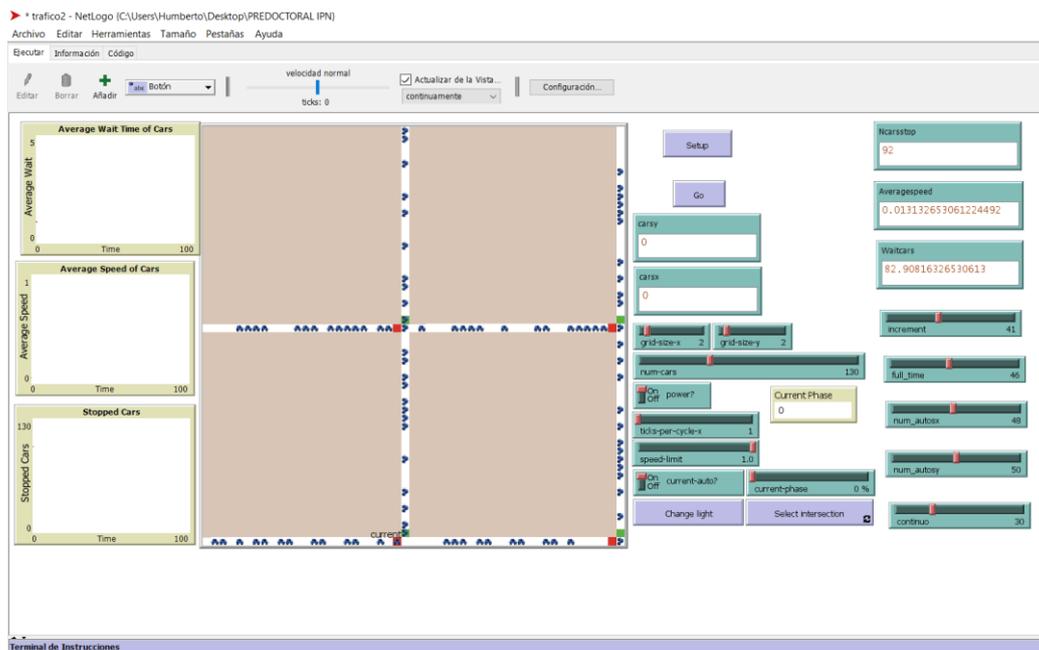


Figura 8. Pantalla del simulador NetLogo en su proceso de simulación.

Fuente: (Wilinsky, 2003)

Los resultados muestran la dinámica eficaz, donde el semáforo muestra los diferentes ciclos

del cambio de luces en un sistema de dos cruces, (ver figuras 9 y 10).

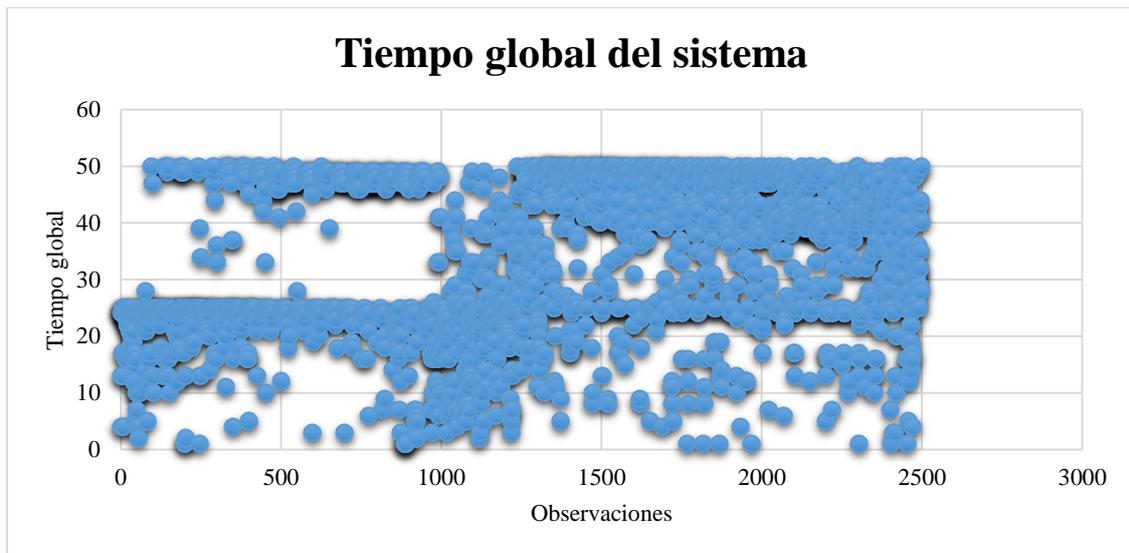


Figura 9. Se elaboró la gráfica donde muestra el comportamiento óptimo del tiempo global del semáforo. (Elaboración propia)

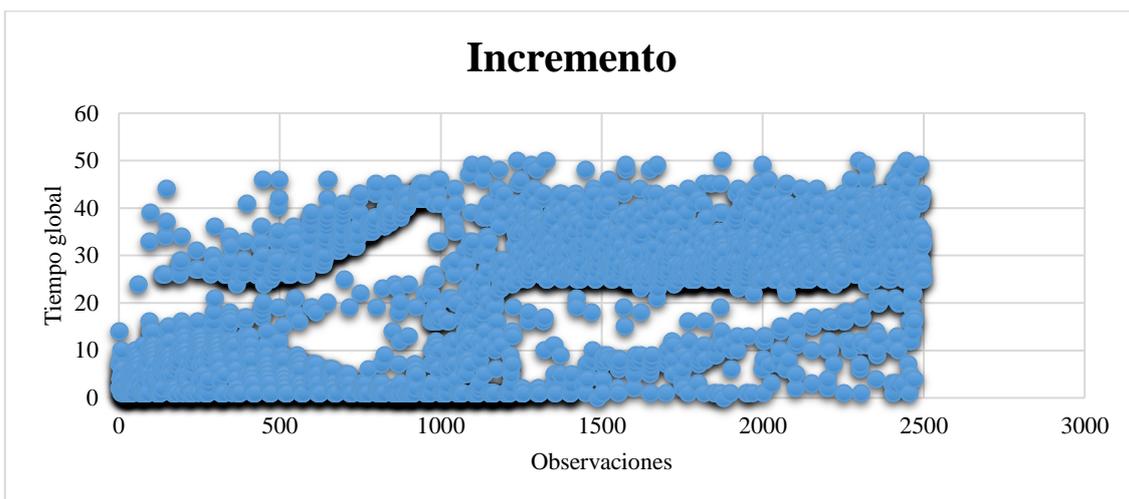


Figura 10. Presenta el funcionamiento óptimo del cambio de luces en el semáforo. (Elaboración propia)

Finalmente, se presenta el comportamiento óptimo del sistema en dos intersecciones, y el comportamiento sobre el flujo vehicular con las

diferentes cargas vehiculares y su óptimo desempeño como se muestra a continuación, ver la figura 11.

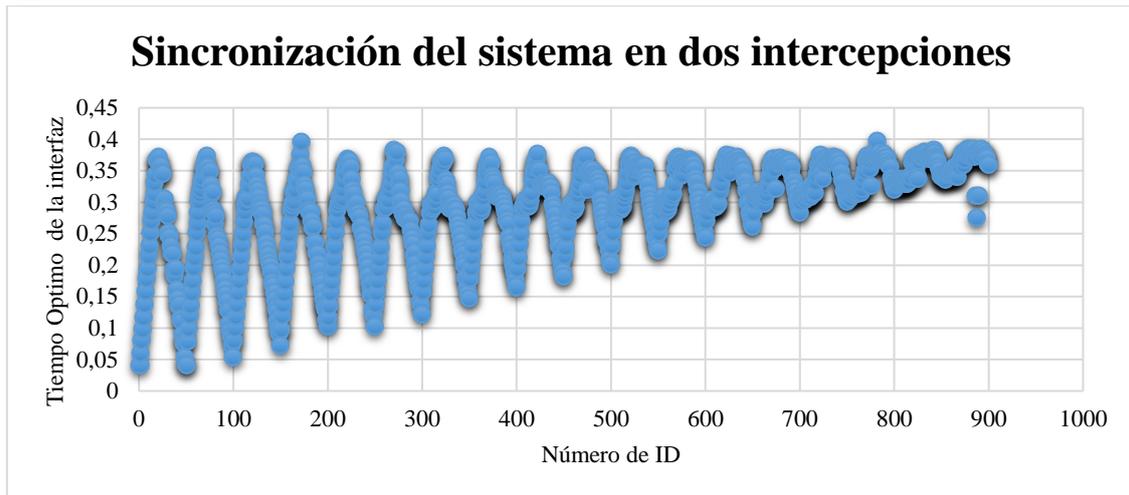


Figura 11. Sincronización al cambio de luces y diferentes cargas vehiculares en el sistema. (Elaboración propia)

Conclusiones

La congestión en los sistemas de vialidad en todo el mundo es una de las causas principales problemas que generan diversos problemas de contaminación, ruido, cuellos de botella etc. Los avances más significativos y evolutivos es dar paso a la inteligencia artificial sobre vehículos no tripulados en un futuro muy cercano. Algunas limitaciones es la falta de condiciones económicas y de infraestructura vial, por ende, al llevar a cabo la propuesta a un escenario real las condiciones como el estrés y diversas variables que no se mencionan en el presente estudio, hacen interesante el nuevo planteamiento y retos futuros. Un factor considerable son los costos en la adquisición de los dispositivos necesarios para su aplicación en un escenario real. La presente investigación hace énfasis sobre la solución al problema vehicular en un sistema de dos intercepciones. A través del comportamiento y programación dinámica de los agentes vehiculares en ambos cruces dan una posible respuesta a la problemática de movilidad. La presente investigación muestra los resultados obtenidos mediante un algoritmo matemático considerando las diferentes cargas vehiculares en ambos ejes como propuesta innovadora que utiliza los procesos de simulación para mejorar el tráfico vehicular. El planteamiento a futuro consistirá es reducir aún más el tiempo de espera y al mismo tiempo aumentar la velocidad de viaje al hacer que los automóviles se comuniquen entre sí. Por otra parte, uno de los trabajos futuros es optimización un sistema de múltiples intercepciones o cruces, utilizando semáforos inteligentes programados mediante un micro chip programado con los resultados obtenidos en el presente trabajo.

La presente investigación brinda una solución innovadora al tráfico vehicular en un sistema de dos cruces, a través de la programación óptima de la interfaz (Semáforo) como se muestra en la tabla 2 del manuscrito.

Los resultados son alentadores y muestran que el algoritmo matemático programado en una interfaz, para el sistema de dos intercepciones ambas controladas por una interfaz se muestra que el sistema logra el equilibrio entre las diferentes cargas vehiculares y la excelente sincronización del semáforo, por último se brinda una posible respuesta a la problemática vial que afecta a todo el mundo, siendo un tema de gran interés donde los gobiernos deben de involucrarse a un más en la problemática antes mencionada.

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DOI: <https://doi.org/10.34069/AI/2024.74.02.3>

How to Cite:

Parveen, M., & Javaid, S. (2024). Saudi firms' performance dynamics: Organizational learning, innovation, and the dual roles of firm size and type. *Amazonia Investiga*, 13(74), 35-50. <https://doi.org/10.34069/AI/2024.74.02.3>

Saudi firms' performance dynamics: Organizational learning, innovation, and the dual roles of firm size and type

التعلم التنظيمي، الابتكار، والأدوار المزدوجة لحجم الشركة والنوع: ديناميات أداء الشركات السعودية

Received: January 5, 2024

Accepted: February 20, 2024

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Abstract

The objective of this research paper is to propose a robust framework for understanding the correlation between organizational learning, innovation, and the performance of Saudi Arabian firms, encompassing both financial and non-financial aspects. Additionally, the study evaluates how factors such as "firm type" and "firm size" influence organizational learning, innovation, and overall firm performance. For this study, we distributed a questionnaire to Jeddah, Saudi Arabia's private firm employees for a year. Analysis involved 815 complete sets, utilizing Structural Equation Modeling (SEM) through Confirmatory Factor Analysis (CFA) to explore relationships among latent variables via path analysis. Organization learning significantly enhances both financial and non-financial performance. Additionally, innovation positively influences firm performance. The combined impact of organizational learning and innovation strongly influences overall firm performance. Introducing the mediating variable "type of firm" enhances the relationship between organizational learning, innovation, and firm performance, as depicted in Model 2. The result of path analysis shows that "firm size" as moderating variable is significantly negatively related with innovation and firm performance. This study contributes by exploring the interplay of organizational learning, innovation, and their impact on firm performance, particularly within the emerging Saudi context, enhancing existing knowledge.

Keywords: Organization learning, innovation, firm financial and non-financial performance, Confirmatory factor analysis, Structural equation modeling.

خلاصة

الهدف من هذه الورقة البحثية هو التوصية بإطار شامل للتعرف على العلاقة بين التعلم التنظيمي والابتكار على أداء

في هذه (المالية وغير المالية) الشركات السعودية الدراسة، قمنا بتوزيع استبيان على موظفي الشركات الخاصة في جدة بالمملكة العربية السعودية لمدة عام مجموعة كاملة، باستخدام نموذج 815 شمل التحليل من خلال تحليل العامل (SEM) المعادلات الهيكلية لاستكشاف العلاقات بين المتغيرات (CFA) التوكيدي التعلم التنظيمي يعزز بشكل الكامنة عبر تحليل المسار بالإضافة إلى ذلك، كبير الأداء المالي وغير المالي يؤثر. يؤثر الابتكار بشكل إيجابي على أداء الشركة التأثير المشترك للتعلم التنظيمي والابتكار بقوة على نوع "إن تقديم المتغير الوسيط. الأداء العام للشركة يعزز العلاقة بين التعلم التنظيمي والابتكار "الشركة وتساهم 2. وأداء الشركة، كما هو موضح في النموذج هذه الدراسة من خلال اكتشاف التفاعل بين التعلم التنظيمي والابتكار وتأثيره على أداء الشركة مع السياق السعودي الناشئ، وتعزيز المعرفة الموجودة.

التعلم التنظيمي، الابتكار، الأداء: الكلمات المفتاحية المالي وغير المالي للشركات، التحليل العائلي التوكيدي، نمذجة المعادلات الهيكلية

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Introduction

In today's dynamic society, companies face constant challenges derived from technological advances and market changes. To survive and thrive, organizations must adapt, foster innovation, and embrace change. In this context, organizational learning and innovation have become fundamental pillars for business success.

Organizational learning is the continuous process of acquiring, creating and applying knowledge within an organization. According to Kyoungshin & Zhenqiu (2019), this process allows companies to adapt to changes in the environment, improve their efficiency and develop new ideas and products. Innovation, on the other hand, is the implementation of new ideas and methods to improve a company's processes, products or services.

Saudi Arabia, historically reliant on oil exports, has undergone a remarkable evolution into a burgeoning economy ripe with diverse business prospects. Embracing this transformation, the Saudi government acknowledges the critical role of organizational learning and innovation in driving economic progress. In response, it has instituted a range of policies aimed at fostering these practices within companies operating within its borders. This strategic approach not only enhances the nation's competitiveness but also propels it towards sustainable growth, positioning Saudi Arabia as a dynamic player in the global marketplace.

Studying organizational learning and innovation dynamics within the country could provide valuable insights into their impact on financial and non-financial performance across sectors, making it a compelling case study for understanding evolving organizational dynamics and innovation in a changing business landscape. Our integrated framework, comprising three pivotal pillars for business success, lays the groundwork for this exploration. Through our research, we aim to uncover the intricate relationships between organizational learning, innovation, and firm performance within the Saudi context. By focusing on the mediating role of company type and the moderating influence of company size, we seek to provide insights into the mechanisms shaping organizational resilience and growth in the Saudi business environment. The research questions addressed in this study are:

- Is there a positive relationship between organizational learning and innovation?

- Is innovation positively correlated with company performance?
- Is there a positive relationship between organizational learning and company performance?

Additionally, the study investigates: the effects of organizational learning on innovation and firm performance, innovation on firm performance, and organizational learning on firm performance. It also analyzes how firm type and size influence organizational learning, innovation, and firm performance. The article encompasses a literature review, hypotheses, methodology, results, and a conclusion, offering managerial insights.

Theoretical framework and hypothesis development

Taylor's 1900 discovery of knowledge transfer's positive impact on industry marked the birth of learning organizations. Cyert and March coined "organizational learning" in 1978, introducing single and double loop learning. The concept gained prominence in the 1990s, emphasizing that learning extends beyond individual skills to group dynamics, thriving in a conducive work environment (Nemeth, 1997). Since then, organizational learning has become a focal point for researchers and practitioners, reflecting its profound influence on organizational distinctions (Jyothibabu & Farooq, 2010). Organizations, especially in high-tech industries, strive to adapt and innovate to meet market demands, maintain market share, and stay profitable in the dynamic realm of technology. Understanding how businesses can adjust and enhance competitiveness amid environmental changes is crucial. Scientists predominantly employ organizational learning to explore strategies for adaptation. Research affirms that learning is integral to long-term performance improvement and serves as the cornerstone for attaining sustainable competitive advantages.

Calantone et al. (2002) and Jiménez-Jiménez & Sanz-Valle (2011) highlight that learning-oriented businesses respond to market changes, with competition driven by the acquisition and application of knowledge to provide added value to customers. This concept forms the basis for research in management and organizational studies, emphasizing learning as a crucial competitive advantage for firms.

Bolaji Bello, & Adeoye (2018) found significant correlations between organizational learning, innovation, and organizational performance (financial and non-financial). These variables also exhibited positive relationships with each other. However, limited research explores these interconnections, particularly in Saudi Arabia. Addressing this gap, our study aims to comprehensively investigate the relationships and impacts of organizational learning, innovation, and performance. It will depict the organizational learning process and assess innovation (product, process, and culture) and organizational performance (financial and non-financial) within a comprehensive framework or model.

Organizational learning

Giniuniene and Jurksiene (2015) define Organizational Learning (OL) as the process of collecting and transforming data into knowledge. OL facilitates quick learning and application of knowledge, allowing businesses to continually improve processes. According to (DiBella, Nevis, & Gould, 1996), organizational learning comprises four forms: information acquisition (Infacq), informational distribution (infdis), informational interpretation (infant), and behavioral and cognitive changes (BCC). Organizational learning unfolds in four forms. Firstly, information acquisition involves creating and reinforcing knowledge as a precursor to gathering information. Secondly, information distribution sees the dissemination of acquired information within the organization. The third form is information interpretation, where organizations emphasize understanding acquired and distributed information through electronic, formal, and informal channels. The fourth form, behavioral and cognitive changes, represents significant learning at the top level, causing alterations in norms and rules, dynamically impacting the business climate.

There were several modified models developed by researchers (Hung et al., 2011; Sarros et al., 2008; & Tamininau et al., 2009) pertaining to organizational learning and innovativeness. However, we have followed the pathway by (Škerlavaj et al., 2010) and made an attempt to study an empirical investigation of the relationship between organizational learning and innovation that leads to firm performance in both financial and non-financial way pertaining to the Saudi context. Based on the review literature, we hypothesize that:

H1: Organizational learning (information acquisition, information distribution, information interpretation, and behavioral and cognitive changes) has a significant and strong impact on Saudi Arabian Firm Performance (both Financial and Non-Financial).

H1a: Information Acquisition has a positive and significant impact on Organisational learning in context of Saudi Arabia.

H1b: Information Distribution has a positive and significant impact on Organisational learning in context of Saudi Arabia.

H1c: Information Interpretation has a positive and significant impact on Organisational learning in context of Saudi Arabia.

H1d: Behavioral and Cognitive behavior has a positive and significant impact on Organisational learning in context of Saudi Arabia.

Innovations

The concept of innovation at the organizational level we need to understand the amalgamation of two constructs as by (Crossan & Apaydin, 2010): First, Technical innovation (Product), Second, Administrative innovation (Process) and (3) Innovative culture. Innovative culture can be defined as an organization means that all the organization members are engaged actively in generating new processes, product and services (Sarros et al., 2008).

Impact of Innovation on Organization/firm performance

Recent research consistently shows a positive correlation between innovation and various measures of firm performance (Ayinaddis, 2022; Dessie et al., 2022; & Issau et al., 2021). This highlights the crucial role of innovation in sustaining and boosting revenues, contributing to overall improved performance. Chen (2017) emphasizes the necessity of innovation for firms to enhance their performances. While innovation is often associated with individual companies, it has become a key driver for a country's economic growth and social welfare. In the present dynamic landscape, both developing and developed nations focus on innovation to drive growth and competitiveness, ensuring business sustainability (Chen, Yin, & Mei, 2018). Yıldız et al. (2014) confirm that innovation significantly and positively impacts business performance. Raj and Srivastava (2014) define innovation as a firm's capacity to develop new products, services, and processes. Crossan and Apaydin (2010) further suggest that, at the organizational level, innovation encompasses an innovative

culture and technical innovations (products, services), along with administrative innovations (processes). Batmaz and Özcan (2008) define product innovation as the transformation of an idea into a marketable, new/improved product, method, or service. Veugelers (2008) notes that process innovation impacts output, production growth, and cost-effectiveness. The introduction of innovative products is expected to positively influence employment, income growth, and process innovation, with potential cost-cutting benefits (Fagerberg et al., 2004). Additionally, an innovative culture serves as a valuable resource, distinguishing organizations from competitors and significantly impacting both financial and non-financial performance (Rehman et al., 2019).

Mabrouk and Mamoghli (2010) highlight the positive impact of product and process innovation on productivity and profitability. Githikawa (2011) argues that fostering an organized innovative culture, along with process and product innovation, enhances a firm's flexibility, leading to improved products, expanded networks, and heightened technological competitiveness. Prior studies (Reed et al., 2012; Yavarzadeh et al., 2015) affirm a positive relationship between organizational performance and innovation. The study affirms that innovation, whether in product, process, or organizational structure, significantly and positively influences organizational performance across growth, finances, internal processes, and customer satisfaction. Existing empirical studies from various countries, including Ireland, the UK, Finland, Sri Lanka, South Korea, and China, consistently underscore the importance of innovation in organizational performance (Ken & Tsai, 2010; Saunila, Ukko, & Rantanen, 2014; De Mel, McKenzie, & Woodruff, 2009; Han et al., 2017; Wang & Lin, 2013).

Recent global studies highlight innovation's positive impact, including product and process types, on companies, improving performance and financial value (Rajapathirana & Hui, 2018; Spescha & Woerter, 2018). Zaefarian et al., (2017) research emphasizes the role of business relationships with suppliers and customers in fostering innovation and enhancing firm performance. They emphasize that these relationships are strengthened by an innovative culture. Despite potential negatives and some contradictory evidence, theories and empirical studies consistently propose a positive and significant relationship between innovative

activities and company performance. Hence, following are the hypothesis that,

H2: Innovation has a significant and strong impact on both financial and non-financial Saudi Arabian firm performance.

H2a: Product/service (technical) innovation has significantly and positively impacted on Innovation in context of Saudi Arabia.

H2b: Process innovation (administrative) has significantly and positively impacted on Innovation in context of Saudi Arabia.

H2c: Innovative culture has significant and a positive influence on Innovation in context of Saudi Arabia.

Impact of organizational learning on innovation

Studies by (de Pablo Gonzalez del Campo & Skerlavaj, 2009; Škerlavaj et al., 2010) showcase empirical and theoretical research on the pivotal role of organizational learning in driving innovation. Effective organizational learning is deemed essential for fostering innovation within firms (Park & Kim, 2006). Firms with diverse resources, potential, skills, and competencies facilitate a faster learning process, generating internal and external opportunities. Organizational learning, thus, enhances a firm's innovation and creativity (Rodan & Galunic, 2004), cultivating an innovative culture through knowledge development. With knowledge as a crucial component, firms must innovate in research and development to manage and utilize it effectively (Liao, Fei, & Liu, 2008). The foundation of innovation lies in organizational learning, enriching firms' knowledge. A high degree of knowledge sharing enhances firm innovation. Fostering innovation demands efforts like acknowledging innovative behavior, dedicating resources, and cultivating a structure and culture that promotes innovation implementation and development (Senge et al., 1994).

Kandemir and Hult (2005) posit that positive changes in behavior and understanding the environment are linked to an innovative culture and administrative/technical innovations. Encouraging cognitive map changes fosters innovation acceptance and motivates experimentation for creativity, essential for improving organizational learning efficiency. Prioritizing all four forms of organizational learning—information acquisition, distribution, interpretation, and behavioral/cognitive changes—is vital.

Hence, following are the hypothesis that,

H3: Organisational Learning has a significant and strong impact on Innovation in context of Saudi Arabia.

Organizational performance

Organizational performance, defined by (Peterson, Gijbers, & Wilks, 2003), involves efficient resource use, producing consistent outcomes aligned with goals. Antony and Bhattacharyya (2010) consider it a measure of success delivering value to customers, while De Waal & Sultan (2012) define it as meeting financial and non-financial criteria. Gentry and Shen (2010) stress a comprehensive evaluation considering both financial and non-financial aspects as the key approach.

Organizational learning and its impact on Saudi Arabian firm/organization performance (Financial and Non-financial).

Organizational learning, as highlighted by (Sanzo et al., 2012), is a dynamic process involving creating, acquiring, and integrating knowledge to enhance internal resources and competencies, ultimately empowering the organization for higher performance. Megheirkouni (2017) emphasizes the significant benefits of this type of organizational learning, particularly for organizations in uncertain and dynamic environments, enriching their performance through a learning-oriented workforce. Thus, organizational learning plays a crucial role in shaping firm performance. According to (Kim, Watkins & Lu, 2017), organizational learning is a critical component explaining organizational performance. Studies by (Shurafa & Mohamed, 2016; Rehman, Bhatti & Chaudhry, 2019) proclaimed, organizational learning's pivotal role in shaping firm financial and non-financial performance. This raises the question: How is organizational performance evaluated? In the modern business landscape, the emphasis is on strengthening relationships among employees, customers, and society. In addition, it demonstrates a significant and positive impact of organizational learning on both financial (Return on Assets and Value added per employee) and non-financial firm performance (in terms of suppliers, employees, and customers).

H4: Organizational learning and Innovation has a significant and strong impact on both Saudi Arabian firms' financial and non-financial performance.

Impact of Firms' Type and Firm's Size on organizational learning, innovation and firm's performance

The learning organization framework helps businesses by fostering experimentation, creativity, and brainstorming, which increases total innovation. Giving employees the space (and time) to learn new things, pursue interests, and share their views enables them to excel in their jobs. Innovative activities in large-sized companies and SMEs differ even when they have the same physical capital structure (Noori et al., 2017). In contrast to SMEs, large sized companies are more adept at securing external finance for the advancement of research and development (R&D) projects by (Noori et al., 2017). The performance of the company may benefit from this capability. SMEs and large companies often engage in different kinds of innovative activity. Externally-driven innovation makes use of both internal and external resources, as well as technological expertise. These primarily include raising a company's productivity levels. Internal innovation refers to the assets and skills a business has available for innovative R&D projects (Kim et al., 2016). The analysis revealed that even though both external and internal creative R&D activities have an impact on the performance of large-sized firms, only internal innovative R&D activities have an impact on the performance of SMEs (Kim et al., 2016). Mabenge et al. (2020) find larger and younger enterprises are more influenced by innovation. Studies establish a direct link between innovation and company performance (Mustafa & Yaakub, 2018; & Ullah, 2020).

Large companies leverage economies of scale, gaining advantages in input cost negotiations and output levels. Lee's (2009) study supports this by revealing higher profitability with larger total assets. Theoretically, larger organizations engage in more operations, generating more sales and products, leading to increased revenues. Higher sales yield higher profits, translating to increased income. More income or profit after taxes enhances the return on assets, investments, and equity, highlighting the benefits of size in achieving financial success. Empirical evidence indicates an association between firm size and performance/profitability (Bolarinwa & Obembe, 2019 & Dang et al., 2018). Companies in different sectors engage in diverse primary activities, leading to varied innovation approaches. According to Abdu & Jibir (2018), manufacturing companies, followed by service and retail companies, show the highest innovation levels. Across diverse industries,

public and private entities pursue technological and innovative endeavors, impacting the profitability of their companies in various ways.

H5a: Type of Firms has strong and significant effect on organizational learning, innovation and firms' performance.

H5b: Firm size has a significant and positive relationship between organizational learning, innovation and firms' performance.

H6a: Firms type mediates the relationship between innovation and firms' performance

H6b: Firm size moderates the relationship between innovation and firm's performance.

Research methodology

Measurement instrument

We employed Škerlavaj et al. (2010) instrument with three constructs and 42 items rated on a five-point Likert scale. Innovativeness was measured using a five-item scale for innovative culture and a 13-item scale for innovations (Process and Product). Organization/firm performance was assessed with a 19-item bipolar scale, measuring

financial performance (Return on Assets, Value added per employee) and non-financial performance from suppliers (3 items), employees (12 items), and customers (4 items) perspectives, along with demographic details (7 items). The questionnaire was translated into Arabic. Among the 815 respondents, 63.2% were male, 36.8% were female, 51.2% held bachelor's degrees, 78.5% were Saudi, and 40.4% had 6 to 10 years of professional experience. IBM SPSS (version 24) and Amos (version 20) software were used for data analysis, employing Structural Equation Modelling (SEM) to test stated hypotheses.

Participants and sample size

In the latter part of 2022, 1000 questionnaires were disseminated to employees in private and public firms located in Jeddah, Saudi Arabia. A total of 835 complete sets were gathered from October 2023 to January 2024, and the size was determined by calculating the natural logarithm of total assets. After performing Cook and Leverage's outlier test, 815 responses were retained for further analysis. Demographic details are presented in Table 1.

Table 1.
Demographic profile

Demographic variables		Responses	Frequency	Respondents
Gender	Male	515	63.2	815
	Female	300	36.8	
Age	20 – 30	214	26.2	815
	31 – 40	375	46.01	
	41 – 50	126	15.4	
	51 and Above	100	12.3	
Highest Educational level	Diploma	215	26.3	815
	Bachelor's degree	418	51.2	
	Master's degree	182	22.3	
	PhD	40	4.9	
Work Experience	0–5 years	205	25.1	815
	6–10 years	330	40.4	
	11–15 years	165	20.2	
	More than 15 years	115	14.3	
Nationality	Saudi	640	78.5	815
	Non-Saudi	175	21.5	
Firm Size	Total Assets	815	100	815
Firm Type	Public	484	59.4	815
	Private	331	40.6	

Survey Results

Preliminary analysis

Data set is analyzed to ensure instrument quality by convergent and discriminant validity, which

leads to better constructs value and before testing the hypothesis using SEM. In the words of (Rehman et al., 2019) stated that convergent validity refers to a situation where items of a

variable reflect effectively to their associated indicator. As per Hair et al. (2013) prescribed to calculate three things to see convergent validity, that is, Average Variance-Extracted (AVE), factor loadings, and composite reliability. The standardized values of AVE and factor loadings should be at least 0.50 and CR value must be higher than 0.70 (Hair et al., 2013; Rehman et al., 2019). To get better results concerning CR and AVE we have deleted all those items that have factors loadings less than 0.50 to make a good model as recommended by (Hayduk & Littvay, 2012 and Rehman et al., 2019). Non-financial Performance from suppliers has been dropped from the analysis at the preliminary stage to get reliability and best fit. To ensure the Composite

Reliability, we have dropped few items from Non-Financial Firm Performance variable, and all reaches above 0.60 (Rehman et al. 2019).

Refer to Table-2 (Annexture I) AVE of all the three constructs i.e. Organizational Learning, Innovation and Firm Performance is 0.792, 0.885 and 0.766 respectively, all greater than 0.7, suggesting the convergent validity of the constructs. Also, the results presented in Table-2 confirm the discriminant validity as the AVE of the underlying factors is higher than the squared correlation between the factors and the ASV for each factor is lower than the AVE value, consistent with the previous studies like (Alarcon & Sanchez; 2015; Parveen & Adeinat, 2019).

Table 2.
Assessment of Reliability, Convergent Validity and Discriminant Validity

	Mean	SD	CR	AVE	ASV	OL	Inno	Firm Perf
OL	9.514	3.67	0.769	0.792	0.234	0.889		
Inno	5.312	2.69	0.771	0.885	0.338	0.541	0.941	
Firm Perf	13.65	5.38	0.818	0.766	0.321	0.455	0.372	0.875

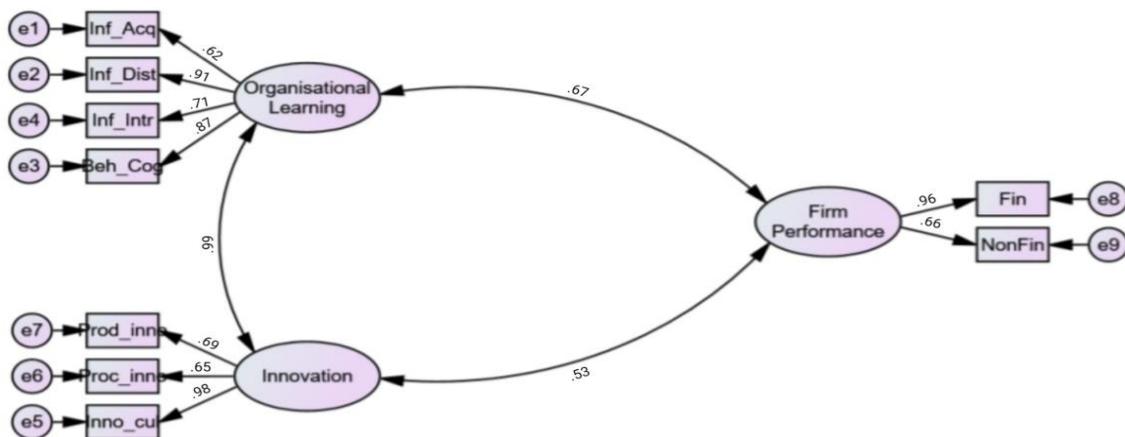
Notes: CR, composite reliability; AVE, average variance extracted; ASV, average shared variance.

Values below the diagonal are correlation estimates among factors, diagonal elements are the squared root of AVE and values above the diagonal are squared inter-factor correlations. Based on Alarcon & Sanchez, 2015) threshold, reliability = CR > 0.70; convergent validity = AVE > 0.50; discriminant validity = ASV < AVE or the squared root AVE > inter-factor correlations.

Result analysis

The present study took special care in research design, data collection and related factors affecting missing values (Bagozzi & Yi, 2012).

Effective steps taken to address the conventional considerations such as dealing with missing values, identifying suspicious responses and outliers etc. The present study used the full information maximum likelihood (FIML) method which is considered as more efficient than list wise deletion, pairwise deletion and similar response pattern imputation (Enders & Bandalos, 2001; Xiong et al., 2015). In our case, the maximum likelihood estimates are all positive and significant at p<0.05. The SEM model was employed to examine the relationship between different latent variables using the path analysis using Confirmatory Factor Analysis (CFA) technique as depicted in Model-1.



Model-1. Relationship between Organizational Learning, Innovation and Saudi Arabian firm performance.

The Path analysis using Confirmatory Factor Analysis (CFA) in the above Model-1 comprises of three exogenous latent factor variables i.e., Organizational Learning, Innovation and their impact on Firm Performance covering both financial and non-financial aspects without the mediating and moderating variables. Organizational Learning factor is measured by four observed variables viz. Information Acquisition, Information Distribution, Information Interpretation and Cognitive behavior, whereas the Innovation is measured by three observed variables viz. Product innovation, Process Innovation and Innovation Culture, and Firm Performance by Financial and Non-Financial Variables, the reliability of which is influenced by random measurement error as indicated by associated error term. Each of these observed variables is regressed onto its

respective factor. Finally, the above three factors are shown to be inter-correlated.

The Chi-square (χ^2) test predicts overall model fit by analyzing the discrepancy between the sample model and the proposed model (Hu & Bentler, 1999). We found the normed chi-squared value is 1.67. Also, the comparative χ^2 of the χ^2 to degrees of freedom ratio can be used to minimize the effect of sample size (Hooper et al., 2008). We have got the values of this ratio less than 2 i.e., 1.221 that indicates a good fit consistent with the previous studies (Marsh & Hou, 1996; Reisinger & Turner, 1999; Xiong et al., 2015). As per the Baseline comparisons, we found CFI (Comparative Fit Statistic) as 1.997 greater than 0.9, which is considered as the model is fitted good. (See Annexure I, table-3)

Table 3.
Model Fit

Goodness of Fit Indices	Construct
χ^2 / degree of freedom	1.221
CFI (Comparative Fit Index)	1.997
TLT (Tusker-Lewis fit Test)	0.997
RMSEA (Root Mean Square Error)	0.042
GFI (Goodness Fit Index)	0.938

Further, the absolute indices are the most vital signal of how well the proposed theory fits the real world (Hooper et al., 2008; Xiong et al., 2015). In addition to the χ^2 test, the absolute indices include the root mean square error of approximation (RMSEA), goodness-of-fit index (GFI), adjusted goodness-of-fit index (AGFI), root mean square residual (RMR) and standardized root mean square residual (SRMR). RMSEA, as a very informative statistic, measures how well the parameter estimates generated in the proposed model fit the population matrix (Byrne, 2001; Xiong et al., 2015). The RMSEA considers the error of approximation in the population and asks the question "How well would the model, with unknown but optimally chosen parameter values, fit the population covariance matrix if it were available?" (Browne & Cudeck, 1992; Byrne, 2010). This discrepancy, as measured by the RMSEA, is expressed per degree of freedom, thus making it sensitive to the number of estimated parameters in the model (i.e., the complexity of the model); values less than .05 indicate good fit (Xiong et al., 2015), which is in our case is found out to be 0.042. (see Annexure I, table-3)

Figure-1 illustrates that Organizational Learning accounts for 62% of Information Acquisition, 91% of Information Distribution, 71% of Information Interpretation, and 87% of Cognitive Behavior. Product innovation, Process Innovation, and Innovation Culture contribute 69%, 65%, and 98% to Innovation, respectively. Regarding Firm Performance, 96% is clarified by Financial Variable, and 66% by Non-Financial Variable. Particularly, 67% of Organizational Learning and 53% of Innovation impact Firm Performance, confirming the significance of the stated hypotheses.

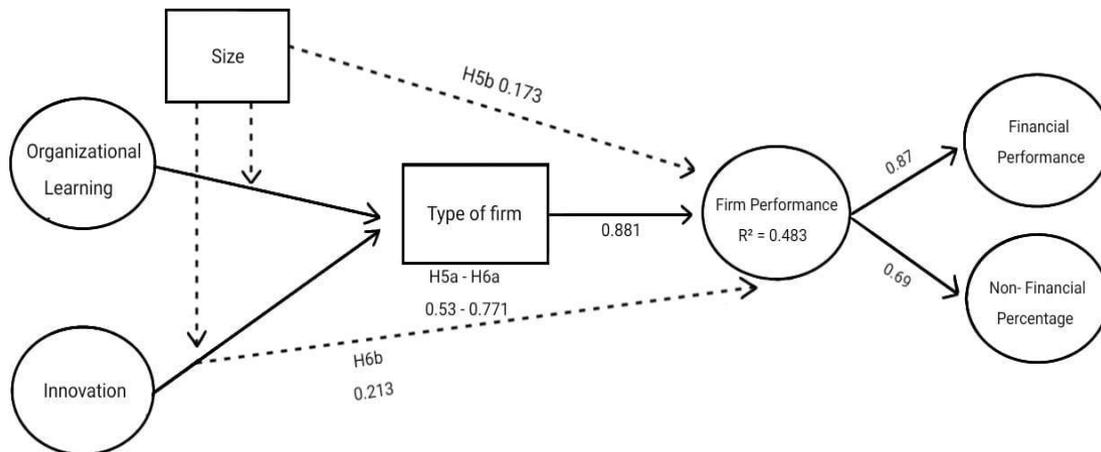
Refer to Table 4, Model-1 shows that Information Acquisition Information distribution Information Interpretation and Cognitive Behavior have significant positive influence on organizational learning significant at p value ≤ 0.05 and p ≤ 0.001 level supporting H1a, H1b, H1c and H1d respectively. Further, Organizational Learning have significant positive impact on Firms financial and non-financial performance, have positive coefficients and t-value significant at p ≤ 0.001 level supporting H1. Also, Product Innovation, Process innovation and Innovation culture has positive and significant impact on Innovation at p value ≤ 0.10 p value ≤ 0.05 and p ≤ 0.001 level

supporting H2a, H2b, and H2c respectively. Innovation has positive impact on Firm's Financial and Non-Financial Performance at $p \leq 0.05$ supporting H2. Then, Organizational Learning has strong and positive impact on Innovation at $p \leq 0.001$ supporting H3. Lastly, Organizational Learning and Innovation has significant strong impact on Firm's Financial and Non-Financial Performance at $p \leq 0.05$ supporting H4. The result is consistent and supportive with the previous literature.

Further, we have introduced "type of firm" as mediating variable and "size" as moderating variable in Model 2 to see the overall effect on the firm's financial and non-financial performance. We have found a strong and significant direct effect of introducing the

mediating variable "type of firm" to the relationship of organizational learning, innovation, and firm performance (see Model 2).

Then, we excluded the type of firm from the path analysis and perform the bootstrap. The result shows standardized path coefficients of indirect effect as 0.53 and 0.771, t-statistic of 11.363 and 7.325, and co- efficiency of total effect as 0.881, with t-statistics 17.651. Table 4 shows that the total effect is statistically significantly stronger than indirect effects, indicating that type of firm is a mediator affecting the relationship between organizational learning, innovation, and firm performance. This shows that H5a and H6a is supported. Later, we add the construct firm size (Size) to see the moderating effect of its impact on the relationship between the organizational learning, innovation and firm performance.



Model-2. Effect of Moderating Variable and Mediating Variable as Size and Type of Firm on Firms' Performance.

The result of path analysis shows that firm size as moderating variable is significantly negatively related with innovation (-0.213, t-statistics of 8.773) at $p \leq 0.10$ confidence level and significantly positively related with organizational learning and firm performance (path coefficient=0.173, t-statistics of 9.728) at $p \leq 0.05$ confidence level. This shows that hypotheses 5b and 6b are supported and consistent with previous studies

like Wolff and Pett (2006); Leal-Rodríguez et al. (2015) and Kijkasiwat and Phuensane (2020). Therefore, by adding type of firm as the mediator, and firm size as the moderator in Model 2, gives the R-square of 0.483 implying organizational learning, innovation, type of firm, and firm size explains the variance of firm performance to 48.3 percent.

Table 4.
Estimates of Parameters (Model 1 and Model 2)

Hypothesis		Pathways	Standardized Pathway's Coefficient	t-value
Model 1				
H1		OL → Firm Per	0.389*	5.982
	a	Inf acq → OL	0.832*	3.590
	b	Inf distr → OL	0.451***	14.213
	c	Inf Int → OL	0.094*	1.985
	d	Cog_Beh → OL	0.253***	4.494
H2		Inno → Firm Per	0.710**	9.515
	a	Prod inno → Inno	0.572*	6.122
	b	Proc inno → Inno	0.693****	1.711
	c	Inno_Cul → Inno	0.591***	5.531
H3		OL → Inno	0.583***	3.133
H4		OL → Inno → Firm Per	0.831*	11.329
Model 2				
H5	a	OL → Type → Firm Per	0.053**	11.363
	b	OL → Size → Firm Per	0.173**	9.728
H6	a	Inno → Type → Firm Per	0.771**	7.325
	b	Inno → Size → Firm Per	-0.213*	8.773

* $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$

Note: Firm Performance includes both Financial and Non-Financial Variables.

Discussion

The relationship between innovation, financial performance, and non-financial performance has been extensively studied in the literature. The analysis presented in this study indicates a dual relationship between innovation and firm performance, where innovation positively influences both financial and non-financial performance, while enhanced financial performance facilitates increased funds for innovation (Petare et al., 2023). Innovation has been found to have a positive impact on both financial and non-financial performance, benefiting stakeholders such as employees, stockholders, customers, and management. Improved non-financial performance, such as market share, customer satisfaction, and employee engagement, can motivate further innovation, leading to a virtuous cycle of innovation and performance improvement; hence this is aligned with the prior research by (Chen, 2017).

Moreover, the study reveals that public firms, with greater access to financial resources, allocate more to innovation, resulting in heightened financial and non-financial performance (Gurel, 2017). This finding is consistent with the literature, which suggests that public firms have more resources to invest in innovation, leading to better performance outcomes (Baumol, 2002).

Furthermore, firm size affects innovation and performance, as larger total assets correlate with

increased innovation but lower financial and non-financial performance (Hu & Wang, 2010). This finding indicates that larger firms may face challenges in managing innovation and performance, as they may have more complex organizational structures and processes (Burgelman, 2002). Recent studies have further explored this relationship, finding that firm size and innovation performance are positively correlated, but moderated by factors such as technology category, innovation strategy, and organizational structure. For example, high-technology firms are better able to leverage innovation to improve performance compared to low-technology firms (Agustia et al., 2022), and firms with a more proactive innovation strategy or a decentralized organizational structure are better able to leverage their size to achieve higher innovation performance (Kijkasiwat & Phuensane, 2020; Song et al., 2015). These findings highlight the importance of considering multiple factors when examining the relationship between firm size and innovation performance.

In addition, the study finds that organizational learning leads to increased financial and non-financial performance. Specifically, when profits increase, there are more funds available for training and development programs and R&D, leading to the accomplishment of both individual and organizational goals and enhancing more effective and efficient organizational learning. Kim (2016) suggests that a learning organization influences knowledge performance, adaptive performance, and financial performance, with both knowledge performance and adaptive

performance positively affecting financial performance. However, a study by (Obadeyi, 2019) found no meaningful relationship between organizational learning and financial performance of start-up companies. The study suggests that the relationship between organizational learning and financial performance may be more complex in start-up companies compared to established firms.

Moreover, when there is an enhancement in non-financial firm performance, it also helps in gaining more effective organizational learning, as it facilitates the overall growth and development of its human resources, giving the Saudi company a competitive edge in the global world (Azizi, 2017). This finding is consistent with the literature, which suggests that non-financial performance, such as employee satisfaction and customer loyalty, is critical for organizational learning and competitiveness (Easterby-Smith, Crossan, & Nicolini, 2002). A recent study by (Jamai et al., 2021) also found that non-financial performance significantly impacts organizational learning, which subsequently enhances firm performance.

Conclusion

In summary, this study contributes to the literature by examining all variables collectively in a single model, establishing a clear link between organizational learning, innovation, and firm performance (financial and non-financial) in the Saudi context. Additionally, it introduces a mediating variable (type of firm) and a moderating variable (firm size) for a more robust analysis, yielding interesting results in Model-2. Lastly, the research utilizes a sample of Saudi Arabian firms, addressing the scarcity of empirical research in the Saudi context. The outcome of this research paper have raised to major recommendations to the top managerial level, Human resource specialist and practitioners, Finance managers and policy makers for improvising the financial and non-financial performances of Saudi Arabian firms.

Managerial implications

1. Saudi Arabian firms can opt for performance linked learning, and there should be increment in knowledge availability and accessibility to knowledge sources. Firstly, acquisition of new knowledge should be promoted by preparing employees attending numerous conferences/seminars/workshops regularly, amalgamating their R&D policy and raising the enhancement of novel

philosophies, ideas and experimentation within the firm. Secondly, the firms should encourage knowledge distribution and interpretation within the firm by applying various approaches and techniques to promote coordination, preparing employees accountable for accumulating, assembling and sharing employee's recommendations within the firm. Thirdly, Saudi firms should made efforts to retain the knowledge by creating the databases and facilitating access to these databases through divergent networks. Also reflective culture should be enhanced in order to enrich the learning culture in the organization.

2. The findings also provide insight that organizational learning expedites innovation. Hence, a firm expecting to develop and enhance corporate performance through innovation should develop its organizational learning processes and practices.
3. This research also confirms that organization learning has positive association with firm financial and non-financial performance. This provides an implication for managers, practitioners, in go-getting for an improved performance of the firm. They should also utilize organizational learning dimensions effectively to achieve their performance objectives.
4. The analysis provides a clear indication that Saudi Arabian firms should pay more attention to innovation in product improvisation, process up gradation and enhancement of innovative culture, and inclined towards adoption of new technologies and procedures for firm's sustainability in this current dynamic environment.
5. Finally, this research study also shows positive and significant relationship between innovation and firm performance (financial and non-financial). Since firm performance is a major concern to all firms, it's very pertinent to understand the association between innovation and firms' financial and non-financial performance will help the Saudi Arabian firms to develop better competitive strategies. The greater the understanding of the significance of innovation, the better would be the comprehension into how firms can accomplish improved competitive strategies and firms' financial and non-financial performance.

Limitation of the Study

The study only considers the impact of organizational learning on firm performance in the context of SMEs in Saudi Arabia. The findings may not be applicable to SMEs in other countries, where the organizational and institutional contexts may be different. Future studies should consider a more diverse sample of countries in order to increase the generalizability of the findings.

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DOI: <https://doi.org/10.34069/AI/2024.74.02.4>

How to Cite:

Flotskaya, N., Aryabkina, I., Bulanova, S., Ponomareva, M., & Flotskiy, N. (2024). Development of gender identity in Nenets adolescents – representatives of indigenous small-numbered peoples of the north. *Amazonia Investiga*, 13(74), 51-61. <https://doi.org/10.34069/AI/2024.74.02.4>

Development of gender identity in Nenets adolescents – representatives of indigenous small-numbered peoples of the north

РАЗВИТИЕ ГЕНДЕРНОЙ ИДЕНТИЧНОСТИ У ПОДРОСТКОВ – ПРЕДСТАВИТЕЛЕЙ КОРЕННЫХ МАЛОЧИСЛЕННЫХ НАРОДОВ НАЦИОНАЛЬНОСТИ НЕНЦЫ

Received: December 28, 2023

Accepted: February 15, 2024

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Abstract

The current article is concerned with studying specific features of gender identity development in ethnic Nenets adolescents – representatives of indigenous small-numbered peoples living in the Russian High North. The study involved a comparative analysis of gender identity development in ethnic Nenets and ethnic Russian male and female adolescents.

The article presents the results of an empirical study conducted using the Bem Sex-Role Inventory (BSRI). The respondents in the empirical study were 99 Nenets adolescents aged 12-15 years (54 boys and 45 girls); 121 ethnic Russian adolescents aged 12-15 years (63 boys and 58 girls).

The analysis of the dynamics of gender identity development in Nenets adolescents highlighted changes in representation of masculinity and femininity, as well as changes in distribution of

Аннотация

Статья посвящена проблеме изучения особенностей развития гендерной идентичности подростков – представителей коренных малочисленных народов национальности ненцы, проживающих на Крайнем Севере России. Исследование предполагало проведение сравнительного анализа развития гендерной идентичности у подростков мужского и женского пола национальности ненцы и русской национальности.

В статье представлены результаты эмпирического исследования, проведенного с использованием Анкеты половых ролей С. Бем. В качестве респондентов в эмпирическом исследовании выступили подростки – ненцы в возрасте 12-15 лет в количестве 99 человека (54 мальчика и 45 девочек); подростки русской национальности в возрасте 12-15 лет в

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gender identity types in the period of transition from the age of 12-13 years to the age of 14-15 years. The comparative analysis of gender identity in ethnic Nenets and ethnic Russian adolescents highlighted the presence of both similar and differing trends in the process of gender identity development. The results of the study enrich the understanding of the development of gender identity in Nenets adolescents and provide new information about the particularities of this process in minority indigenous peoples of the High North.

Keywords: Gender identity, masculinity, femininity, adolescence, nenets adolescents, russian adolescents.

Introduction

Among the issues typical of modern day society, those related to gender identity development in a person hold a special place. Understanding the phenomenon of gender identity contributes to a deeper understanding of human development in social and cultural contexts. Gender identity is one of the basic personality characteristics and one of the aspects of self-comprehension, incorporating self-perception as a representative of a certain gender. The formation of gender identity continues during one's lifetime. Adolescence is a sensitive life period for gender identity development. During adolescence, as part of the formation of a new level of self-comprehension, a relatively stable concept of oneself as a representative of a certain gender starts to form, an individual choice of the structure of gender behaviour is made, and an "image" of one's own gender role emerges. Adoption of a gender role is a process closely related to norms and customs of a corresponding culture. Therefore, research interest is focused on studying gender identity development in adolescents who represent indigenous small-numbered peoples whose lifestyle, customs and traditions are very specific. The Nenets are one of indigenous ethnic groups living in the Russian High North. They lead a nomadic lifestyle. Consequently, we can assume that the content of

количестве 121 человек (63 мальчика и 58 девочек).

Анализ динамики гендерной идентичности в течение подросткового возраста у подростков национальности ненцы позволил выявить изменения в представленности маскулинности и фемининности, а также в распространенности типов гендерной идентичности при переходе от 12-13 лет к 14-15 годам. Сравнительный анализ гендерной идентичности у подростков национальностей ненцы и русские позволил выявить как сходные, так и отличные тенденции в этом процессе. Результаты проведенного исследования обогащают научные представления о феномене гендерной идентичности, дополняют и расширяют представления о процессе становления гендерной идентичности у представителей коренных малочисленных народов Крайнего Севера.

Ключевые слова: Гендерная идентичность, маскулинность, фемининность, подростковый возраст, подростки ненецкой национальности, подростки русской национальности.

gender roles in this community reflects the specifics of its social characteristics.

Literature review

Characteristic aspects of the gender identity phenomenon are reflected in contemporary research (Bakunova et al., 2017; Baranovskaya, 2016; Vasilenko & Brovkina, 2017, and the others). Describing the concept of gender identity, I. S. Kon (Kon, 2004) emphasizes the fundamental character of one's sense of belonging to a particular sex, identifying oneself as a male, a female, or as a representative of an "intermediate" sex. L. B. Shneider points at the fact that a subject with a certain gender identity fits in with the corresponding gender role and demonstrates the consonance of self-comprehension and behaviour (Shneider, 2007). V. F. Petrenko points out that gender is reflected within a personality, and is a process and a result of self-reflection at the same time (Petrenko, 1983). Gender identity is represented by a multi-level system of correlation between personality and physical, psychophysiological, psychological, and sociocultural concepts of "masculinity" (manhood) and "femininity" (womanhood) as independent variables. When considering gender identity, masculinity and femininity come to the fore (Kletsina, 2018) as

they contain characteristics of behavioural, psychological, and somatic attributes typical for males and females. Research by S. Bem (Bem, 2004) demonstrates that masculinity involves displaying traditionally masculine behaviour, femininity – traditionally feminine behaviour, and both constructs are not opposite to each other, but independent. In addition, the researcher describes another construct – androgyny, which she considers a successful combination of traditionally masculine and traditionally feminine psychological qualities. S. Bem has proposed the concept of psychological androgyny, according to which she distinguishes four types of gender identity: the undifferentiated, the androgynous, the masculine, and the feminine. The undifferentiated type of gender identity is characterized by low levels of both femininity and masculinity. The androgynous type, on the contrary, is characterized by high levels of both femininity and masculinity. The feminine type of gender identity is characterized by high levels of femininity and low levels of masculinity. As for the masculine type of gender identity, there are correspondingly high levels of masculinity and low levels of femininity (Bem, 2004).

Contemporary studies point out that gender identity is formed by social processes, is related to society, and is a most critical regulator of human behaviour in the social environment (Asmolov, 2007; Kletsina, 2018; Tereshenkova, 2005; and others). Development of gender identity depends on practices and customs of the corresponding society and culture. Gender identity forms as a result of a complex biosocial process combining ontogenesis, gender socialization, and development of self-comprehension (Shneider, 2007). As a consequence, the characteristic aspects of a society, determined by its cultural traditions, history, and values, will inevitably influence the varieties of gender roles and their substantive characteristics.

Development of gender identity and adjustment of the content of one's own gender role continues during one's lifetime. At the same time, adolescence is the most significant period for acquiring gender identity (Peregudina, 2011; Romanov, 1997; Rymarev, 2006; Syomina, 2003; and others). In adolescence, as part of the formation of a new level of self-comprehension, a relatively stable concept of oneself as a representative of a certain gender starts to form, an individual choice of the structure of gender behaviour is made, and an "image" of one's own gender role emerges (Remschmidt, 1994). When

adolescents begin to grow aware of their physiological make-up, interest towards the opposite sex appears as well as adoption of gender behaviour styles – this becomes the basis for one's sense of belonging to a particular gender (Flotskaya, 2006).

E. A. Vasilenko, E. I. Brovkina emphasize that formation of gender identity in adolescents proceeds to completion by the age of 13-14 years; in girls this process goes faster than in boys. The authors draw attention to the fact that gender identity development in most Russian teenagers today is based on traditional gender stereotypes of masculinity and femininity (Vasilenko & Brovkina, 2017).

A study of gender identity by I. V. Romanov revealed the presence of a negative phase in the age-related gender identity crisis, which boys and girls experience at the age of 12-13 years. A distinctive feature of this phase is the weakening of orientation towards masculine images in boys, and the presence of an undifferentiated type of gender identity in girls. The author points out that adolescents overcome the crisis by the age of 14-15 years, and begin to move towards a positive gender identity (Romanov, 1997).

Since the formation of gender identity in an adolescent is a complex process of acquisition of a gender role derived from the norms and customs of the corresponding culture (Asmolov, 2007), researchers are particularly interested in studying gender identity development in non-mainstream cultures and societies. Indigenous small-numbered peoples can be seen as specific communities of people who in many respects have preserved the ancient mode of life, ethnic customs, beliefs, and traditions. As a consequence, the content of gender roles in these communities may have particular aspects. Thus, the indigenous small-numbered peoples of the High North, who live in harsh climatic conditions, far away from centers of industry and culture, have retained a nomadic or a semi-nomadic lifestyle and traditional activities (reindeer herding, fishing, hunting). Therefore, their ideas of masculinity and femininity models, and of the distribution of gender roles are likely to have specific features. A.G. Asmolov emphasizes that gender identity development is a complex process when a teenager adopts a gender role derived from practices and customs of the corresponding culture (Asmolov, 2007). I.P. Khabarov in his study (Khabarov, 2003) analyzed gender specifics in ethnic Sakha adolescents. The author notes that gender identity development in those adolescents is influenced

by harsh climatic conditions and life circumstances. Significant efforts have always been made to cultivate masculine traits in Sakha boys, since the survival of the ethnic group in harsh conditions depended on this. However, an interpenetration of “masculine” and “feminine” images takes place in the minds of today’s Sakha teenagers; they become more androgynous. Male adolescents begin to demonstrate the presence of feminine traits, while female adolescents begin to demonstrate the presence of masculine traits.

One of the indigenous small-numbered peoples living in the Russian High North are the Nenets. The Nenets lead a nomadic life, which has allowed them to preserve traditions, culture, and identity of their ethnic group. They are the descendants of the indigenous population of the White Sea coast and live in the Nenets Autonomous District. The traditional occupation of the Nenets is reindeer herding, in summer they practise hunting and fishing.

It should be noted that research on gender identity in adolescent representatives of indigenous peoples of the High North is practically non-existent in modern psychology, and research on gender identity in ethnic Nenets adolescents has no previous history.

In view of the above, we assumed that gender identity in Nenets adolescents as representatives of indigenous small-numbered peoples would have particular dynamic developmental features and specific character in comparison with gender identity in ethnic Russian adolescents. We have conducted an empirical study to test this hypothesis.

Materials and methods

To identify specific characteristics of gender identity in male and female Nenets adolescents, we conducted an empirical study in the Nenets Autonomous District of the Arkhangelsk Region of the Russian Federation. To achieve the research objectives, we compared ethnic Nenets adolescents to ethnic Russian adolescents living in the Arkhangelsk Region of the Russian Federation. The respondents in the study were 99 ethnic Nenets teenagers aged 12-15 years (54 boys and 45 girls); and 121 ethnic Russian teenagers aged 12-15 years (63 boys and 58 girls). During the formation of sample groups, the respondents indicated their ethnicity. The respondents in the current study include teenagers who identify themselves as ethnic Nenets.

At the organization stage, we prepared a documentation package, which included a study relevance reasoning, a description of its aims, objectives and stages, and a description of the experimental techniques. This documentation package was submitted to the Ministry of Education and Science of the Arkhangelsk Region. As a result, we have received a permission to conduct the study.

We identified comprehensive schools located in the Arkhangelsk region, which served as the base for the study. Before the study we organized meetings with the parents of our future respondents at schools, and explained aims, objectives, and procedure of the study to them. Parents or other legal representatives of the students gave their written consent for the adolescents to participate in the study.

The diagnostic study was carried out in subgroups of 10 – 12 people. The researcher gave the instructions for completing the tests, and the students filled in the answer sheets. When respondents had questions, the researcher approached them and provided the necessary explanations individually.

In our study we used the Bem Sex-Role Inventory (BSRI). This tool helps to measure the degree of expressiveness of masculinity and femininity in adolescent boys and girls, and then, based on the ratio, to identify their type of gender identity. Within the study, the respondents assessed their personality characteristics. The list of sixty characteristics to be assessed included both traditionally masculine and feminine qualities, as well as neutral qualities. The processing of the results included the calculation of the total number of points on each of the scales, which determined the degree of expressiveness of femininity and masculinity characteristics in each test subject. To identify the type of gender identity, individual scores of femininity and masculinity were compared to the group average identified by calculating the median value. Individual scores equal to or above the median were considered high, while scores below the median were considered low. High masculinity scores combined with low femininity scores correspond to the masculine type of gender identity. High femininity scores combined with low masculinity scores correspond to the feminine type of gender identity. If both masculinity and femininity scores are high, it identifies the androgynous type of gender identity. Low masculinity and femininity scores identify the undifferentiated type of gender identity (Ilyin, 2003).

The research data were processed using SPSS Statistics 22. We used the Student's t-test for independent samples to assess the significance of differences in the comparison of masculinity and femininity scores in groups of respondents; Fisher's test was used to compare the degree of expressiveness of gender identity types.

Results

While studying the dynamics of gender identity development in adolescent representatives of indigenous small-numbered peoples of the Russian North, we analyzed changes in masculinity and femininity scores as well as changes in distribution of gender identity types in Nenets boys and girls in the period of transition from the age of 12-13 years to the age of 14-15 years. The dynamics of gender identity indicators in male and female Nenets adolescents are presented in Table 1.

Table 1.
Expressiveness of masculinity and femininity characteristics in Nenets boys and girls aged 12-13 and 14-15 years.

	Nenets boys		Nenets girls	
	12-13 years	14-15 years	12-13 years	14-15 years
Masculinity	0,67±0,04	0,74±0,03	0,62±0,04	0,60±0,03
Femininity	0,53±0,03	0,57±0,03	0,74±0,03	0,75±0,03

The analysis of the results of studying gender identity in Nenets adolescents demonstrates that, in total, masculinity scores ($M=0,67\pm0,04$) prevail over femininity scores ($M=0,53\pm0,03$) in Nenets boys aged 12-13 years. In Nenets girls aged 12-13 years, in total, femininity scores ($M=0,74\pm0,03$) prevail over masculinity scores ($M=0,62\pm0,04$). In the period of transition from the age of 12 years to the age of 15 years, there are no significant changes in masculinity and femininity scores in Nenets boys and Nenets girls: in boys, masculinity scores ($M=0,74\pm0,03$) continue to prevail over femininity scores ($M=0,57\pm0,03$), and in girls, femininity scores ($M=0,75\pm0,03$) continue to prevail over

masculinity scores ($M=0,60\pm0,03$). These results indicate that manifestation of traditionally masculine behaviour in boys and manifestation of traditionally feminine behaviour in girls remain stable in Nenets adolescents during the adolescence period.

The analysis of distribution of gender identity types in Nenets boys aged 12-13 years shows that the predominant type of their gender identity is masculine (32%) (Fig. 1). The undifferentiated type is less represented (26%). The least common types of gender identity in Nenets boys aged 12-13 years are the androgynous (21%) and the feminine (21%) types.

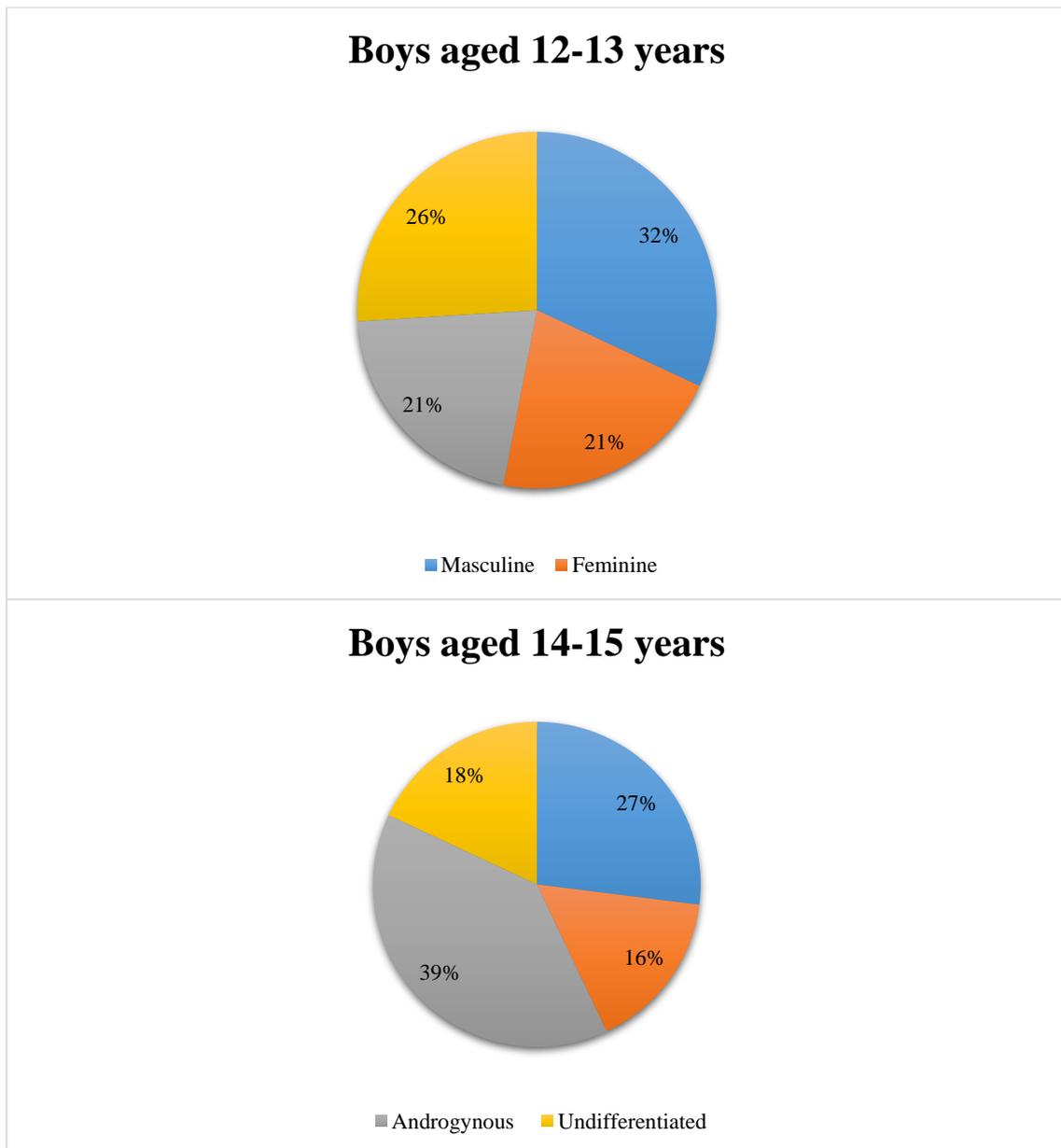


Figure 1. Distribution of gender identity types in Nenets boys in the period from the age of 12 years to the age of 15 years.

A number of changes are observed in distribution of gender identity types in Nenets boys in the period of transition from the age of 12 years to the age of 15 years. The number of respondents with the androgynous type of gender identity increases significantly (from 21% to 39%) ($p \leq 0,01$), this type of gender identity becomes predominant. By the age of 14-15 years, the representation of the masculine type of gender identity in Nenets boys decreases (27%), the undifferentiated (18%) and feminine (16%) types of gender identity become the least common. An increase in the number of respondents with the androgynous type of gender identity is accompanied by a simultaneous decrease in the

number of respondents with an undifferentiated type of gender identity. These results indicate that more individuals with pronounced masculine and feminine traits appear among Nenets boys in the adolescence period.

The analysis of the distribution of gender identity types in Nenets girls aged 12-13 years shows that the predominant type is the undifferentiated type (41%) (Fig. 2.). The androgynous type is less represented (23%). The least common types of gender identity identified in Nenets girls at the age of 12-13 years are the feminine (18%) and the masculine types (18%).

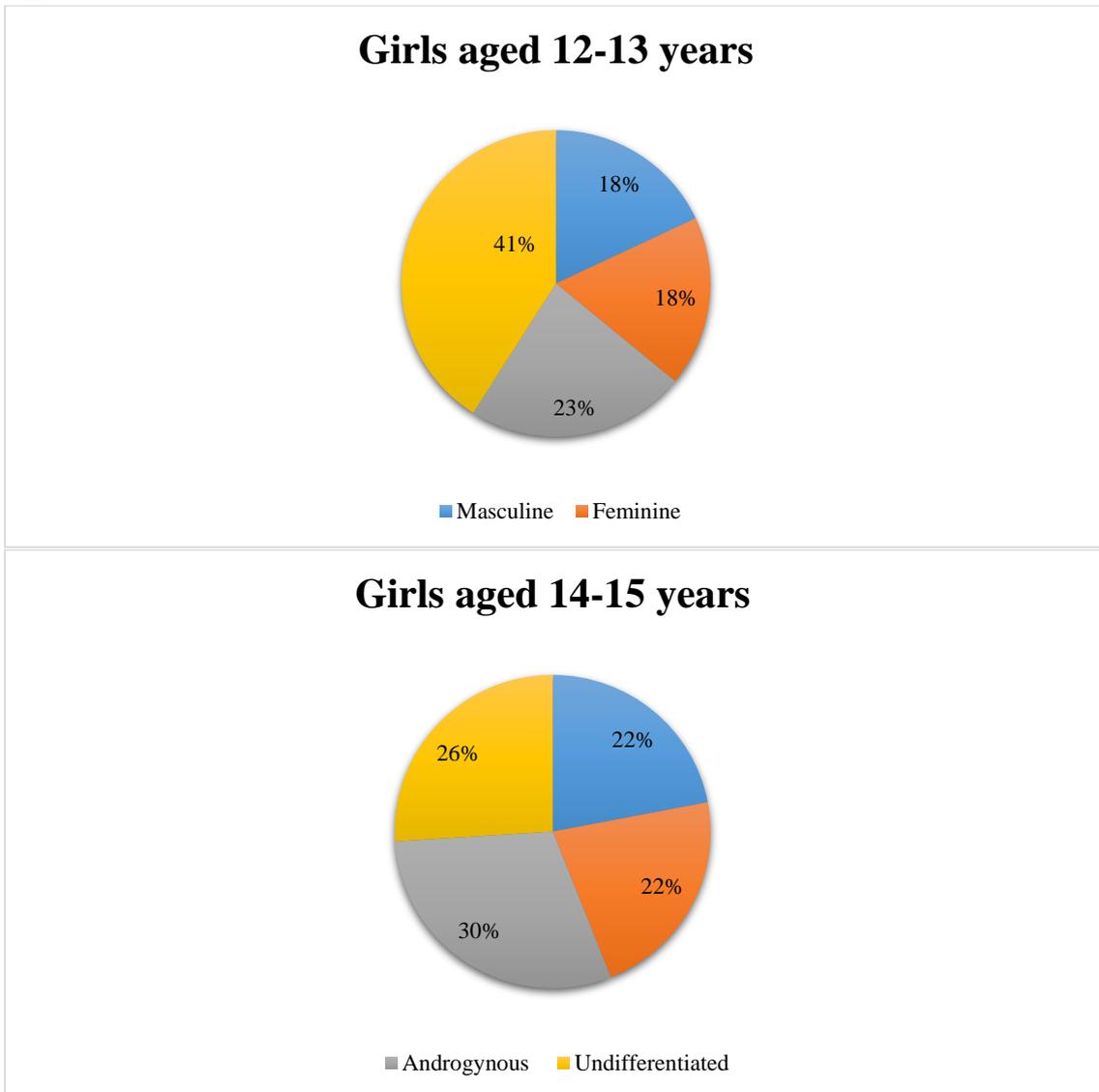


Figure 2. Distribution of gender identity types in Nenets girls in the period from the age of 12 years to the age of 15 years.

In the period of transition from the age of 12 years to the age of 15 years, a number of changes are observed in distribution of gender identity types in Nenets girls. The predominant type of gender identity in Nenets girls at the age of 14-15 years is androgynous (30%). There is a trend towards a decrease in representation of the undifferentiated type of gender identity (from 41% to 26%) ($p \leq 0,05$). The least common types of gender identity identified in Nenets girls at the age of 14-15 years are the feminine (22%) and the masculine types (22%). The decrease in the number of respondents with the undifferentiated type of gender identity takes place simultaneously with an increase in the number of respondents with the androgynous type of gender identity. These results indicate that the number of

individuals with a low degree of manifestation of masculine and feminine qualities decreases among Nenets girls during the adolescence period.

Studying the characteristic aspects of gender identity development in adolescent representatives of indigenous small-numbered peoples of the Russian North, we analyzed the characteristic aspects of masculinity and femininity manifestation, as well as of distribution of gender identity types in Nenets boys and girls aged 12-15 years in comparison with ethnic Russian adolescents of the same age. The specificity of gender identity indicators in ethnic Nenets and ethnic Russian male and female adolescents is presented in Table 2.

Table 2.

Expressiveness of masculinity and femininity characteristics in ethnic Nenets and ethnic Russian boys and girls at the age of 12-15 years.

	Ethnic Nenets adolescents		Ethnic Russian adolescents	
	Boys	Girls	Boys	Girls
Masculinity	0,71±0,03	0,61±0,02**	0,69±0,03	0,69±0,02**
Femininity	0,55±0,02**	0,75±0,03	0,63±0,02**	0,78±0,03

Note: ** - $p \leq 0,01$.

The analysis of the results of studying gender identity in boys aged 12-15 years shows that the femininity score in Nenets boys is significantly lower than in their ethnic Russian peers ($p \leq 0,01$). These results indicate that traditionally feminine qualities are less represented in the sex-role model of Nenets boys aged 12-15 years. Regarding masculinity, no significant differences were found in the studied groups of respondents, which speaks for similar trends in representation of traditionally masculine qualities in sex-role models of Nenets and Russian boys at the age of 12-15 years.

The analysis of the results of studying gender identity in girls aged 12-15 years shows that the masculinity score in Nenets girls is significantly

lower than in their ethnic Russian peers ($p \leq 0,01$). These results indicate that traditionally masculine qualities are less represented in the sex-role model of Nenets girls at the age of 12-15 years. Regarding femininity, no significant differences were found in the studied groups of respondents, which attests to similar trends in representation of traditionally feminine qualities in the sex-role models of Nenets and Russian girls at the age of 12-15 years.

The analysis of distribution of gender identity types in boys and girls aged 12-15 years makes it possible to identify particular features in distribution of gender identity types in Nenets adolescents in comparison with their ethnic Russian peers (Table 3).

Table 3.

Distribution of gender identity types in Nenets and Russian boys and girls at the age of 12-15 years.

Gender identity types	Ethnic Nenets adolescents		Ethnic Russian adolescents	
	Boys	Girls	Boys	Girls
Masculine type	30%	20%	25%	29%
Feminine type	18%	20%*	16%	33%*
Androgynous type	30%*	27%	42%*	29%
Undifferentiated type	22%	33%**	17%	9%**

Note: * - $p \leq 0,05$; ** - $p \leq 0,01$.

A trend can be seen towards the androgynous gender identity type being less represented among Nenets boys aged 12-15 years than among their ethnic Russian peers ($p \leq 0,05$). No significant differences were found in distribution of other types of gender identity in adolescent boys. These results indicate that respondents with pronounced both masculine and feminine qualities are met less often among Nenets boys than among their Russian peers.

The undifferentiated type of gender identity is significantly more common ($p \leq 0,01$) among Nenets girls aged 12-15 years than among their ethnic Russian peers. In addition, there is a trend toward the feminine type of gender identity being less represented ($p \leq 0,05$) among Nenets girls. No significant differences were found in distribution of the androgynous and the masculine types of gender identity in Nenets girls and their ethnic Russian peers. These results

indicate that respondents with feebly pronounced both masculine and feminine qualities are found among Nenets girls more often than among their ethnic Russian peers, while respondents with pronounced feminine qualities are less common among Nenets girls than among their ethnic Russian peers.

Discussion

The analysis of gender identity dynamics in Nenets adolescents over the adolescence period has made it possible to identify certain trends in the process. The trend for preserving the predominance of manifestations of traditionally masculine behaviour in Nenets boys and predominance of manifestations of traditionally feminine behaviour in Nenets girls is characteristic of the majority of Russian adolescents in total (Vasilenko & Brovkina,

2017; Peregudina, 2011; Romanov, 1997; Rymarev, 2006; and others).

The trend toward an increase in the number of adolescents with the androgynous type of gender identity, and a decrease in the number of adolescents with the undifferentiated type of gender identity, characteristic of both Nenets boys and girls, can be related to age-specific changes taking place in adolescence. This period is generally characterized by personal identity formation, elaboration of a self-concept, and choice of behaviour patterns, which in the context of gender identity is manifested in a clearer identification of one's own sex-role model (Lukyanenko, 2007; Tereshenkova, 2005; Rymarev, 2006; and others).

The comparative analysis of gender identity in ethnic Nenets and ethnic Russian adolescents has made it possible to identify both similar and differing trends in this process. Similar trends include the predominance of traditionally masculine behaviour in boys and traditionally feminine behaviour in girls among both Nenets and Russian adolescents. At the same time, it is important to note the presence of specific features in gender identity development of Nenets adolescents in comparison with their ethnic Russian peers. Thus, there is a trend toward traditional gender characteristics of the opposite sex being less pronounced in Nenets boys and girls. This can be due to certain traditions of upbringing which do not encourage manifestation of personal characteristics non-standard for born gender, which is conditioned by specific natural, climatic and socio-cultural living conditions of indigenous small-numbered peoples (Khabarov, 2003; Mironov, 2012; Buchek, 2012; and others).

In addition, a trend can be noted toward slowing down the rate of gender identity formation in Nenets boys in comparison with their ethnic Russian peers, which is manifested in the lower frequency of occurrence of the androgynous sex-role model, characteristic of dynamic processes of gender identity development in Nenets adolescents. The same trend toward slowing down the rate of gender identity formation can be noted in Nenets girls in comparison with their ethnic Russian peers, which is manifested in greater prevalence of the undifferentiated sex-role model, which should be decreasing in adolescence. The presence of such a trend in both Nenets boys and Nenets girls can be related to difficulties of socialization, typical for representatives of indigenous small-numbered peoples of the North (Buchek, 2012;

Vinokurova, 2003; Deryabina et al., 2011; Indenbaum, 2008; Lobova, 2010; Shipulina, 2010; and others).

A comparison of the results of the current study of gender identity in Nenets adolescents to the results obtained by other researchers is not possible since at present there are no other studies of gender identity in Nenets adolescents.

Thus, summarizing the results of the study, we would like to point out that these results were obtained from an experimental sample group of adolescents aged 12–15 years by comparing the survey results of ethnic Nenets adolescent respondents to those of ethnic Russian adolescent respondents, focusing on the indicators of masculinity, femininity, and the prevalence of gender identity types in accordance with the S. Bem Sex-Role Inventory (BSRI) technique. This determines the limitations of our study.

Conclusions

The analysis of gender identity dynamics in Nenets adolescents over the adolescence period highlighted changes in representation of masculinity and femininity, as well as in distribution of gender identity types in the period of transition from the age of 12-13 years to the age of 14-15 years. The comparative analysis of gender identity in ethnic Nenets and ethnic Russian adolescents highlighted the presence of both similar and differing trends in this process. The results of the study enrich the scientific understanding of the gender identity phenomenon, elaborate and expand the vision of gender identity formation process in representatives of indigenous small-numbered peoples of the High North. Identification of specific features of gender identity development of Nenets adolescents will help to update the programs of psychological assistance and support for adolescents in the aspect of socialization and building life strategies.

The prospects for future research on gender identity in representatives of indigenous small-numbered peoples include studying other components of gender identity in adolescents, analyzing the dynamics of gender identity development at different stages of ontogeny, and comparing the results of studying gender identity in ethnic Nenets to representatives of other indigenous small-numbered peoples.

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DOI: <https://doi.org/10.34069/AI/2024.74.02.5>

Golkarian, G. (2024). Traces of theosophical approach in Jalal'ud-Din Muhammad Rumi. *Amazonia Investiga*, 13(74), 62-71.
<https://doi.org/10.34069/AI/2024.74.02.5>

How to Cite:

Traces of theosophical approach in Jalal'ud-Din Muhammad Rumi

Следы теософского подхода у Джалалуд-Дина Мухаммада Руми

Received: January 12, 2024

Accepted: February 27, 2024

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Abstract

Rumi's concept of "Love," which He has proposed for years, has been tried to be explained from various perspectives. However, some scholars claim that it consists of phrases reflecting the content of "Divine Love," some of them "The peak of human romanticism," and some of them "Theosophy."

The critical works written by Rumi are Masnawi and Divan-e Shams. He points out two crucial issues there and even starts the poem at the beginning of the Masnawi not with the name of Allah, but with "Listen from the reed-flute!" In this beginning, Rumi deals with the expressions "separation" and "unity" and emphasizes that the creature will prefer to return to the place it is attached to.

This research examines theosophical approaches based on Rumi's work. It tries to determine the difference between romantic thinking, theosophic approaches, and the love expressed by Rumi. There are similarities between Rumi's view and theosophism. However, the necessary research has not been done in this regard. In today's era, getting results about Rumi's thoughts and mystical view of theosophism is essential. This research is based on comparative studies and the qualitative methodology. Corpus selection was at the forefront, and Divan-e Kabir and Masnawi were determined as the main works and analysis sources.

Keywords: Rumi, theosophism, divine love, romanticism, masnawi.

Абстрактный

Концепцию «Любви», которую Руми предлагал на протяжении многих лет, пытались объяснить с различных точек зрения. Однако некоторые учёные утверждают, что оно состоит из фраз, отражающих содержание «Божественной любви», некоторые из них — «Вершина человеческого романтизма», а некоторые — «Теософии».

Критические работы, написанные Руми, - это «Маснави» и «Диван-э Шамс». Он указывает там на два принципиальных вопроса и даже начинает стихотворение в начале Маснави не с имени Аллаха, а со слов «Слушай из тростниковой флейты!» В начале Руми обращается к выражениям «разделение» и «единство» и подчеркивает, что существо предпочтет вернуться в то место, к которому оно привязано.

В этом исследовании рассматриваются теософские подходы, основанные на работах Руми. Он пытается определить разницу между романтическим мышлением, теософскими подходами и любовью, выраженной Руми. Между взглядами Руми и теософизмом есть сходство. Однако необходимые исследования в этом отношении не были проведены. В современную эпоху крайне важно получить результаты о мыслях Руми и мистическом взгляде на теософизм. Данное исследование основано на сравнительных исследованиях и качественной методологии. Отбор корпуса был на первом плане, а Диван-е Кабир и Маснави были определены как основные труды и источники анализа.

Ключевые слова: Руми, Теософизм, Божественная любовь, Романтизм, Маснави.

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WoS Researcher ID: T-3725-2019



Introduction

Rather than general information about Rumi, his place and influence in today's literature constitute the subject's essence. Although Rumi is defined as a Sufi and knowledgeable about wisdom, three critical issues in his works and his legacy are still suitable for examination and academic research. 1. Man, 2. creation, 3. philosophy of life. Based on Rumi's thought, the elements, and interpretations that he gave meaning to life, purposeful life related to creation and human-society responsibilities, and ultimately, the vision he created for humans are the subject of considerable debate.

However, it is also inevitable to know his importance in world literature and why his poems are important in the field of comparative literature in today's literature.

Jalalud-Din Muhammad Balkhi (Rumi) is considered the most important Sufi Mystic Poet. His existence and spiritual legacy are too famous to fit within geographical boundaries. Because he addresses humanity with divine love, he is the property of the entire human world. Rumi and his other works, especially *Masnawi* and *Divan-e Kabir*, are among Sufi literature's most mysterious and respected works. These works also reveal many unidentified levels of spirituality. Rumi intensely tried to use the native language and convey his purpose. Knowledge of truth that the senses cannot obtain is a fundamental spiritual principle. (Lashari & Awan, 2014, pp. 1-14).

This article examines the spiritual and vision aspects while investigating the love aspect in Rumi's poems. Rumi is considered an artist who paints on a blank canvas with the magic of his poetry and metrical words. He thinks the factor that gives eternal life is "love" and introduces the source of love as the essence of life. When one considers his work and dives into his poems, it is easy to understand the relationship and concept of "Human-God" by evaluating beautiful landscapes and images of landscapes through the eyes of a traveler with an abstract methodical approach.

The works created by Rumi are truly important philosophical, wisdom, mystical, and literary treasures. It can produce and educate all the beauties of the world. Whether a concrete or fictional character, Rumi can impact our minds with a work of natural beauty. *Masnawi's* unique blend of spiritual content and romanticism remains permanent in readers' hearts with its

essence and fascinating notes. (Joshi, 2019, pp. 7-15).

Hypothesis and critical question

As it is known, Rumi's thought has been examined by researchers who have conducted research on many Islamic literatures in the present century, as well as by researchers who are affiliated with Christian, Buddhist, Brahman, and even Zoroastrian religions, and this has led to the emergence of various areas of discussion.

The common opinion about Rumi is that he was a wise man, a mystic, and a poet. However, in the meantime, love for humanity, self-sacrifice, keeping the covenant, and many similar positive moral values present him as a humanist, and some even criticize him. They describe him as a person who exhibits the thought and approach of Jesus.

However, some researchers who have recently continued their studies in the "Mevlevi order" field say he was a theosophical person. In this context, our critical question is, "Is Rumi a theosophist or a voice of Divine love?" it turns out. The hypothesis is based on findings to answer this question.

Theoretical framework or literature review

Within the theoretical framework, Mevlana's analysis of love can be discussed from various aspects. In this context, the idea of "love" obtained based on literature review should be evaluated semantically. Semantic analysis of the language Rumi used to express love involves understanding the deep meaning of the words, metaphors, and symbols used in his works. There may be various approaches to the semantic analysis of the language Rumi used to express love, considering some of its essential elements. For example, Rumi describes the struggle between separation and togetherness with the metaphor of the "cauldron of love." A person who disciplines and matures his soul by getting rid of all undesirable desires and especially worldly ambitions in the cauldron of love transforms his heart into an environment where God can be manifested.

In another place, Rumi expresses: "Those who act with evidence and reasons have feet like wooden legs. "Wooden legs are completely unreliable and completely flimsy." According to Rumi, judgment based on evidence and

reasoning is related to worldly matters. Political, legal, economic, etc. Conclusions can be reached by reasoning about worldly issues. However, reaching God and the truth of existence through this path and method is like going on a world journey with a wooden leg. In other words, Rumi says that the mind does not have a function in reaching God; it can only help us reach Him. In this respect, Rumi does not accept that the issue of determinism is identical to love and tries to prove that the issue of love is related to the heart and spirituality.

The symbolic richness of the language, the spiritual dimension of love, the ironic use of the language, the semantic analysis of love, and other issues can be considered as the subject of analysis. Still, this article is evaluated in terms of theosophic, considering the "semantic analysis of love."

Human beings are creatures that wonder, ask questions, and ultimately improve themselves. Rumi, in all his works, especially Masnawi, described the human being through the balance of mind/heart and mentioned that he should be satisfied mentally and spiritually. In this regard, Rumi, who talks about the need for man to develop himself both physically and spiritually and explains in a didactic manner how to achieve this in his works, emphasizes that bad habits and the evils that arise from them are prevented by revealing the essence of the human being. After all, according to Rumi, what makes a person human is the ability to think and question the things, beings, and life around him, especially himself and his actions. While doing this, it is necessary to rely on knowledge on the one hand and wisdom on the other.

Methodology

In terms of developing the methodology to carry out the semantic analysis of love, a systematic approach to understanding the deep meaning of the language in Rumi's works was considered. In this context, the qualitative and comparative method as a methodology, corpus selection was at the forefront, and Divan-e Kabir and Masnawi were determined as the main works and analysis sources. In addition, conceptual metaphor analysis was also discussed in terms of representing abstract concepts of love. The metaphor "Love is a journey" is emphasized in this context.

Comparisons have been made on the following essential points of Mevlana's philosophy of love. A research article analyzed the subject of love

and the philosophy of love by making necessary semantic and interpretive comparisons on Mevlana's important poems, in his Divan-ı Kebir and Masnawi, and the works and comments of people working in Sufi literature in the following centuries. In this context, the topics emphasized regarding Rumi's philosophy of love are as follows:

- a) **Cauldron of Love Metaphor:** Rumi describes a person's inner journey using the metaphor of the "cauldron of love." Based on many sample poems, Rumi's unity on the subject occurs in an entirely spiritual meaning and environment.
- b) **The Relationship between Mind and Love:** Rumi addresses the relationship between mind and love differently. Again, the following facts were obtained based on the poems determined during the research. While the mind operates with evidence and reason regarding worldly matters, love operates on a spiritual dimension. According to Rumi, reason is insufficient to reach God; love can help people reach Him.
- c) **Philosophy of Faith and Love:** In Rumi's works, he emphasizes that the human mind is limited and that the philosophy of faith and love should be resorted to when the power of the mind ends. Even the poem "Ney Name" proves that faith and love play an essential role in a person's reaching God.
- d) **Self-Realization of Man:** In Rumi's system of thought, the concept of "self-realization" is not in the sense expressed by personal developmentists or psychologists. It means that a person realizes himself, is surrounded by love, and matures to reach God. Rumi's philosophy of love should be examined in depth to understand man's inner journey and spiritual quests. His works are essential to love and man's reaching for God.

All data were analyzed by comparing sample poems with the approaches and interpretations in other literature based on two important works of Rumi.

Results and discusion

As a person of love, Rumi watches and evaluates people, things, beings, and the universe from the window of his heart. Rumi's ideas, thoughts, and views give meaning to all the objects created with a focus on the "love" concept of love and attach importance to tolerance and acceptance of life's bitter or sweet events and developments-changes based on love. He always described the rising of the Moon, the setting of the Sun, and the

rotation of the Earth in terms of "love" and emphasized that the source of evil and horror was "lovelessness and lack of love."

Since Rumi has a deep respect for nature, or in other words, the "essence" of every human being, he has and continues to have many fans and followers from every branch and in every period. After him, his ideas, views, and lifestyles were systematized, and the "Moulavi Order" branch of the sea of Sufism emerged. Moulavi's order reflects a deep civilization and state. This way, many men of science, art, literature, and politics were cultivated. Thus, precious people were raised in Moulavi dervish lodges. (Top, 2007, p. 776).

Jalaled-Din Rumi is a thinker with an essential place in the Islamic Sufism tradition. The concept of love frequently appears in Rumi's poems and teachings. According to Rumi, love is man's love for God. Love is a tool for man to transcend himself and get closer to God. Although Rumi's understanding of love has similarities with romanticism, it offers another philosophical meaning. When we look at Rumi's thoughts, it is understood that he put forward a movement in which Theosophism, Romanticism, emotion, and imagination are essential. But when it comes to the question of which aspect can be dominant, it is possible to understand Rumi's deep thought through the approaches in his poems.

Like romanticism, Rumi's understanding of love knows that emotion and imagination are essential. (Rezaie & A'alami, 2019, pp. 87-116).

It is clearly understood that Rumi's love poems express man's love for God and his return to Him. To give an example from Rumi's love poems: (Rumi J.-D. M., 2001a, p. 108).

*"I burn with the fire of love; I will become ashes;
I am the one who loves you; I am the one who
loves you!"*

In this poem, Rumi expresses how love burns people to ashes. The fact that love burns people to ashes is a tool for people to transcend themselves and get closer to God. Rumi's love poems express man's love for God. Even though Rumi's understanding of love and romanticism only reflects the wave of divine love, the theosophical approach has a deep meaning. Romanticism is a movement in which emotion and imagination are valued. Like romanticism, Rumi's understanding of love knows that emotion and creativity are essential. But when

we look at his similar poems, he may always seek to return to where he came from and become the same as the beginning.

What is Theosophy?

Theosophy is a concept that generally encompasses mystical and esoteric teachings. Theosophy deals with topics such as the nature of the world and the universe, human evolution, immortality of the soul, and universal wisdom. The theosophy movement first emerged in the mid-19th century and aimed to bring together many different traditions and teachings. (Eşmeli & Topal, 2022, pp. 91-107).

Theosophy is a term derived from the Greek words "theos" (God) and "sophia" (wisdom). At its core, it includes a series of teachings covering metaphysical topics such as the nature of the universe, human evolution, and the soul's immortality. Theosophy lies at the intersection of mysticism, philosophy of religion, and esoteric teachings. (Faivre, 1998, pp. 1-10).

When we look at the concepts in Rumi's poems, we can see that the same themes generally operate. Wisdom is given an important place in Rumi's thought, and human beings can only reach the highest level from the lowest level with knowledge, which is only possible through four gradual steps. (Naseh & Akhlaghifard, 2018, pp. 254-264) The wisdom story is achieved through Sect- Shariah- Ingenuity- truth. So, it seems that Rumi, with a completely theosophical approach, defends that man will be immortal and return to his essence by nature. In this respect, he describes the night he will die as "Şeb-i Arus" (Night of Wedding). In other words, the night he will reach God symbolizes the excitement and love a groom can experience with his bride.

History and origins

The Theosophical movement was founded in the mid-19th century by Helena Petrovna Blavatsky, Henry Steel Olcott, and several other pioneers. Blavatsky's works "Isis Unveiled," published in 1877, and "The Secret Doctrine," published in 1888, are among the primary texts of Theosophy. In these works, Blavatsky tried to explain supernatural events, mystical teachings, and the mysteries of the universe. (Gül, 2017, pp. 1-20).

Theosophy is significantly influenced by Indian and Eastern philosophy, Western mysticism, and ancient religions. Vedanta and Yoga teachings in India include traditions such as Taoism, Kabbalah, and Gnosticism.

Fundamental beliefs of theosophical thought

Theosophical teachings suggest that the universe is a whole and that everything is interrelated in a universal context. Some of the core beliefs include:

1. Universal Unity: According to philosophical teachings, every part of the universe is interconnected. There is the same universal spirit in everything.
2. Reincarnation and Karma: Theosophy adopts the concepts of reincarnation and karma. Accordingly, people evolve over many lifetimes and suffer the consequences of their actions.
3. Supernatural Phenomena: Theosophy also includes understanding supernatural phenomena and man's inner potential. Subjects such as telepathy, telekinesis, and psychic abilities are among theosophical beliefs.
4. Universal Wisdom: Theosophy aims to discover the deep secrets of the universe. It is about the attempt to understand human evolution and cosmic reality.

Modern influences and criticisms

Theosophy significantly impacted the early 20th century, especially in the Western world. However, some have claimed that Theosophy is speculative and not based on scientific foundations. Moreover, some teachings of Theosophy cannot be accepted independently of the religious and cultural context. (Quinn, 1997, p. 132).

As a result, Theosophy represents more than a belief system for many people. It is a way to discover the universe's secrets, realize human spiritual potential, and seek universal wisdom. However, it is not a doctrine everyone will accept and is often questioned by critics. Theosophy reflects the attempt to understand man's relationship with the universe, soul, and destiny. No matter how acceptable and scientific it may be, it cannot be denied that Theosophy has contributed to humanity's philosophical and religious pursuits. (Versluis, 1994, p. 87).

Romanticism and Theosophism approach in Rumi's views

Rumi's most famous work, "Masnawi," is a type of poetry with rhymes comprising 26 thousand couplets. It consists of 6 volumes; It was completed in 9 years with a 2-year break. Scholars describe Masnawi as a Sufi

commentary of the Quran and the book of reaching the truth. It contains 270 stories and parables expressed in poetic language. While explaining these, verses and hadiths were used. (Kayışlı & Önal, 2022, pp. 528-541).

In Masnawi, striking messages come after the stories. In his works, Rumi refers to specific subjects (concrete) in isolation (abstract); It deals mainly with internal and essential concepts. He handles the subtleties with full attention in the stories he tells. He deals with mind, soul, heart, love, and spirit issues. Its purpose is to save man from worldly passions and attachments, take him to the highest stages and ranks, and glorify him.

It is possible to see the closeness of thought to Rumi's Theosophical teachings in Masnawi. Article 1 of the Teachings speaks of "Universal Unity." In this context, the Sufi view parallels the same thought. Because according to Sufism, everything depends on the principle of "Unity of Body." Unity of body is an essential concept in the Islamic Sufi tradition and has been discussed by many Muslim thinkers. This concept means "being together". According to "Vahdeti vücut" (Unity of Body), all beings are manifestations of a single being, Allah, and everything expresses Allah. This idea is also found in the philosophy of Seyyed Imadeddin Nasimi. (Golkarian, 2020, pp. 264-272).

In his poem, Rumi says the following about the unity of existence or cosmic unity (Balkhi, 1998, p. 29).

ما عدم هاییم و هستی های ما / تو وجود مطلقى فانی نما

We are all from nothingness, but our existences remain, and we will be, in any case, returning to our origin.

The second issue comes from the theosophical teachings related to the issue of reincarnation. However, reincarnation is not accepted in Islamic teachings and is considered a false belief. But by observing such a poem by Rumi, you can understand that he believed in reincarnation. (Balkhi, 2002, p. 135).

آمده اول به اقلیم جماد / وز جمادى در نباتى اوفتاد
سالها اندر نباتى عمر کرد / وز جمادى یاد ناورد از نبرد
وز نباتى چون به حیوانى فتاد / نامدش حال نباتى هیچ یاد

At first, it was born in the form of a solid being, and then it changed into a plant. Then, he spent many years in a vegetative state, and during this period of his life, he did not remember anything from his solid state. When he changed from a



vegetable to an animal, he remembered nothing from his time as a vegetable.

Rumi also talks about the supernatural phenomena and the inner abilities of man, which is in line with the third teachings of the theosophical perspective (Balkhi, & Divan-e Shams, 2019, p. 33).

ای برادر تو همان اندیشه ای / مابقی تو استخوان و ریشه
ای
گر گل است اندیشه تو گلشنی / ور بود خاری، تو همیشه
گلخنی

O brother of my nature, know that you have a remarkable ability based on your intellect and power of thinking. And if you did not have wisdom and thought, you would be nothing but skin and bones. If your wisdom and thoughts are like flowers, be sure your whole being will be flowers. But if your thoughts are thorny and harmful, know that you will become a pile of thorns.

And in another place, he expresses his thinking following the fourth doctrine of theosophical theory. This theory refers to universal wisdom and believes everything happens according to wisdom. If something happens to man, it is from God's mercy. But what man wants but does not achieve is due to divine wisdom, which has the same result as mercy. Because of this insight, Rumi pointed out the bitter and sweet events in life and believed that nothing is without reason and that all events become objective for human evolution. In this regard, such a poem from Rumi can be used as an example: (Rumi, 2001b, p. 1674).

ما ز بالاییم و بالا میرویم / ما ز دریایم و به دریا می رویم
ما از اینجا و از آنجا نیستیم / ما ز بیجا میرویم و بی میرویم
اختر ما نیست در دور قمر / لاجرم فوق ثریا می رویم

We are from a high and superior world and will go to the top. We are the separated drop from the sea that will eventually join the sea. We do not have a fixed place in the current world, and this world has dimensions and sizes that we do not fit into. When we go to that world, a place will have no meaning, and everything will be the same. Hence, it is eternal. According to the false belief that every human life is connected to a star, we are not forced to travel around the Moon. We do not go around the Moon or the Sun, but our place is higher and higher than the Moon.

Masnawi considers the wisdom side of the events people witness around them. He uses some specific examples as symbols for this. For

example, the rooster represents "lust," the peacock represents "rank," and the crow represents "excess of desires," that is, excessive desire and insatiability.

Rumi is a great spiritual educator who evaluates people at every stage. He said that you cannot understand anything without understanding people. Also, Masnawi is the paradise of the hearts of those who get rid of selfishness and self-centeredness.

In his essential work Masnawi, Rumi begins his words with "Listen to reed flute!" With this appealing word, he obliges the reader to think and carefully analyze the terms. Why does he take up the symbol of "reed flute"? In his opinion, everything happens by listening. Only listening deeply to the voice of the universe, the Holy Books' speeches, and the Prophets' words is possible. Rumi wants to express this by saying, "Listen to the reed flute," said to all persons, "Listen to the revelation!"

"Listening" is an essential principle in Sufism. It is not the speaker but the listener who learns. The ear is the entrance to knowledge. To emphasize the importance of listening, elders say, "Teach your child to listen; he will learn to speak anyway!" In addition, those who listen are recorded in the mind, and what is read and written is recorded in the lines. What is in the bars, digital records, can be deleted, but what is in the mind is not deleted; it is permanent.

While human life is in the state of reading and listening, one should listen to the "reed flute," made of a smooth reed from which delicious sounds and melodies come. That "reed flute" is not an ordinary musical instrument. In Rumi's Masnawi, everything begins with the story and complaint of the reed flute. The narrator of Masnawi is, first, a story poet. He is like the storyteller of unread words, with all the secrets of reading the lyrical comments of concepts. His interest is in storytelling, and his habit is in storytelling. So much so that he sometimes tells stories, even in his ghazal lyrics. Throughout the novel, Rumi directs the attentive reader to the world beyond the level, which, according to some researchers, is a duality. Or it allows the issue of reaching conclusions through contradictions in the style of expression.

The reader goes beyond the world of narration, even the excitement of Sufism, into the field of education. Masnawi's stories and anecdotes, which may rarely be the poet's invention, often draw from the famous and widespread traditions

and collections of his time or age or the tales and stories reported in the lectures and articles of Shams Tabrizi or from books and rules about the situations and sayings of Sufi sheiks, or even from books of typical Arabic and Persian literature. (Zarrinkoub, 1998, pp. 297-300).

Rumi conveys his literary method and how to express his love by constantly resorting to allegory and these stories of address. Of course, Rumi's aim is not just to tell stories. Instead, it is a kind of allegory and argument in which the reader can understand the story and reach the main facts. However, the way the story is written makes the subject of love attractive in works such as Masnawi and Divan-e Shams, and inferences are made based on the story to achieve the goal, making it a unique character.

Rumi sees the story as a criterion for measuring meanings and draws attention to the importance of understanding story concepts. Therefore, according to Rumi, love and romance are not the peak of excitement and emotion a person perceives physically. On the contrary, romanticism has a different meaning in Rumi. Therefore, the meanings of love and romance in Rumi can be interpreted as a philosophical concept, and it would not be an exaggeration if we call it "Theosophy."

"Reed" in Sufism represents the perfect human being, the scholars, and the perfect guides who have transcended their ego, freed themselves from sins, and are at the level of taking refuge in God Almighty with a sublime heart. In other words, the flute is likened to nature, and the reed is likened to the world of the heart. (Esparham & Tasdigi, 2018, pp. 87-114).

Rumi says in his story "Reed Flute" (Balkhi, 1982, p. 13).

بشنو از نی چون حکایت می کند / از جدایی ها شکایت می کند
 از نیستان تا مرا ببریده اند / در نفیرم مرد و زن نالیده اند
 سینه خواهم شرحه شرحه از فراق / تا بگویم شرح درد
 اشتیاق
 هر کسی کو دور ماند از اصل خویش / باز جوید روزگار
 وصل خویش

Listen, what is the reed about? Because it tells a story. Its story is to complain about separations! From the moment they cut me off from the reed, everyone - man and woman - cried out of pity for this pity. I look for such a heart that it is torn to pieces by the pain of separation. Because such a heart already understands what I say. Let us know this: whoever stays away from his essence

and origin will eventually return to himself and his creator and unite with his heart.

With these couplets, Rumi reveals that he gives meaning to life according to theosophical fundamental beliefs and thoughts.

If the reed flute is a heartstring with heartfelt and warm moans that always remind one of separation and sadness, a person disconnected from his origin and essence feels empty inside and aches from break, just like the reed flute. Returning to his heart is the only thing that comforts him and relieves his heartache. According to Rumi, the world we live in is just a route. As point "A" is our original, point "Z" will also be ours. Therefore, what we experience in life are the factors that constantly push us towards our essence.

According to Rumi, nothing is meaningless, and even though they are seemingly contradictory, they are always in unity. This idea of Rumi also coincides with the "Yin Yang" philosophy. Rumi refers to the "Principle of Contrasts" in all his narratives.

He says in another poem: (Ankaravî, 2005, p. 188).

از محبت خارها گل می شود / وز محبت سرکه ها مل می شود
 وز محبت بار، بختی می شود / از محبت دار، تختی می شود
 وز محبت دیو حوری می شود / از محبت نار، نوری می شود
 بی محبت موم، آهن می / از محبت سنگ روغن می شود
 شود

Because of love, thorns become roses. Sour vinegars are sweetened same honey. If there is love, the gallows turn into a bed. And again, with love, misfortune turns into happiness. If there is love, even fire becomes light, and with love, ghouls change into fairies. If there is love, the stone becomes soft like oil, but the wax becomes steel when there is no love.

The accurate interpretation of Love in Rumi

The basis of the Moulavi profession and Sufi method and school is love. In Rumi's understanding of Sufism, love is the doctor of all causes and the cure for all internal and spiritual diseases of human beings. But what Rumi means by love is divine love, devotion to God, and the longing to return to Him.

The meaning of love in romanticism is lust; The manifestation of love is sensual. Love is a reality that cannot be understood in a virtual

environment. Virtual love looks for juice, color, and showiness. The person who has worldly love and romantic characteristics is the one who completely dominates excitement and emotion.

Love is the key to the secret of Rumi's thoughts and works. For this reason, Rumi's *Mesnevi* begins and ends with love. This love is essential because it eliminates self-centered aggression from people and forces people to be educated as their instincts require. According to Rumi, one can forget everything with love by avoiding predatory behavior, the struggle for survival, greed, jealousy, evil, unhealthy competition, and hypocrisy. If a person wants perfection, he should not fall in love with a mortal lover; he should have two identical signs of the lover and the beloved; he should see himself as one of God's attributes and think about God's manifestation. Rumi says that worldly man can only be perfect by seeing himself in God and understanding the existence of divine love in his essence. Then, he can fully demonstrate the concept and reality of the lover and the beloved.

Rumi tried to integrate beyond logical changes, and he worked in the field of knowledge, wisdom, and mysticism, but the education of mystical love and working on the ground in the hearts of the curious literature. He used primary language to get his point across but made a concerted effort to convey it. It is known that the knowledge of truth that cannot be obtained through the senses is a fundamental principle in spirituality. Love is no longer fully understood as a complex subject due to developments arising from worldly issues. Rather than the known human love and romantic love, Mystical love is explained by Rumi with simple verses that can contain many intelligent aspects. The diverse romantic elements of the seeker further enhance the beauty of spiritualism. Rumi can impact our minds with a work of true beauty, whether a concrete thing or a structured character. (Golkarian, 2018, pp. 423-430).

Rumi works more logically while adding charisma and power when writing his poetry. As we have already mentioned, the definition of love, when it comes to it, is subject to great debate, which makes a comparative study of Rumi's and Shakespeare's poems on the subject of love quite tricky. Rumi praises holy love so much that he interprets dying for love as being able to come to life again. So, dying for the sake of love is not the known bitter death but perhaps a sweet rebirth. He expresses this issue in his poem as follows: (Balkhi, 1994, p. 636).

بمیرید بمیرید در این عشق بمیرید / در این عشق چو مردید
همه روح پذیرید
بمیرید بمیرید و زین مرگ مترسید / کز این خاک برآید
سماوات بگیریید
بمیرید بمیرید و زین نفس بیریید / که این نفس چو بندست و
شما همچو اسیریید

Die, die in this love. Because in love, you come to life again through death. Die, and do not be afraid of death. Because if you move away from the Earth, you become heavenly. Die so that by the end, you will be free from self. You are a prisoner because the self is a chain attached to your feet.

Rumi uses a unique method to convey his emotional words to his readers: he chooses to write poems in Persian language and ghazal verse forms.

The work known as *Divan-e Shams* or *Divan-e Kabir* is entirely related to the subject of love by Rumi. The love-themed topics covered in the work mentioned above are impressive in content and structure. The structural method used in *Divan-e Shams* is the "Ghazal" form. Rumi feels useless in expressing love without holding on to the ghazal in this work. Therefore, ghazal and love-themed topics are elements that integrate.

In Persian literature, ghazals are the most crucial way of expressing love. "The word ghazal itself not only refers to romantic contexts and themes in the poem but also describes a certain form used in poems about love." (Pournamdarian, 1995, p. 37).

The love-type poems presented in ghazals can be divided into two groups: romantic and mystical. As it is known, ghazal content defines love as turning to "beautiful," which can be physical objects or intellectual items.

Conclusion

Since the basis of Rumi's Sufi school is love, the narration of love stories in his *Masnevi* is quite impressive. Rumi believes the lover and the beloved should be the same. The relationship should be more intimate and complete. Rumi, in his stories in his book *Masnevi*, tries to defeat formalism in love and proves that if love is real, it can give character to a person. In short, Rumi expresses the beautiful and mystical understanding that comes from true love because true love is the foundation of his cult.

The current research aims to define love and romance through a mysticism and theosophical

approach rather than ideological manipulation. In the study, the necessary analysis was made through sample poems and quotes. Rumi's works have been translated or commented on by many people. However, for some, the subject of love has been paired with romance, paving the way for manipulation. In this context, Rumi revealed different ideas and conceptualizations in his Masnawi.

As it is known, deviated parameters related to love may inevitably affect the reader's perception of the text and the author's image in the target context. Based on the findings in the article, the current research can be considered necessary in revealing the incompatibility between the source text's ideology and the target text's subtexts. The results also reveal a systematic tendency to romanticize (human or mystical) the reader and be comfortable with theosophical thoughts. Although the current research objectives were achieved, limitations that could be addressed for further research should be highlighted. In addition, the emergence of different interpretations of Rumi's poems when translated into Arabic, Turkish, German, and English, unfortunately, not only creates his whole approach to love. Sometimes, personal interpretations also confuse and even overshadow Rumi's personality. In this context, the issue of the perception of love and romance from Mevlana's perspective needs to be further investigated. For this reason, the article's primary goal is to prove that there are Theosophical traces in Rumi's way of thinking.

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DOI: <https://doi.org/10.34069/AI/2024.74.02.6>

How to Cite:

Scheda, N., Pashchenko, I., Chervonska, L., Tereshchenko, S., & Vrubel, H. (2024). The health-restoring potential of musical art in the postwar period. *Amazonia Investiga*, 13(74), 72-80. <https://doi.org/10.34069/AI/2024.74.02.6>

The health-restoring potential of musical art in the postwar period

Здоров'я Відновлювальний Потенціал Музичного Мистецтва у Післявоєнний Час

Received: December 14, 2023

Accepted: January 27, 2024

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Abstract

The academic paper explores the prospects of using music therapy for people who have participated in hostilities or have been in the epicentre of military operations and have experienced post-traumatic stress disorder. The present research encompasses the historical documentation of attempts to apply music therapy during the First and Second World Wars, the evolution of music therapy in the latter part of the XX century, and the potential for growth in the context of contemporary conflicts, in particular, the ongoing Russian aggression against Ukraine since 2014. Three main types of music therapy practices have been identified: perceptual, motor practices, and music-making. It has been revealed that the positive impact of music therapy practices is not only noted by the patients themselves but also measured instrumentally, which gives objective grounds to emphasize the importance of the health-restoring

Анотація

У науковій роботі досліджуються перспективи використання музикотерапії для людей, які брали участь у бойових діях або перебували в епіцентрі військових дій і пережили посттравматичний стресовий розлад. Це дослідження охоплює історичну документацію про спроби застосування музичної терапії під час Першої та Другої світових війн, еволюцію музичної терапії в другій половині XX століття та потенціал для зростання в контексті сучасних конфліктів, зокрема, російська агресія, що триває проти України з 2014 р. Було визначено три основні типи музикотерапевтичних практик: перцептивні, моторні практики та музикування. Виявлено, що позитивний вплив музико-терапевтичних практик не тільки відзначається самими пацієнтами, але й вимірюється інструментально, що дає об'єктивні підстави підкреслювати важливість оздоровчого

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potential of musical art. At the same time, the analysis of publications shows that music therapy practices are not widespread, but rather sporadic initiatives of individual rehabilitation centers and volunteer organizations. In addition, the attempt to find out which musical works should be used for music therapy practices also brings no results due to the lack of relevant studies.

Keywords: music therapy, post-traumatic stress disorder, rehabilitation, interdisciplinary.

Introduction

The use of musical art for therapeutic purposes is of increasing interest to both psychologists and musicologists. Music therapy becomes a part of art therapy – a science that studies the health-restoring capabilities of art.

The formation of music therapy as a separate science dates back to the beginning of the XX century and is related to the studies of James L. Corning and V. Behterev. Some references to the use of music therapy methods are also known during World War I.

The development of music therapy in the period after World War II is associated with the contributions of Margaret Anderton, Isa Maud Ilsen, and Harriet Ayer Seymou. At that time, music therapy was officially recognized in some military institutions; in particular, in 1945, the use of music for rehabilitation in military hospitals was regulated in the U.S. War Department Technical Bulletin 187.

The actualization of interest in music therapy in recent years is related to the ongoing modern wars. In particular, Russia's aggression against Ukraine began in 2014, and at the time of writing the present academic paper, it has already killed hundreds of thousands of people. This war is not expected to be finished soon raising a range of issues for world science that would help to effectively counter the aggressor. In addition to innovations in the sphere of military technologies, which are regularly covered in scientific discourse, the issue of rehabilitation of people who have experienced trauma and psychological shocks in the combat zone is also significant. This issue is also regularly covered in the medical and social literature, which we will partially refer to in our research to the extent that they address the use of music therapy as a complementary therapeutic method.

The specifics of music therapy involve a

потенціалу музичного мистецтва. Водночас аналіз публікацій показує, що практики музикотерапії є не масовими, а спорадичними ініціативами окремих реабілітаційних центрів та волонтерських організацій. Крім того, спроба з'ясувати, які музичні твори варто використовувати для музико-терапевтичних практик, також не приносить результатів через відсутність відповідних досліджень.

Ключові слова: музикотерапія, посттравматичний стресовий розлад, реабілітація, міждисциплінарний.

multidisciplinary approach that takes into account the achievements of both musicology and medicine. From a medical point of view, art therapy tries to find out how art can influence not only a person's mood but also to normalize blood pressure, heart rate, stimulate memory, improve respiratory function, articulation and other aspects of physical and mental health, as well as to develop relevant effective methods of art therapy. Moreover, these can be both receptive methods (listening to music) and active methods – playing musical instruments, singing, performing special exercises to music, exercises for developing speech to music, listening to music with subsequent discussion.

From the musicological point of view, the issue of what kind of music has the best healing capabilities is of the greatest practical interest, what kind of works can be recommended to doctors for a course of therapy. Furthermore, art therapy can give composers an answer to the question of what kind of music should be written to be used in medical and rehabilitation institutions, what kind of music can help overcome post-traumatic stress disorder (PTSD). The purpose of our research is to analyze the achievements of music therapy in this area.

Literature review

The analysis of publications shows that a wide range of issues related to the impact of music on human health are studied. The authors of recent monographs include Hans-Helmut Decker-Voigt, Kenneth E. Bruscia, Karen Goodman, David Aldridge, Tony Wigram, Even Ruud, K.D. Goodman, Alison Levinge, William B. Davis, Kate E. Gfeller, etc.

A general overview of music therapy studies is given in the scientific work of O. Lvov (2019), who describes five significant models of music

therapy that were presented at the World Congress of Music Therapy in Washington, DC (the USA): GIM (Guided Imagery Method in Music, Helen L. Woppu), Analytical Music Therapy (Mary Priestley), Creative Music Therapy (authors – Paul Nordoff & Clive Robbins), Music Therapy of Benenzon (Rolando Benenzon), Behavioral Music Therapy (Clifford K. Madsen), Free Improvisation Therapy (Juliette Alvin).

Shabutin, Khmil & Shabutin (2008) examine the therapeutic properties of certain musical styles: Gregorian chant, sign chant, baroque, rococo, classicism, impressionism, folklore, and, more specifically, Indian music. The scholars list about 30 pieces of music that can be recommended for therapeutic purposes.

Landis-Shack, Heinz & Bonn-Miller (2017) analyzed the literature on music therapy and concluded that music activates brain regions associated with pleasure and stress reduction, promoting the release of endorphins and increasing positive emotions. Music therapy has proven to be effective in combination with other therapies, helping to improve the patient's physical and psychological condition, as well as their integration into society.

The publications of military researchers describing the rehabilitation activities that military personnel undergo are of great interest to our research. In particular, after the beginning of the Russian aggression in 2014, Kolesnychenko (2019), Gavlovsky, Golovanova, and Kharchenko (2019), Makarenko (2018), Stebluk et al., (2020), Safin and Yakymchuk (2019), Gulbs & Kobets (2021), Hordiienko (2021), Vasylenko (2020) have explored and studied rehabilitation measures.

A separate group of publications describes the experience of incorporating music therapy into university and school education. The researchers note that music therapy "stimulates the emotional sphere of the subjects of the educational process" (Dobrovolska, 2023), "helps to neutralize neuropsychic overload, restore a positive emotional and energy tone" (Burnazova & Kostievych, 2020), contributes to the creation of a "positive emotional communicative environment" reduces neuropsychic stress, stabilizes the functional state of students, and includes reflexive mechanisms for activating cognitive activity (Pavlenko, 2019; Reschke-Hernandez, 2014). In addition, the use of music therapy in music schools contributes to "increasing the effectiveness of music education,

preserving and improving children's health, activating their interest and interest in music classes and lessons, developing their musical abilities, imagination and fantasy, enhancing their creative activity, harmonizing the sensual sphere, solving problems of interpersonal and creative communication against the background of health" (Malashevskaya, 2017).

Methodology

The analysis of music therapy publications makes it possible to point to the prevalence of three research methodologies: sociological, analytical, and generalizing-analytical.

The sociological method involves a questionnaire survey of a group of people who receive music therapy, followed by processing the results. In particular, this method was applied in the studies by Davis, Mulvaney-Day, Larson, Hoover & Mauch (2014), Akelma, Altinsoy, Arslan, & Ergil (2020). In some studies, like Maleki & Youseflu (2023), the questionnaire was supplemented by recording physiological indicators, which allowed for more objective indicators of the impact of music therapy on patients. The analytical approach involves studying the history of a particular patient who received music therapy treatment (for example, in the study by Vaudreuil et al., 2019) or examining the work of certain organizations or groups of specialists who have implemented music therapy treatment (Pezzin et al., 2018; Thompson & Neimeyer, 2014). The generalizing-analytical approach involves studying and identifying disparate data collected and published by researchers. A similar approach was used earlier in the scientific works of Landis-Shack, Heinz & Bonn-Miller (2017), Lvov (2019), Davis (2012) etc.

In the present research, we will rely on a generalizing-analytical approach and analyze two categories of publications – publications by authors from different countries that contain "music therapy" and "combat" in the keywords and publications by Ukrainian authors devoted to the rehabilitation of military personnel who participated in the defense of the country against Russian aggression. The purpose of the analysis is to identify music therapy practices and assess their health-restoring potential.

This study conducted a systematic review and analysis of the potential of musical art to restore health in the concept of post-war rehabilitation and recovery.

In the research process, several general scientific methods were used, in particular - analysis and synthesis (to research current theoretical concepts and scientific developments regarding the potential of musical art in post-war personality regeneration); comparison (for the systematization of conceptual approaches to the definition of basic concepts and criteria, clarification of the terminological apparatus); structural-logical method (to develop proposals for improving the paradigm of music therapy).

The work on the research was implemented based on the principles of complexity and systematicity of scientific research, which made it possible to analyze the object of research as a complete system with several interrelationships and interdependencies.

Results and discussions

The analysis of publications focusing on the health-restoring potential of musical art for people who have had traumatic experiences in the combat zone allows us to identify the following areas of research: the study of the impact of music therapy on a particular patient with a detailed examination of the anamnesis and the impact of music therapy on a group of patients using surveys. The vast majority fall into the second category.

Individual experiences are most fully described in the scientific work of Vaudreuil, Avila, Bradt, & Pasquina (2019). The scientists studied the experience of Luis Avila, a U.S. soldier who took part in combat operations in Afghanistan in 2011 and was seriously injured. According to the case report, Luis Alvia was in a coma for 40 days and "Avila's wife was informed that it was unlikely that he would regain consciousness and the discontinuation of life support was recommended. Mrs. Avila elected to continue life support and attempted to establish contact with CPT Avila by playing his favorite music (e.g., Help, Ode to Joy, The Army Song, and God Bless America). She also played video/audio recordings of their family and children" (Vaudreuil et al., 2019; Collie et al., 2006). Further use of music therapy involved 60-minute sessions three times a week, combining listening to music with speech language pathology [SLP], physical therapy [PT] and occupational therapy [OT]. According to the researchers, the sessions made it possible to "(1) access pre-injury memories through musical reminiscence, (2) acknowledge and process events of the attack through songwriting, (3) address his personal loss of limb, vision, communication, and mobility through successes

in music-based rehabilitation associated with post-traumatic growth, (4) express gratitude to his family and friends through self-selected songs or creating his own music, and (5) honor the lives of his fellow and fallen soldiers through musical performance".

Studies of music therapy that have been applied to different groups of people allow us to distinguish three groups of music therapy practices: perceptual (patients listen to music), motor (patients perform various physical exercises to music) and creative (patients play musical instruments, sing or create music) (Ambler et al., 2023).

Perceptual practices involve offering patients to listen to music. Unfortunately, most studies, with the exception of the one cited above, do not specify which compositions the patients listened to. Some studies contain only general characteristics.

For instance, the study of Maleki & Youseflu (2023) suggested listening to "Turkish music, pop music, piano music at 70 bpm". In the study by Uğraş, G.A., Yıldırım, G., Yüksel, S., Öztürkçü, Y., Kuzdere, M., & Öztekin, S.D. (2018), patients were offered to listen to "classical, Turkish music and nature sounds". The research by Akelma, Altınsoy, Arslan, & Ergil (2020) refers to "favorite" music (without any specification). Most studies do not provide any guidance.

The role of perceptual music therapy is positively assessed in most studies. For instance, Maleki & Youseflu (2023) used music therapy in maternity hospitals in order to reduce short-term postpartum episiotomy pain. In the researcher's opinion, "music-based interventions can reduce the 1.60-unit of episiotomy pain score in both primiparous and multiparous than the control group. The highest and lowest effect of music on reducing the pain was at two and 48 h after episiotomy repair respectively".

Akelma, Altınsoy, Arslan, & Ergil (2020) explored the effect of listening to music on patients preparing for surgery. Surveys with methods for determining the level of anxiety (STAI-1 and STAI-2) and pain (NRS) showed that "listening to patient-preferred favorite music preoperatively reduced anxiety, regulated hemodynamic parameters, and improved postoperative patient satisfaction".

Uğraş, G.A., Yıldırım, G., Yüksel, S., Öztürkçü, Y., Kuzdere, M., & Öztekin, S.D. (2018) measured

patients' anxiety levels (STAI-S), systolic blood pressure (SBP), diastolic blood pressure (DBP), heart rate (HR) and revealed that "all types of music" reduced anxiety levels, as well as blood pressure and cortisol levels. Natural sounds additionally reduced diastolic blood pressure; classical Turkish music also reduced diastolic blood pressure and heart rate.

Krout (2007) justifies the use of music therapy to facilitate relaxation, as a means of masking unnecessary environmental stimuli, and as a distraction from stress or physical pain. The correlation between music and several facets of psychoneuroimmunology, the limbic system's function in emotional and physiological reactions to music, and the autonomic nervous system's function in hormone release are also discussed.

The study of Steiner-Brett (2023) suggests that "music therapy is presented as an effective non-pharmacological approach for addressing psychosocial needs, particularly, for informal caregivers". The study clearly demonstrates that music therapy benefits patients as well as caregivers, including physicians and relatives.

We conditionally refer to various practices in which music is used as an accompaniment for various motor or speech exercises to *motor practices*. In most cases, scholars do not specify what kind of music was used, limiting only to a superficial description of the practices applied.

For instance, Bronson, Vaudreuil, and Bradt (2018) describe a slow-tempo movement accompanied by music, during which the music therapist creates a dynamic melodic contour on the piano, cello, or other melodic instruments, aligned with the body scan trajectory. Roy, Bellini, Kruger, Haight & Vermetten (2022) used a "walk and talk" cognitive therapy procedure for patients with PTSD. The music was used as part of the "Motion-Assisted, Multi-Modal Memory Desensitization and Reconsolidation (3MDR)" procedure. In both cases, scientists assess the results of music therapy as positive; however, they emphasize the need for further studies.

Active forms of music therapy are mentioned in educational practice. For example, Pavlenko (2019, p. 139) describes such a technique as a "joint performance of a well-known song for one of the group members to celebrate his/her achievements or congratulate him/her", which, according to the author, "evokes positive emotions, a sense of cohesion".

Music-making practices are described in at least two studies. For instance, in the above-mentioned study by Bronson, Vaudreuil & Bradt, (2018), 60-minute sessions are held with group instrument playing and songwriting, with songwriting based on the 12-bar blues pattern. According to the researcher's viewpoint, "the therapist facilitates the group in playing the blues by accompanying on a strong rhythmic instrument (drums/percussion, bass, or rhythm guitar). Song lyrics can be added to the music, either spoken or sung by patients or the music therapist» (p. 201).

The experience of *the Guitars for Vets*, the volunteer project, aiming to provide free guitar lessons to veterans, which, according to the initiators, should help restore psychological balance, is equally interesting. Pezzin, Larson, Lorber, McGinley & Dillingham (2018) reported a moderate positive effect of lessons for those who agreed to participate in the project.

In several articles, researchers avoid specifying the nature of the music therapy practices used; however, they note their positive effects.

In particular, Davis, Mulvaney-Day, Larson, Hoover & Mauch (2014) tried to investigate the effectiveness of alternative and complementary medicine, which included music therapy along with chiropractic, herbs, massage, megavitamins, movement therapy, and relaxation.

Hasanović, Sinanovi, Pajević, Avdibegović, Sutović (2006) describe the issue of innovation in the health care system in Bosnia and Herzegovina, with a special focus on mental health care.

Prospects for applying music therapy in modern conditions also encourage the study of the Ukrainian experience. Consequently, let us highlight several studies by Ukrainian authors published after Russia's occupation of the Crimean peninsula and Donbas.

Safin & Yakymchuk (2019) consider psychological tools for conducting rehabilitation activities with combat veterans in combination with pharmacocorrection methods with psychotropic drugs, adaptogens, biostimulants, physiotherapy and psychotherapy methods, etc. The researcher mentions music therapy as one of the methods of psychotherapeutic rehabilitation (along with "bibliotherapy, imagery therapy, art therapy"), which "is widely used in foreign armed forces" (p. 240); however, he does not

highlight the specifics of its application in Ukraine.

Lytvynenko (2015) mentions the use of “art therapy” and “therapy with art and creative expression” along with Gestalt therapy and body-oriented psychotherapy, although the specifics of this therapy are not revealed. Gavlovsky, Golovanova, & Kharchenko (2019) mention art therapy, namely “the work of an artist”, among the programs of the Kremenchuk Regional Hospital for War Veterans; however, they do not mention any practices related to music.

The following works are devoted to the issues of psychological rehabilitation of military personnel; however, they do not contain any mention of music therapy. Along with this, the following methods are mentioned:

- “psycho-diagnostics, debriefing, trainings on optimization of internal potential and restoration of psychological security of a person, game activities, psychological lectures, training in self-regulation; watching movies, recreation (swimming, sauna, jacuzzi, karaoke, fishing), massage, individual consultations, walks, gym classes, etc.” (Kolesnychenko, 2019);
- “medical examination; psychological diagnostics (screening); psychological education (pro-education); psycho-emotional relief and restoration of psychological security of the individual; psychophysiological relief; social rehabilitation” (Vasylenko, 2020);
- “non-hospital therapy, individual and group psychotherapy; family counseling; relaxation and biofeedback techniques; physiotherapy, pharmacotherapy” (Safin and Yakymchuk, 2019);
- “providing emotional, meaningful and existential support to a person or society in situations of difficulty arising in the course of their personal and social existence” (Makarenko, 2018).

Discussions

The obtained results indicate a limited use of music therapy, primarily as a complementary measure. Although researchers have noted the positive effects of music therapy on patients’ conditions, which are detected not only by patient surveys but also measured instrumentally, there is a lack of detailed explanations of the features of music used, as well as explanations of the mechanisms of music’s effect on patients. These issues are considered to be insufficiently studied.

Music therapy has also become the subject of a large number of journalistic articles and websites, as well as videos on YouTube, which, according to their authors, allegedly have healing properties. However, we should be especially cautious regarding these sources of information. In particular, videos that form a distorted view of music therapy are being shared on the YouTube video platform. For instance, videos titled “Healing music” with the “frequency” of 432 Hz or 732 Hz are very popular (up to 40 million views or more). However, it should be borne in mind that the recordings presented on them are not signals of the declared frequency, but, as a rule, slow-tempo musical compositions based on classical harmony, which is known to use complex harmonies consisting of sounds with fundamental frequencies from 30-50 Hz to 2-4 kHz.

The content side of musical works that can be used in the process of music therapy is still out of the researchers’ attention. The content side, which is determined by its intonational nature and, for music combined with poetry, also by the verbal range, can be an important factor in the psychological impact of music, both positive, if the piece of music is among the patient’s favorite compositions, as well as negative. The negative impact can be manifested clearly if, for example, the song is sung in the language of the state, or glorifies the values of the state in hostilities against which the person, to whom the music is imposed, participated. This circumstance, in particular, is one of the important reasons for the restrictive measures against Russian music introduced in Ukraine with the beginning of the large-scale phase of the Russian invasion in 2022.

Conclusions

Published studies show the significant health-restoring potential of music for veterans of hostilities. In particular, listening to music, doing exercises accompanied by music, and making music (singing, playing musical instruments) can help improve human health, including normalizing blood pressure, heart rate, reducing anxiety, stimulating memory, etc. At the same time, the application of music therapy in real medical practice is currently used only sporadically and only in certain rehabilitation centers as supplementary to other types of therapy.

The scientific work explores the prospects of using music therapy for people who have participated in hostilities or were at the epicentre of hostilities and experienced post-traumatic

stress disorder. In the course of the work, a retrospective analysis of historical documentation was implemented regarding attempts to use music therapy during the First and Second World Wars, the evolution of music therapy in the second half of the 20th century, and the potential for growth in the context of modern conflicts, in particular, the Russian aggression against Ukraine, which has been ongoing since 2014. p.

In the process of research, three main types of music therapy practices were identified: perceptual, motor practices and music making. It was found that the positive impact of music therapy practices is not only noted by the patients themselves but also measured instrumentally, which provides objective grounds for emphasizing the importance of the healing potential of musical art. At the same time, it was proven that music therapy practices are not mass, but sporadic initiatives of individual rehabilitation centres and volunteer organizations.

From a musicological point of view, the greatest practical interest for future research in this direction is the question of which music has the best therapeutic potential, and which works can be recommended to doctors for conducting a therapeutic course. In addition, art therapy can give composers an answer to the question of what music should be written for use in medical and rehabilitation institutions, and what music can help overcome post-traumatic stress disorder, which is an invaluable resource for the recovery of both military personnel and the public in the post-war period of personal regeneration - psychological resource potential.

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DOI: <https://doi.org/10.34069/AI/2024.74.02.7>

How to Cite:

Seredina, I., Bazyl, L., Orlov, V., Klymenko, M., & Spitsyna, A. (2024). Development of entrepreneurial competence among future specialists in the face of social changes. *Amazonia Investiga*, 13(74), 81-89. <https://doi.org/10.34069/AI/2024.74.02.7>

Development of entrepreneurial competence among future specialists in the face of social changes

Розвиток підприємницької компетентності майбутніх фахівців в умовах соціальних змін

Received: December 17, 2023

Accepted: January 26, 2024

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Abstract

The article focuses on developing the entrepreneurial competence of vocational education students in the era of crises in public life. The relevance of the current study arises from the fact that the dynamics of the traditional methodological approach, given the global trends, determines the priority of focusing on the competence approach. The aim is to analyze the possibilities of innovative technologies for the development of entrepreneurial competence of vocational education students during the period of societal transformation and crises. Substantiated the structure of the entrepreneurial competence of future specialists, which synergizes professional and personal components. The identified vectors for improving the educational process aimed at forming information, digital, communication, and intercultural competence in vocational education students as essential components of

Анотація

У статті йдеться про формування підприємницької компетентності здобувачів професійно-технічної освіти в епоху криз суспільного життя та активних трансформаційних процесів. Актуальність дослідження зумовлена тим, що динаміка традиційного методичного підходу в освітньому процесі з огляду на світові тенденції зумовлює пріоритетність орієнтації на компетентнісний підхід. Мета – проаналізувати можливості інноваційних технологій для розвитку підприємницької компетентності учнів професійно-технічної освіти в період трансформації суспільства та кризи. Обґрунтовано структуру підприємницької компетентності майбутніх спеціалістів, яка поєднує в собі професійну та особистісну складові. Визначено вектори вдосконалення освітнього процесу, спрямовані на формування інформаційної, цифрової,

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their overall professionalism. Established that the need to actualize the phenomenon of entrepreneurial competence is caused by the specific requirements of today's professional qualities of a specialist, characterized by specific content and a specific focus on professional activity. Found that digital literacy, logical thinking, and effective communication skills are among the promising areas for forming students' entrepreneurial competence. They have outlined the basic principles of implementation and development of interdisciplinary integration of the educational process through innovative technologies.

Keywords: vocational education, entrepreneurship, business project, career, entrepreneurial education, competence, thinking, business activity, creation of new jobs, counseling, training, entrepreneurship for youth.

Introduction

Professional training of vocational education students is seen as a pedagogical process. This process is expected to result in the formation of a holistic professional competence of a specialist. Innovative technologies for the development of entrepreneurial competence of vocational education students during societal transformation and crises are seen as promising tools for the formation of professional competence of future specialists. It identifies entrepreneurial competence as an essential feature of professional activity that synthesizes its integrative abilities, competencies, and personal qualities.

Recently, in the national educational space, great attention has been paid to the problem of forming the entrepreneurial competence of vocational education students in the context of a competency-based approach involving innovative technologies. In this regard, the concept of entrepreneurial competence of future specialists is considered a complex integrative feature. It represents a system of knowledge, skills, abilities, values, and personal qualities of specialists, which form the basis for their goals and ability to implement professional and social functions in the direction of effective entrepreneurial activity.

комунікаційної та міжкультурної компетентності здобувачів ПТНЗ як невід'ємних складових їх загального професіоналізму. Встановлено, що необхідність актуалізації феномену підприємницької компетентності зумовлена специфічними вимогами сучасності до професійних якостей фахівця, що характеризуються специфічним змістом та специфічною спрямованістю професійної діяльності. Встановлено, що цифрова грамотність, логічне мислення та навички ефективної комунікації є одними з перспективних напрямів формування підприємницької компетентності учнів. Окреслено основні принципи реалізації та розвитку міжпредметної інтеграції навчального процесу за допомогою інноваційних технологій.

Ключові слова: професійно-технічна освіта, підприємництво, бізнес-проект, кар'єра, підприємницька освіта, компетентність, мислення, ділова активність, створення нових робочих місць, консультування, навчання, підприємництво для молоді.

Many relevant interdisciplinary academic studies are devoted to the problems of forming and improving the entrepreneurial competence of future professionals in the context of crises and instability. Some modern scientists (Kraus & Kraus, 2021; Panchenko, s.f) are studying the peculiarities of transforming targeted strategies of the educational process of developing entrepreneurial competence in the context of global digitalization. Some scholars (Maslich, & Yermolenko, 2023; Radkevych, 2022; Zavgorodnia, 2020) reflect the issues of introducing innovative tools into the educational professional environment. They aim to develop effective communication skills in students and meet the requirements of digitalizing socio-economic processes.

Other scholars (Bazyl, 2022; Aliksieieva et al., 2020; Titova, 2020) note that in the context of political, economic and financial instability and crisis social phenomena, it is imperative to study the mechanisms of forming entrepreneurial competence by elaborating adaptive development strategies in the context of transforming the socio-economic environment.

It should be noted that, as of today, very little attention has been paid to identifying the functionality of the structural components of the

entrepreneurial competence of vocational education students. Most developed world countries prioritize the democratization and informatization of society. This contributes to the formation of qualitatively new approaches in the field of economic education (Markova et al., 2019; Banit, 2019).

Future specialists should be prepared to work effectively both in the national economic environment and in a globally integrated financial hub. For this reason, the professional targeted educational activities of professional educational institutions should be based on competence-based principles.

This article aims to study the potential of innovative technologies for the development of entrepreneurial competence of vocational education students during the period of societal transformation and crises.

Literature review

The results of analyzing the scientific developments of the sociological, pedagogical, cultural, and economic vectors of modern research indicate a significant interest in the problem of forming entrepreneurial competence among scientists. This topic has gained particular relevance during the socio-economic transformation in Ukraine.

In particular, modern Ukrainian scholars focus their attention on the issues of forming the competitiveness of modern specialists in the context of educational diversification (Bazyl, Klymenko, & Orlov, 2019; Spitsyna, 2020) and the development of entrepreneurial competence skills (Seredina, 2021; Seredina, 2022; Klymenko et al., 2021).

From various scientific perspectives, the problem and its various aspects have been reflected in numerous research studies (Skakovska & Kotyk, 2020; Dembitskaya, Kobylansky, & Pugach, 2021; Kopniak, 2020). Specifically, contemporary research illuminates the structural elements of entrepreneurial competence among vocational education students (Chermenko, 2021; Dzwigol et al., 2020; Orlov, 2010). The scholars analyze the process of forming professional qualities of future managers (Sinambela et al., 2020). They also study specific types of entrepreneurial competence (Cebrián, Junyent, Mulà, 2020; Spitsyna, 2006) and socio-cultural competence (Reis, Fleury, Carvalho, 2021; Bazyl, Fursa, Oruzha, 2021). Modern researchers explore the culture of professional communication and communicative competence of future specialists in

finance and economics (Bratianu, Hadad, & Bejinaru, 2020).

At the same time, some scholars have generalized the issues of forming the structure of entrepreneurial competence among vocational education students during periods of societal transformation and crises (Eizaguirre, García-Feijoo, & Laka, 2019). Also, in some recent studies, the paradigm of investigated phenomena in the context of students' personal maturity and engagement of interdisciplinary integration functionality is seen as a priority for the development of the vocational educational process (Baird & Parayitam, 2019).

Consequently, most contemporary scholars interpret the formation of entrepreneurial competence as the value basis for the professional activity of a future specialist. At the same time, the issues of functional aspects of the structural components of forming entrepreneurial competence of students, as well as the analysis of opportunities to improve the structural and functional model of this process using innovative technologies, are mostly ignored by modern scientists or are understudied. This actualizes the need for an expanded study of the research subject.

Materials and methods

The article is an analytical study conducted by the principles of comprehensiveness and systematicity of scientific research. This approach made it possible to analyze the research object as a whole system with multiple interrelationships and interdependencies.

The research was conducted using the following methodology. In the first stage, a critical analysis of theoretical concepts was carried out. Several scientific works and publications related to the studied discourse were elaborated, and the main principles of theoretical definitions were systematized and outlined. Based on critical analysis, it was possible to analyze the support of thesis arguments by modern scientists regarding opinions on one or another issue.

The methods of analysis and synthesis were used to identify the main factors in forming a set of structural components of future specialists' entrepreneurial competence. The inductive method was used to formulate prognostic directions for the development of the studied process. The deductive method was employed to identify the direction of forming an innovative educational concept in vocational education.

The next stage of the research methodology provided for the identification of the features of innovative technologies for the development of entrepreneurial competence of vocational education students in the period of transformation and crisis.

The method of abstraction was used to highlight theoretical generalizations, identify the main categories and concepts, as well as to formulate conclusions about the priority vectors of development on the formation of entrepreneurial competence. The comparison method was applied to identify the specific features of the modern innovative paradigm in the sector of entrepreneurial competence development among vocational education students using modern educational technologies, compared to traditional approaches to training.

During the final stage of the research, the main aspects of the use of innovative technologies for the development of entrepreneurial competence of vocational education students were revealed, their influence during the period of transformation and crises was revealed; further research prospects are determined.

Special attention is paid to the functioning of innovative technologies for the development of entrepreneurial competence in modern educational institutions of professional education. In conclusion, based on the proposed research methodology, it is possible to present the results obtained as a result of the conducted analysis.

Results

The problem of forming developed entrepreneurial competence among future specialists is a top priority in the context of active transformation of the socio-economic environment and the priority of development intensification. The modern dynamics of social processes predetermine innovative

requirements for vocational education students, their communication and functional interaction with society, their awareness of rights and responsibilities, the ability to make correct decisions independently, and the most effective exercise of their abilities.

More generally, entrepreneurial competence ensures a form of specialist activity where their professional activity is carried out at a sufficiently high level. Such activity is marked by tangible economic results of work and the realization of personal potential. At the same time, it should be noted that the entrepreneurial inclinations of specialists are determined by the ratio of their professional skills as well as professional and psychological qualities. Entrepreneurial competence implies the existence of a psychological condition of specialists, allowing them to act independently, possessing the ability and skill to perform certain labor functions and be responsible for their consequences. Thus, it can be argued that the main essence of entrepreneurial competence is an integral psychological quality of a personality. It is manifested in the effective implementation of new ideas, motivated by the ability to creatively search, which allows for solving several problematic situations in social and professional activities.

The basis for the formation of entrepreneurial competence of a vocational education student requires a combination of traditional teaching principles. These principles include a scientific approach, awareness and purposefulness of the learning process, proactivity, thoroughness and independence in learning, adherence to the principle of linking learning with practical activities and realities of life, and innovative ones. The latter principle includes intensification of the learning process, the use of interactive learning and creative development opportunities, and innovative visualization (Figure 1).

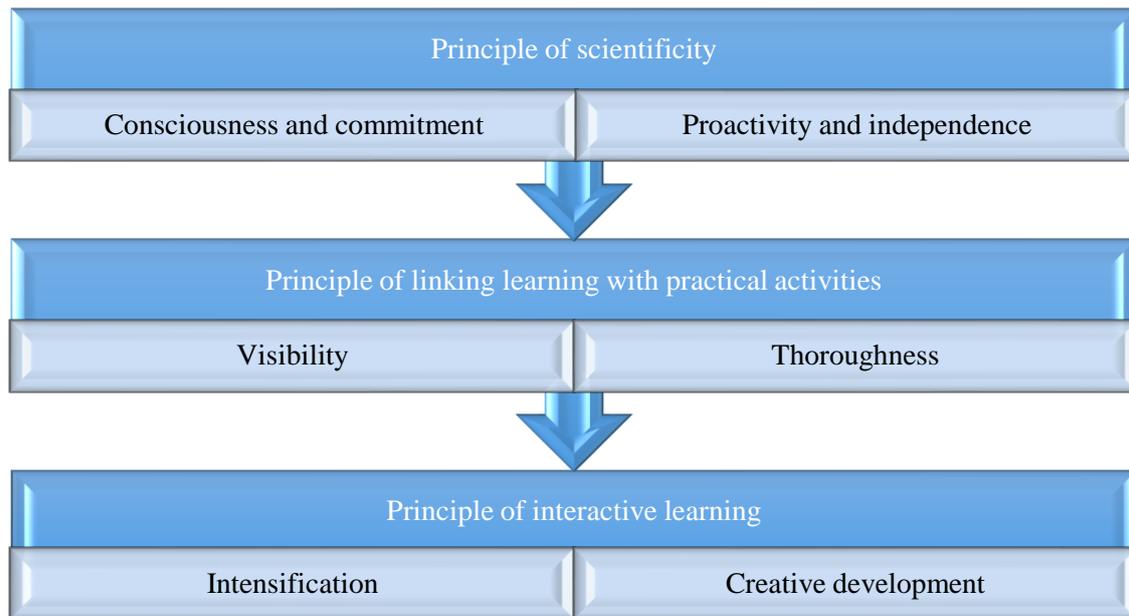


Figure 1. Innovative principles for the development of entrepreneurial competence of vocational education students.

Based on Figure 1, it is worth noting that the principle of scientificity requires compliance of educational discipline content in the professional training curriculum with modern scientific achievements. Vocational education applicants should receive detailed and systematized latest scientific achievements that introduce them to the conceptual foundations of entrepreneurship, the categorical and conceptual apparatus of entrepreneurial activity, and the laws of the market economy. They should also understand their cause-and-effect relationships concerning the needs of modern society (Chernenko, 2021; Dzwigol et al., 2020).

The principle of consciousness and commitment within the framework of innovative technologies for the development of entrepreneurial competence is characterized by a positive motivation for educational activities and an understanding of the goals and objectives of the entrepreneurial component of professional training. The implementation of this principle should facilitate conscious decision-making on the use of knowledge of entrepreneurship basics in further professional activities. The principle of proactivity and independence contributes to the formation of students' initiative and prevents indifference and rigidity. This principle is realized in the organization of students' independent work.

The principle of linking learning with practical activities and the realities of social processes is based on the approach where theoretical material

offered for study should be fixed in the practical field. The principle of visibility stimulates the intensification of emotional impact on students, as well as the growth in the level of educational material accessibility. Both verbal and object-based visualization are used during the study and analysis of economic phenomena. The principle of thoroughness implements a consistent progression from the acquired knowledge and skills to new ones. It helps to establish effective cause-and-effect relationships between them and systematize the known, as well as to actively use it in practice.

The principle of intensification within the framework of innovative educational technologies implements a personality-oriented approach, effective communication, and collective interaction. It stimulates the motivation of students, the use of educational and cognitive, problem-solving and creative tasks, and the use of modern information and computer technologies. The principle of interactive learning promotes cooperation, collaboration, and dialogue, often through the use of active role-playing and training tools. At the same time, students are involved in creativity for creative interaction. The application of this principle allows us to intensify the learning process and make it more effective. Finally, the principle of creative development allows for the intensification of the effectiveness of entrepreneurial thinking and promotes the adoption of non-standard solutions. It will enable students to realize self-expression during

professional activities (Skakovska & Kotyk, 2020; Dembitskaya, Kobylansky, & Pugach, 2021; Kopniak, 2020).

It should be noted that within the framework of professional training, the level of entrepreneurial competence is significantly influenced by certain structural and functional components. Their mastery, to a large extent, identifies the competitiveness of a modern specialist (Dzwigol et al., 2020; Sinambela et al., 2020).

It is worth noting that entrepreneurial competence is inseparable from the ability to interact, communicate, and organize joint activities. Therefore, it is necessary to develop the relevant skills in future specialists. It is evident that the structure of the entrepreneurial competence notion of vocational education during crises and the instability of social processes is a dynamic phenomenon. It depends on the dynamics of socio-economic development and labor market features (Nikolova, & Cnossen, 2020).

The motivational and value component of innovative technologies for the development of entrepreneurial competence of vocational education students during societal transformation and crises provides adequate prerequisites for the implementation of other structural components. It also determines a positive attitude to the occupation, intensifies the level of awareness of the value of knowledge for personal and professional development, and is seen as an essential characteristic of readiness for professional activity.

In the structure of the entrepreneurial competence of a vocational education student, an important role is assigned to the cognitive component. This component is considered in terms of knowledge of professional terminology, principles, and concepts, accumulation of systematic professional knowledge, and interdisciplinary connections. In turn, it forms the theoretical and methodological basis for the effective professional activity of a future specialist. Cognitive intelligence is defined as the ability to set goals, teach, plan, and analyze the course of personal thinking (Hernandez-de-Menendez, Morales-Menendez, & Escobar, 2020).

The analysis of existing theoretical approaches within the framework of innovative technologies for the development of entrepreneurial competence of vocational education students during societal transformation and crises allows us to distinguish certain functional groups of

methods and tools depending on the expected effectiveness. They include methodologies based on critical thinking, analytical, factual, and evaluation processes, such as brainstorming, SWOT analysis, etc. Also, the methods based on emotions, imagination (modeling, role-playing), and technologies for forming responsibility and implementing and evaluating decisions are considered effective (Reis, Fleury, & Carvalho, 2021).

The possibilities of educational process digitalization and the involvement of interactive technologies and digitalization tools allow for the intensification of the process of developing entrepreneurial competence of vocational education students. They help to adapt students to the peculiarities of professional expression and effective self-realization in the context of societal transformation and crises.

Discussions

It is necessary to take into account the research findings of scientists on key competencies in order to achieve the effectiveness of studying the potential of innovative technologies for the development of entrepreneurial competence of vocational education students during societal transformation and crises. It should be noted that the multifactorial process of developing the structure of entrepreneurial competence has led to differences in approaches to the classification of its structure.

In particular, one of the leading approaches to optimizing the process of forming entrepreneurial competence includes the concept of its identification as a systemic phenomenon. It combines professionally essential personal qualities that stimulate the proper implementation of professional functionality (Gorski et al., 2023). Some scientists consider entrepreneurial competence to be a hub of personal and professional characteristics in a creative way. Its basic components include the professional-content, professional-action, and professional-personal functionalities (Hernandez-de-Menendez, Morales-Menendez, & Escobar, 2020). Instead, representatives of another scientific school emphasize communication and integration competence in the structure of entrepreneurial competence (Abad-Segura & González-Zamar, 2021).

Some modern scholars identify among the main prerequisites for the formation and effective development of entrepreneurial competence those that characterize a person as a subject of

professional activity and reflect interaction with other people. According to scholars, these competencies are characterized by motivational and semantic relations, regulatory components, cognitive components, and experience (Silveyra, Herrero, & Pérez, 2021).

Among the modern approaches to the structure of entrepreneurial competence of vocational education applicants, there is also a component approach that identifies motivational and volitional, functional, communicative, and reflective components (Lv et al., 2021). They are integrated into one synthesized formation – the communicative and functional component of entrepreneurial competence, which is an integrative quality of the personality of a future specialist.

The research findings and the analysis of scientific approaches convincingly show that the structure of a student's entrepreneurial competence should be positioned as one of the priority formative factors in the professional competence of economists. The proposed approach to the development of entrepreneurial competence of future specialists based on the involvement of innovative technologies guarantees an appropriate prognostic level of their competitiveness and professional self-realization.

Conclusions

According to the study, the authors have identified the peculiarities of developing the entrepreneurial competence of vocational education students during societal transformation and crises. During the study, the authors have formed the conviction that the priority directions of vocational education development towards the development of entrepreneurial competence of future specialists include the integration of communication, intercultural as well as informational and digital competence, taking into account the trend of integration of the educational space into the European community. The proposed concept reflects the basic principles of modern innovative technologies for the development of entrepreneurial competence under challenging conditions of uncertainty, crisis, socio-economic phenomena, and social transformation.

It was found that the entrepreneurial competence of vocational education students is currently seen as an essential feature of a specialist's activity and its main integrative quality. This is the result

of the synthesis of professional competencies and personal, professionally crucial qualities.

The obtained results of the study allowed the authors to develop a basic algorithm for the formation of the structure of entrepreneurial competence of future specialists. The proposed synergistic approach represents a system of innovative methodological approaches to professional training. The research proves that the development of entrepreneurial competence allows the implementation of the concept of optimal synchronization of resources and the effective implementation of innovative solutions. It is evident that the factor of entrepreneurial competence is closely related to personal qualities, in particular, leadership skills, conflict resistance, and the ability to make decisions under conditions of uncertainty.

Given the trend of globalization of economic processes and the intensification of social crises, a promising direction for future research on this topic is seen in advanced research on the possibilities of digitalized optimization of the professional education process in terms of developing entrepreneurial competence.

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How to Cite:

Baimuratov, M., Kofman, B., Bobrovnik, D., & Yefremova, N. (2024). Research on the impact of international agreements and standards on national legal systems and legal order. *Amazonia Investiga*, 13(74), 90-102. <https://doi.org/10.34069/AI/2024.74.02.8>

Research on the impact of international agreements and standards on national legal systems and legal order

Дослідження впливу міжнародних договорів та стандартів на національні правові системи та правопорядок

Received: December 21, 2023

Accepted: January 28, 2024

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Abstract

In the contemporary world, where globalization is intensifying, the significance of international agreements and their impact on national legal systems is increasing. International agreements serve not only as the foundation for regulating interstate relations but also as a crucial tool for unifying legal norms, promoting the protection of human rights, sustainable development, economic cooperation, and environmental protection. The analysis of theoretical aspects demonstrates that international agreements are a crucial element of the global legal system, providing a basis for international cooperation. Studying the practical application of international agreements in national legal systems has revealed various mechanisms for implementing and adapting international norms to domestic legislation. Discussions on the challenges of compatibility, sovereignty, the effectiveness of international agreements, and the adaptation of international norms to the national context have highlighted the need to balance the requirements of international law

Анотація

У сучасному світі, де глобалізація посилюється, значення міжнародних договорів та їх вплив на національні правові системи зростає. Міжнародні угоди служать не лише основою регулювання міждержавних відносин, але й важливим інструментом уніфікації правових норм, сприяння захисту прав людини, сталому розвитку, економічному співробітництву та охороні навколишнього середовища. Аналіз теоретичних аспектів свідчить про те, що міжнародні договори є найважливішим елементом глобальної правової системи, що є основою для міжнародного співробітництва. Вивчення практичного застосування міжнародних договорів у національних правових системах виявило різноманітні механізми імплементації та адаптації міжнародних норм до внутрішнього законодавства. Дискусії щодо проблем сумісності, суверенітету, ефективності міжнародних угод та адаптації міжнародних норм до національного контексту підкреслили необхідність балансу між

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with national peculiarities. The study's conclusions emphasize the importance of integrating global norms from international agreements into national legal systems. Further research should focus on developing flexible mechanisms for implementing international agreements that consider the specificities and needs of different states. Additionally, it is important to analyze the impact of technological development on international law.

Keywords: international treaties, national legal systems, globalization, international law, legal integration, sovereignty, effectiveness of international treaties, adaptation of legal norms.

Introduction

In the era of globalization, the diminishing relevance of interstate borders for the flow of capital, dissemination of information, and mobility of human resources underscores the growing influence of international norms and standards on the sovereign legal systems of states. This phenomenon is largely attributed to the proliferation of international treaties aimed at the harmonization of legal norms, the safeguarding of human rights, and the fortification of international security (Hoffman et al., 2022; Henckaerts, 1998). Despite the cornerstone principle of national sovereignty within the contemporary legal order, the process of integration profoundly permeates every facet of state existence, affecting economic, social, political, and legal frameworks alike (Hoffman & Røttingen, 2015; Simmons & Hopkins, 2005).

The present study embarks on an analytical journey to discern the influence exerted by international treaties and standards upon national legal systems and their enforcement mechanisms. Central to this inquiry is the exploration of the dynamic interplay between international and domestic laws, with the overarching aim of fostering legal predictability and advocating for the establishment of universal standards governing justice, human rights, and democratic principles (Heyns & Viljoen, 2021; Goodman & Jinks, 2003). Achieving such objectives necessitates a meticulous examination of the processes involved in the assimilation of international norms into national legislatures, either through the direct incorporation of these norms or via the modification of pre-existing legal principles to align with international mandates (Dolzer, 2004; Kameri-Mbote, 2004).

вимогами міжнародного права та національними особливостями. У висновках дослідження підкреслюється важливість інтеграції глобальних норм міжнародних угод у національні правові системи. Подальші дослідження слід зосередити на розробці гнучких механізмів імплементації міжнародних угод, які враховують особливості та потреби різних держав. Крім того, важливо проаналізувати вплив технологічного розвитку на міжнародне право.

Ключові слова: міжнародні договори, національні правові системи, глобалізація, міжнародне право, правова інтеграція, суверенітет, ефективність міжнародних договорів, адаптація правових норм.

This discourse delves into the modalities and repercussions associated with the external imposition of legal frameworks on national jurisdictions, highlighting both the benefits and the impediments encountered in the global standardization of legal norms (Bonnitche, 2017; Brandi, Blümer, & Morin, 2019). Through the lens of specific case studies, the analysis endeavors to elucidate the practicalities and intricacies of integrating international treaties within various national legal systems. Such an approach facilitates the formulation of well-grounded insights concerning the efficacy and obstacles inherent in the global harmonization of legal standards (Montini, 2011; Versteeg, 2015).

The escalating dynamics of globalization have profoundly underscored the significance of international treaties, heralding a new era where the symbiosis between international norms and national legal frameworks has become indispensable. In this ever-integrating world, where the flux of capital, information, and human resources transcends borders, the essence of legal sovereignty is continuously recalibrated through the lens of international law. This intricate interplay not only facilitates a cohesive regulatory milieu for interstate relations but also cements a foundational basis for advancing human rights, economic synergy, environmental stewardship, and sustainable development on a global scale.

As we delve into the intricacies of this study, our exploration is meticulously sectioned to foster a comprehensive understanding of the subject. Initially, we embark on a journey through the historical evolution of international treaties, tracing their genesis and the pivotal role they

play in the tapestry of global governance. This segment illuminates how treaties have evolved from mere instruments of diplomatic accord to become pivotal in shaping the legal and social order of nations.

Subsequently, we navigate the theoretical underpinnings that form the backbone of international treaties. Here, we dissect the dual nature of treaties as both products of sovereignty and instruments for its limitation, revealing the delicate balance between national autonomy and international obligation. Through a nuanced examination, this section unravels the complex mechanics of treaty implementation, highlighting the myriad ways through which international norms are assimilated into domestic legal landscapes.

The core of our inquiry scrutinizes the practical application and impact of international treaties within national legal systems. Through an array of case studies, we unveil the transformative power of treaties, showcasing their instrumental role in harmonizing legal norms across jurisdictions and catalyzing legal reform. This examination is not merely descriptive but analytical, identifying both the synergies created and the tensions engendered by the integration of international standards into national law.

In addressing the rationale for our study, it becomes evident that the relevance of this inquiry is anchored in the pressing need to understand the mechanics of legal globalization. The proliferation of international treaties and the imperative to harmonize legal norms underscore the critical role of legal scholarship in navigating the challenges and opportunities presented by this global legal mosaic. This study, therefore, not only seeks to elucidate the dynamics of treaty law but also to contribute to the discourse on legal integration, offering insights that could guide future legislative and judicial endeavors.

In conclusion, our investigation reaffirms the pivotal role of international treaties in sculpting the contours of national legal systems. By fostering a dialogue between international and domestic law, treaties emerge not merely as instruments of legal governance but as harbingers of a more just, sustainable, and interconnected world. Through this scholarly voyage, we endeavor to shed light on the paths through which the principles of international cooperation and legal harmonization can be furthered, thereby reinforcing the edifice of global legal order for future generations.

Literature review

The title's topic has garnered significant attention from scholars on both sides of the Atlantic. For example, Hoffman and colleagues (Hoffman et al., 2022) critically evaluates the effectiveness of international agreements, arguing that most of them fail to achieve their stated objectives. This analysis provides crucial context for comprehending the challenges that states encounter when integrating international standards into their legal systems. Dolzer (2004) examines the impact of international investment agreements on domestic administrative law. The author argues that these agreements can significantly influence national legislation by promoting investor protection and legal norm harmonization. This work emphasizes the importance of adapting national legal systems to meet international requirements.

Heyns and Viljoen (Heyns & Viljoen, 2021) analyse the influence of international human rights treaties on national law and policy. They demonstrate how states' obligations within the framework of the UN affect domestic law application and human rights policy. This approach highlights the increasing impact of international norms on national legal standards. Simmons and Hopkins (2005) present theoretical considerations on the constraining power of international agreements and offer a methodology for assessing their impact on state behaviour. This work contributes to understanding the mechanisms through which international agreements influence national legal systems, supporting the idea of limiting sovereignty in the interest of the common good.

Hoffman and Röttingen (2015) conducted a quantitative evaluation of the expected impact of global health agreements. Their findings confirm that while some agreements have significant positive effects, overall effectiveness remains insufficient. Therefore, further research and improvement of implementation mechanisms are necessary.

Bonnitcha's (2017) research assesses the impact of investment treaties and summarizes evidence of their influence on participating states. This analysis complements previous studies by providing a more specific understanding of the economic and legal consequences of such treaties. Montini's (2011) research is noteworthy as it examines the influence of international agreements on climate change in southeastern European countries, highlighting the importance of global collaboration in tackling environmental

issues. The study emphasizes the role of international agreements in shaping national policies on environmental protection.

Examining the impact of human rights treaties, Goodman and Jinks (2003) draw attention to how international agreements contribute to strengthening human rights protections at the national level. They provide empirical evidence of states adapting domestic legislation to international standards, which is crucial for understanding the mechanisms through which international treaties influence national law in the context of human rights. Brandi, Blümer, and Morin (2019) investigated the impact of international treaties on domestic environmental legislation. They found that such treaties can prompt the adoption and implementation of more stringent environmental standards, serving as a catalyst for the development of national environmental policies.

In his 1990 work, Salacuse examines the impact of bilateral investment treaties on attracting foreign investment in developing countries. The study highlights the significance of such treaties in terms of investor protection and fostering economic development. Opeskin and Rothwell (Opeskin & Rothwell, 1995) investigate the impact of international treaties on Australian federalism, highlighting the complexities of the relationship between international obligations and the internal distribution of powers. This study helps to understand the challenges faced by federal states in implementing international agreements. Henckaerts (Henckaerts, 1998) provides information on self-executing treaties and their impact on national legal systems. His work serves as a guide for researchers studying the integration of international norms into domestic law, emphasizing the importance of understanding the legal mechanisms of this process.

Weisburd (Weisburd, 1995) analyses the impact of international treaties and other formal international acts on customary law in the field of human rights. The author examines the influence of international agreements on the development and application of customary law, emphasizing their importance for the protection of human rights. Kaminski (2023) discusses the UN investigation into the potential conflicts between investment policies and human rights protection arising from investment treaties. This research highlights the increasing attention paid to the interaction between economic agreements and human rights.

Versteeg (2015) analyses the impact of international human rights treaties on national constitutions, demonstrating how international law can stimulate the formation and strengthening of national constitutional guarantees. The study examines how international norms affect the development of domestic legal standards.

Continuing the analytical review, Atteritano and Deli (2016) provide an overview of the impact of international sanctions on treaties and contracts. The authors explore how coercive diplomacy and sanctions can influence international agreements. This research is crucial for understanding the dynamics of international law and economics, highlighting specific challenges for states and corporations in the context of international relations. Hashmi and colleagues (2022) analysed the impact of international human rights treaties on national legislation and found that such agreements strengthen national legislative frameworks in the field of human rights. This provides empirical evidence of their effectiveness.

Roberg (Roberg, 2006) discusses the significance of international treaties and their ratification. This work sheds light on the processes underlying international agreements and their impact on international cooperation and legislative practices. Moyn (Moyn, 2012) examines the effectiveness of human rights treaties in changing national practices. This analysis provides a more in-depth understanding of the limitations and possibilities in the context of international law and human rights protection.

Kameri-Mbote (2004) investigates the impact of international treaties on land rights and resources, emphasizing their significance in ensuring land and resource rights in Africa. This research highlights the important role of international agreements in shaping policies aimed at protecting and sustainably using natural resources. Zakari et al. (2021) analysed the impact of international environmental treaties on the environment in countries with varying levels of resource endowment. The study found that international obligations can contribute to improving the environmental condition, regardless of a country's economic status.

Son (2023) analyses the impact of international treaties, including the ILO Maternity Protection Conventions, on participating and non-ratifying countries. The research examines their influence on healthcare and social protection policies in 160 countries, highlighting the global impact of

international standards on improving working conditions and social protection. Roberts and Okanya (Roberts & Okanya, 2022) conducted a comparative study on the socio-economic impact of forced evictions and illegal demolitions in displaced and existing informal settlements. Their work highlights the social and economic consequences of international and national policies that affect human rights and living standards in vulnerable communities.

In his work “International Law and Global Governance: Treaty Regimes and Sustainable Development Goals Implementation”, Harrington (2021) highlights the importance of international law and global governance in achieving sustainable development goals. The author demonstrates how international cooperation and treaty mechanisms can contribute to achieving global sustainable development goals by analyzing treaty regimes. The text highlights the importance of legal instruments in addressing global challenges.

Townsend et al. (2021) analyze the role of health in shaping trade policy, specifically examining successes in tobacco control and access to medicines. The authors emphasize the importance of considering health in trade decision-making processes, highlighting global trade agreements like the Trans-Pacific Partnership.

In their 2022 study, Dotti, Spithoven, and Ysebaert investigate the economic impact of international and European institutions on cities. They demonstrate the advantages of being a “multicapital” city and underscore the importance of international and regional cooperation for economic development. The study confirms the significance of geopolitical location and institutional infrastructure.

Anser, Apergis, and Syed (2021) investigated the relationship between economic policy uncertainty and CO2 emissions in highly polluted countries. Their study emphasizes the importance of incorporating environmental concerns into policymaking.

Bernaz (2021) proposes a conceptualization of corporate responsibility in international law, considering models for a business and human rights treaty. This work highlights the significance of developing international legal frameworks to ensure corporate responsibility, thereby contributing to the protection of human rights in the context of globalization.

Slagter and Van Doorn (Slagter & Van Doorn, 2022) provide fundamental perspectives on international law, underscoring its role in shaping the global order and addressing transnational challenges. This work is crucial for understanding the foundations of international law and its impact on global politics.

In their analysis, Tanzi and Arcari (2021) examine the UN Convention on the Law of International Watercourses as a framework for shared use. They emphasize the significance of international water law for sustainable development and cooperation. The research underscores the crucial role of international agreements in managing transboundary water resources.

In their respective works, Reiners (2021) and Mayer (2021) explore the intersection of international law and human rights. Reiners highlights the significance of transnational collaboration among activists and organizations in promoting human rights globally. Meanwhile, Mayer investigates the potential of international legal obligations in addressing climate change as a human rights issue. This text examines the potential of international human rights law as a tool to address climate change.

Comstock (Comstock, 2021) analyses UN human rights treaties and legal pathways to commitment and compliance in his extensive work “Committed to Rights: Volume 1: UN Human Rights Treaties and Legal Paths for Commitment and Compliance”. This book is a valuable resource for understanding mechanisms to ensure compliance with international human rights obligations and the impact of these treaties on national legal systems.

Kolb (Kolb, 2023) in “The Law of Treaties: An Introduction” provides an introduction to treaty law, covering fundamental principles and the practice of applying international treaties. The book serves as a foundational guide for understanding the structure and functioning of international treaty law.

Nikogosian (Nikogosian, 2021) discusses key aspects of a potential pandemic treaty in “A Guide to a Pandemic Treaty”. The research provides important insights to aid decision-making regarding such a treaty and is relevant in the context of seeking international responses to global health crises.

Bicchi and Schade (Bicchi & Schade, 2022) analyse long-term trends and the impact of the

Lisbon Treaty on European diplomacy, exploring changes in EU external relations and policies. The work emphasizes notable alterations in the EU's international role and diplomatic practices.

In their article, Huda, Heriyanto, and Wardhana (2021) emphasize the importance of constitutional review of the law on the ratification of international treaties by the Constitutional Court of Indonesia. This review ensures compliance of international obligations with the national constitution.

Hamm (2022) analyses the challenges of regulating business and human rights, focusing on the development of the UN Guiding Principles and international treaties. The work points to the difficulty of achieving consensus and legitimacy in international regulation.

Chaisse and Dimitropoulos (2023) examine the interaction between domestic investment laws and international economic law in the context of the liberal international order. They analyse the impact of national legislation on international economic relations.

In his work, M. Hosseini (2023) examines the development of global solidarity in healthcare during times of crisis, with a focus on the legal implications of a potential pandemic treaty. The author highlights the significance of international collaboration in addressing global health emergencies.

Teleki (Teleki, 2021) analyses procedural fairness and fair judicial review in EU competition law, pointing to the influence of Article 6 of the European Convention on Human Rights. This research is important for understanding the interaction between EU law and human rights.

De Vries and Spijkerboer (2021) examine the impact of colonialism on the case law of the European Court of Human Rights in relation to the regulation of international migration and the role of race. The study highlights the lasting influence of colonial legacies on the protection of migrant rights and migration regulation.

Ferreira (2021) examines the improper use of tax treaties by participating states, emphasizing the challenges and issues associated with international tax law. This research is relevant for understanding potential abuses of tax treaties and their impact on the international economy.

Sand and McGee (2022) provide an overview of lessons learned from two decades of international environmental agreements, analyzing their legal aspects. This text highlights the significance of global environmental challenges being addressed through international cooperation and agreements.

The purpose of the article is to analyze the impact of international treaties on national legal systems and legislation, with a focus on their role in ensuring the implementation of sustainable development goals, protecting human rights, regulating economic relations, and implementing environmental standards.

Methodology

This research is theoretical and descriptive by nature. Therefore, our methodology integrates systemic, structural-functional approaches, and methods of analysis and synthesis to comprehensively study the impact of international treaties on national legal systems.

International treaties are considered as part of the global legal system, where each treaty interacts with other elements and influences the structure of international legal relations. The structural-functional approach enables the analysis of how international treaties impact national legal systems. It assesses their role in performing functions such as protecting human rights, regulating economic relations, and promoting sustainable development. The approach uses analysis and synthesis to study the content, objectives, and consequences of international treaties in detail. Analysis enables the dissection of each treaty into components to comprehend its structure, mechanisms of influence on national legislation, and relationships with other legal acts. Synthesis is employed to generalize the obtained data, formulate conclusions about the overall impact of international treaties on legal systems, and develop recommendations for optimizing their implementation and enforcement.

The qualitative dimension of our research hinges on an analysis, aimed at dissecting the substance, aims, and outcomes of international treaties impact on national legal orders. This involves outlining the structural components, mechanisms through which international agreements and standards influence national legislations, and its interrelations with other legal instruments. This detailed examination is instrumental in unveiling the multifaceted roles played by international treaties, notably in the realms of human rights

protection, economic regulation, and the promotion of sustainable development.

Simultaneously, the quantitative aspect of our study leverages statistical analysis to evaluate the impact of international treaties on national legal systems quantitatively. Special attention is paid to the selection of data, which is fundamentally based on the findings presented in the research conducted by Hoffman, Baral, Van Katwyk, Sritharan, Hughsam, Randhawa, & Poirier (Hoffman et al., 2022).

In synthesizing the insights garnered from both qualitative and quantitative analyses, this study not only aims to articulate a comprehensive overview of the impacts of international treaties but also endeavors to formulate actionable recommendations to enhance the efficacy of their incorporation into national legal regimes. This integrative methodological design ensures the study's rigor, offering clear, actionable insights that contribute to the scholarly discourse on international law and its intersection with national legal systems in the face of globalization and the evolution of international relations. Through this methodological lens, the study aspires to provide a substantive contribution to the ongoing dialogue on the optimization of treaty implementation and enforcement within national jurisdictions, underscoring the indispensable role of methodological clarity and precision in advancing legal scholarship.

Results and discussions

In the era of globalization, state sovereignty is frequently challenged by invisible but pervasive forces of international law. International treaties are among these forces and act as fundamental agents of change in national legal systems.

The ratification of international treaties by states is not only a formal act of foreign policy, but also a significant step in the process of integrating international norms and standards into domestic law. The ratification of an international treaty by a state triggers two main legal actions. Firstly, it creates an international obligation for the state to adhere to the provisions of the treaty. Secondly, it initiates the process of internal legal implementation, which may require the adaptation of national legislation to international standards. International treaties function as bridges connecting international and national law, facilitating the harmonization of legal systems.

The implementation of international obligations is not a mechanical or automatic process. It requires conscious efforts for national legal and political institutions. It is important to note that the level of implementation of international norms varies depending on the specific legal system of the country, its constitutional principles, and the general attitude towards international law. For instance, some countries automatically incorporate international treaties into their national law, while others require additional legislative acts to implement treaty provisions.

Thus, the ratification of international treaties is crucial in developing and adapting national legal systems to changing conditions in the international community. This process promotes the unification of international standards and stimulates internal legal reforms, opening the way to a more integrated and coordinated global legal order.

International law can have a significant impact on national legal systems through international regimes. These regimes create a complex network of legal and political connections that facilitate the influence of international law on national legal systems. They cover a wide range of issues, from trade and investment to environmental protection and human rights, and establish international standards and principles that states agree to adhere to by entering into corresponding international agreements. International regimes are institutionalized forms of international cooperation that provide a structured approach to regulating transnational issues requiring coordinated action at various levels. International regimes establish rules of conduct for states and encourage the development and implementation of national legislative and administrative mechanisms to achieve these international standards. The influence of international regimes on national legal systems has both direct and indirect aspects. Directly, they have an impact through legal obligations arising from ratified international agreements. Indirectly, states shape international standards of conduct through normative influence, creating expectations for state behaviour. Adapting national law to meet international requirements is not automatic and presents several challenges. This is achieved by harmonizing international standards with domestic legal traditions and norms, and ensuring effective mechanisms for implementing and monitoring compliance with international obligations at the national level. International regimes play a crucial role in the modern system

of international law. They contribute to the formation of a unified global system of legal norms and standards. International regimes act as catalysts for change in national legal systems, stimulating the development and adaptation of legislation to meet international requirements. The role of international regimes in this context is significant, as they provide a platform for dialogue, exchange of experience, and coordination of actions among states in addressing global issues.

The implementation of international standards into national law requires the active participation and interaction of various actors, including governments, parliaments, judicial bodies, civil society, and expert communities. This process also depends on the state's readiness for reforms and changes, its political will, and its ability to adapt domestic legislation to international obligations.

Simultaneously, the presence of multiple international regimes with their own distinct rules and standards can result in conflicts between different sets of obligations that a state has assumed. Resolving such conflicts necessitates flexibility and creativity in finding legal mechanisms to reconcile different international and national norms.

International regimes play a crucial role in shaping the global legal order by promoting the expansion and deepening of international cooperation. They compel states to fulfil international obligations and contribute to the development of national legal systems in accordance with global requirements and challenges. The significance of these processes cannot be overstated as they make a substantial contribution to stabilizing international relations and strengthening the legal foundations of the international community.

International regimes undoubtedly play a critical role in forming a unified system of international law aimed at regulating transnational relations and challenges. International regimes cover a

wide range of areas, including economics, trade, environmental protection, and human rights. They establish a normative framework that requires participating states to make relevant changes to their national legal systems.

By agreeing to adopt and adhere to certain rules and standards, states address global issues and harmonize their national legislation with international norms. Adapting national legislation to international requirements is a crucial step towards creating a unified international legal order.

However, it is important to recognize that this process is not simple. It involves translating international norms into national law, which requires careful consideration and attention to detail. The implementation of international standards into national legislation presents a range of complexities and challenges, such as preserving national sovereignty and potential conflicts between different international obligations. States must demonstrate the ability to compromise, be flexible in the legislative process, and be ready to cooperate and engage in dialogue with other states and international organizations.

In this context, international regimes serve as instruments of international cooperation and as important factors driving changes in national legal systems to align with international standards and requirements. These processes are crucial for creating a more stable and predictable international legal order.

The recent empirical findings by Hoffman (Hoffman et al., 2002) provide valuable information in this regard (Figure 1). The series of graphs presented hereinafter illustrate the impact of international treaties on various domains, accountability mechanisms, institutional effects, and study effects, all of which are essential for understanding the efficacy of international law on national legal systems.

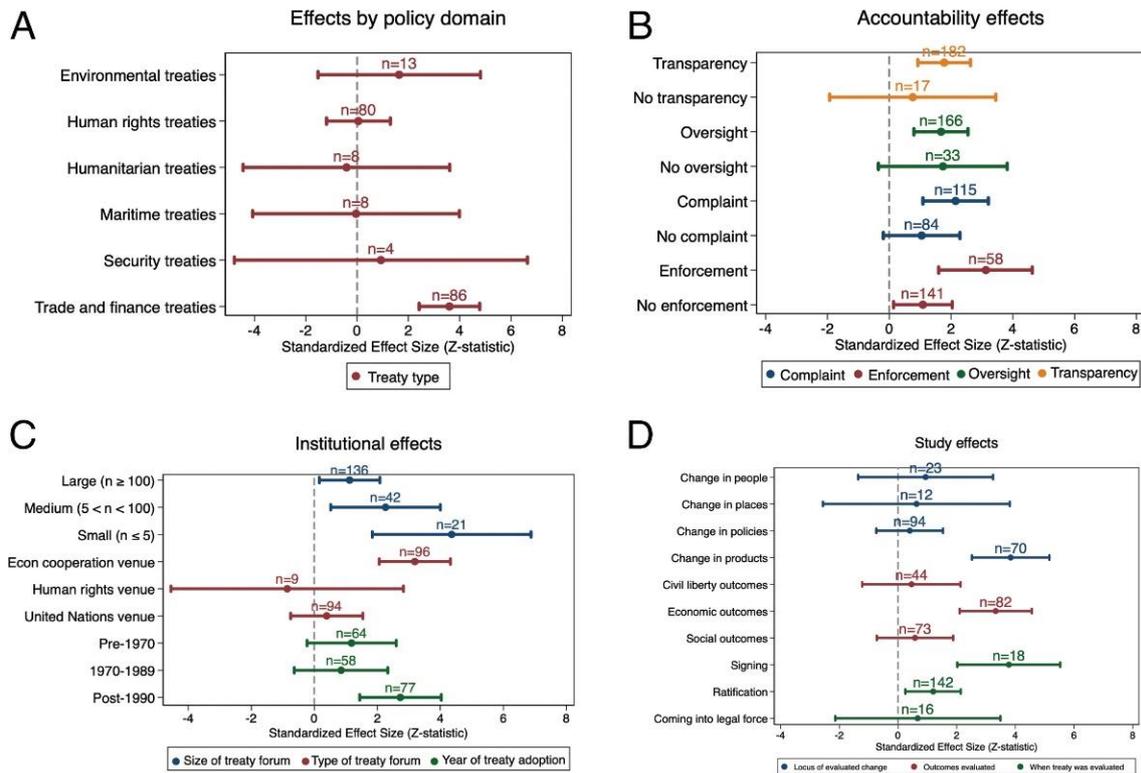


Figure 1. Treaty effects (Hoffman et al., 2022)

Graph A, titled "Effects by policy domain," displays the standardized effect size (Z-statistic) of different types of treaties on their respective policy domains. Notably, trade and finance treaties demonstrate the most significant positive effect, while security treaties exhibit the least. Human rights treaties have a substantial sample size (n=80) but show a wide range of outcomes, suggesting variability in their impact.

Graph B focuses on "Accountability effects" and evaluates the role of transparency, oversight, complaint mechanisms, and enforcement in the effectiveness of treaties. The presence of transparency and oversight mechanisms correlates with positive effects, highlighting their importance in the successful implementation of international treaties. Interestingly, even without enforcement mechanisms, some positive effects are observed, suggesting that other forms of accountability may compensate to some extent.

Graph C, "Institutional effects," breaks down the impact of treaties by the size of the treaty forum, the type of treaty forum, and the year of treaty adoption. Larger forums (n≥100) show a more pronounced positive effect, implying that broader international cooperation may yield more impactful results. Additionally, treaties adopted post-1990 show a positive trend,

reflecting perhaps the evolution of international law's mechanisms over time.

Finally, Graph D, "Study effects," considers the locus of evaluated change and when the treaty was evaluated. Changes in policies and the ratification of treaties are associated with positive effects, emphasizing the importance of formal acceptance and legislative changes at the national level. The impact on economic and social outcomes also indicates the broader implications of treaties beyond immediate legal changes.

In the context of the article on the influence of international law on national legal order, these graphs suggest that the effectiveness of international treaties is multifaceted, dependent on various factors including the type of treaty, the presence and strength of accountability measures, institutional dynamics, and the broader impact evaluated through changes in policies and societal outcomes. The data indicates that while international treaties have the potential to significantly affect national legal systems, the extent and nature of this influence are mediated by a combination of these complex factors.

The intricacies highlighted by these graphs suggest that while international treaties are designed to produce standardized effects across

national borders, their real-world impact is nuanced and variable. The effectiveness of these treaties seems to be enhanced by robust accountability mechanisms, particularly those involving oversight and transparency, which underscores the importance of not only the legal frameworks but also the institutional structures that support their enforcement and monitoring.

The positive correlation between the size of treaty forums and their effects hints at the potential for more substantial impact through collective action and broader international consensus. This collective approach appears to resonate more effectively with national legal systems, possibly due to the perceived legitimacy and support from a larger community of nations. The graph also suggests that more recent treaties, reflecting contemporary global values and concerns, may be more attuned to current legal and social climates, making their adoption and integration into national laws more effective.

Furthermore, the specific locus of evaluated change, such as policy modifications and treaty ratification, suggests that treaties influence not only the codified laws but also the broader legal and regulatory environment. These changes might extend beyond immediate legal frameworks, influencing societal norms, economic practices, and even civil liberties, which are crucial aspects of the national legal order.

In sum, the data underscores the multifaceted relationship between international legal obligations and national laws, shaped by various factors that extend beyond the mere content of treaties. It reinforces the concept that the impact of international treaties is a complex interplay between the quality of the treaty itself, the international and domestic environments at the time of its adoption, and the subsequent efforts made to enforce and uphold the treaty's principles at both the international and national levels.

Jurists and theorists of international law advocate for the unswerving supremacy of international over national law, contending that such a hierarchy ensures unity and coherence in the international order, thereby facilitating the resolution of transnational challenges. This perspective is rooted in the belief that uniform legal standards across borders are essential for effective global governance and are succinctly embodied in the doctrine of "Responsibility to Protect," as conceptualized within the United Nations framework (Hoffman et al., 2022). This principle, while fostering globalization, must be

judiciously balanced against the imperatives of national sovereignty and the distinctive character of domestic legal systems.

On the other hand, there are those who caution against an unqualified primacy of international law, warning that it may erode the sovereign prerogatives of states and the distinctiveness of their legal systems, potentially impeding their capacity to self-regulate on internal issues and to accommodate local nuances. This side of the debate emphasizes the necessity for states to retain autonomy to ensure that international norms, when integrated into the domestic legal milieu, are sensitive to local specificities and do not disrupt the internal legal harmony (Dolzer, 2004; Hoffman et al., 2015).

Debate also centers around the efficacy of international treaties in shaping national and global legal orders. Critics cite the inadequacy of many international treaties, attributing it to the absence of rigorous enforcement mechanisms and penalties for non-compliance, thus diluting their authority and influence (Hoffman et al., 2022). Conversely, proponents of international treaties argue that these agreements are instrumental in crafting global standards and facilitate a consensual approach to international relations, fostering dialogue and cooperation between states (Simmons & Hopkins, 2005).

The significance of international treaties extends beyond their immediate efficacy. These instruments underpin international relations and cooperative endeavors, and their broader impact manifests over time, contributing to the progressive harmonization of legal systems and the alignment of standards (Henckaerts, 1998; Brandi, Blümer, & Morin, 2019). Comparing these findings with previous research underscores the incremental and nuanced nature of international law's influence on national legal frameworks, challenging the dichotomy between global norms and local application (Bonnitcha, 2017).

In summary, the synthesis of this research within the broader academic discourse reveals the intricate nexus between international legal obligations and their national counterparts. This interconnection is critical in understanding the practical implications and significance of treaties, necessitating a nuanced approach to their adoption and implementation (Mayer, 2021). The quest for a "point of balance" continues to necessitate scholarly inquiry and discourse, as the international community strives for legal mechanisms that respect both the global order

and national sovereignty (Comstock, 2021; Kolb, 2023).

Conclusions

The integration of international treaties into national legal systems is crucial for creating a unified legal framework at the international level. This process harmonizes international and national legal norms and contributes to the formation of universally accepted standards in areas such as human rights protection, environmental security, and economic regulation. By providing a platform for jointly addressing global issues, international treaties contribute to stabilizing international relations and supporting sustainable development, while also facing the need for adaptation to the specificity of each national legal system.

The analysis of the impact of international treaties and regimes on national legal systems shows that these mechanisms of international law are crucial in shaping global legal consistency and promoting the standardization of norms across different legal systems. International treaties ratified by states and institutionalized international regimes encourage national legal systems to incorporate international norms into their legislation. This enhances legal certainty and promotes human rights protection, sustainable development, and international security. However, harmonizing national legislations with international standards poses numerous challenges, including preserving national sovereignty, coordinating various international obligations, and adapting national institutional and legal structures.

To effectively implement international obligations at the national level, it is necessary to develop flexible adaptation mechanisms that ensure compliance with international standards while preserving the peculiarities of national legal systems. This requires considering the conclusions drawn from the analysis of the challenges faced.

To facilitate the harmonious integration of international and national norms, it is necessary to strengthen dialogue and cooperation between states, international organizations, and civil society. Institutional and legal innovations should be developed to achieve this goal. Future scientific research in this field should concentrate on examining particular instances of adaptation and implementation, as well as creating methodologies for evaluating the efficacy of

implemented changes in national legal systems in the context of international obligations.

The impact of international treaties on national legal orders is dependent not only on their content and scope of legal obligations but also on the presence of effective mechanisms of control and accountability for their implementation. This applies to both international institutions and national mechanisms for ensuring compliance with international obligations. The development and implementation of such mechanisms is crucial for enhancing the effectiveness of international treaties and their impact on national legal systems. However, it is important to note that overly stringent requirements and sanctions may provoke resistance from states. On the other hand, flexibility and cooperation can foster greater willingness to comply with international obligations.

Adapting international norms to the national context is crucial for their acceptance and effective implementation. This requires considering the cultural, social, and economic peculiarities of each country when implementing international treaties. Such an approach preserves national identity and ensures greater effectiveness of international norms adapted to the realities of each specific state. It is important to strike a balance between the universality of international standards and their adaptation to national conditions.

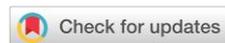
Further research should focus on studying mechanisms for adapting international treaties to national legal systems, while considering the specificities and needs of different states. The development of flexible implementation mechanisms should receive special attention to facilitate the effective implementation of international obligations without undermining national sovereignty. Additionally, it is important to research the impact of technological progress and digitization on international legal relations and the processes of implementing international norms into national legal systems.

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DOI: <https://doi.org/10.34069/AI/2024.74.02.9>

How to Cite:

Guk, O., Mokhonko, G., Darmits, R., Karpil, O., & Mykhailik, N. (2024). Digital transformation: Driving innovation and projects in companies. *Amazonia Investiga*, 13(74), 103-114. <https://doi.org/10.34069/AI/2024.74.02.9>

Digital transformation: Driving innovation and projects in companies

Transformación digital: Impulsando la innovación y los proyectos en las empresas

Received: January 4, 2024

Accepted: February 24, 2024

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Abstract

The main purpose of the article is to present a modern approach to making and implementing management decisions on innovations and projects in an enterprise. The object of the study is the system of innovative activity of a modern enterprise. The scientific task involves modeling the system for making and implementing management decisions on innovations and projects at the enterprise. The research methodology involves the use of the modern IDEF0 functional modeling method. As a result, two IDEF0 models were built. The innovativeness of the results lies in the proposed approach to modeling the adoption and implementation of management decisions on innovations and projects at the enterprise. The peculiarity of the article is that two IDEF0 models were presented at once, one for making management decisions, and the other for their implementation. The study is limited by considering only enterprise innovation.

Resumen

El objetivo principal del artículo es presentar un enfoque moderno para la toma e implementación de decisiones de gestión sobre innovaciones y proyectos en una empresa. El objeto del estudio es el sistema de actividad innovadora de una empresa moderna. La tarea científica consiste en modelar el sistema para la toma e implementación de decisiones de gestión sobre innovaciones y proyectos en la empresa. La metodología de investigación implica el uso del moderno método de modelado funcional IDEF0. Como resultado, se construyeron dos modelos IDEF0. El carácter innovador de los resultados radica en el enfoque propuesto para modelar la adopción e implementación de decisiones de gestión sobre innovaciones y proyectos en la empresa. La peculiaridad del artículo es que se presentaron dos modelos IDEF0 a la vez, uno para la toma de decisiones de gestión y el otro para su implementación. El estudio se limita a considerar únicamente la innovación empresarial. Las

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Prospects for further research are aimed at taking into account the innovative security of the enterprise.

Keywords: marketing, business planning, project management, innovation, management, enterprise.

Introduction

Currently, innovation is the basic element of the development of modern companies. It is innovation that has become the basis for increasing the level of their competitiveness and long-term success in the modern market environment. In the context of doing business, innovation has long ceased to concern exclusively the issue of product production. Modern innovations may concern new production processes, business models, and methods of attracting new customers. Overall, this acts as a multi-faceted concept that can cause a company's success and inclusion in the market.

The importance of innovation stems from the ability to create significant value. Thus, the constant search and adaptation of innovations allows the company to remain relevant in a market environment characterized by dynamism. This adaptation allows the enterprise to quickly adjust its activities to changes in the external and internal environment. The search and implementation of innovations also allow the company not only to maintain and develop its own positions in established markets, but also provide resources and opportunities to enter new ones.

The management system plays a key role in developing a culture of innovation. Thus, an effective and optimized management system in a company is a factor in creating an internal environment where the search for new ideas and solutions, as well as the use of creative thinking, is encouraged and rewarded. The implementation of such a management vector involves not only the allocation of the necessary resources for innovation, but also the constant encouragement of creative approaches to solving problems. At the same time, the management system must be open to changes and adjustments, adapting to external and internal changes. Thus, any effective management system includes structured innovation management processes. The structure of these processes includes measures to identify innovations, assess their potential benefits and costs of implementation. In addition, risk management measures are an important element of modern management systems, since not all

perspectivas de futuras investigaciones tienen como objetivo tener en cuenta la seguridad innovadora de la empresa.

Palabras clave: marketing, planificación empresarial, gestión de proyectos, innovación, gestión, empresa.

innovative ideas can lead to success or have exclusively positive consequences.

In the context of the formation and implementation of new projects, innovation acts as a catalyst for development and growth. It is the generation of innovative ideas that subsequently leads to the formation of new projects, through which the company will be able to open new markets and gain more profit. The generation of new projects based on innovation can open up ways for a company to more optimized interaction with customers, reduce production costs, logistics and optimize other areas of its activities. The implementation of innovations in projects can lead to the formation of a culture of continuous education within the enterprise and the improvement of human resources. Company employees who actively participate in the development of projects based on innovative ideas develop new skills and competencies, thereby further increasing the company's innovative potential. Creating such an environment within the company will lead to increased adaptability of the company and distinguish it from others in the market.

A striking and successful example of implementing projects based on innovation is the implementation of automated inventory management systems, which are used by many successful enterprises. Such systems have already proven their effectiveness due to the fact that they can significantly reduce the time for processing orders. In addition, such systems have significantly reduced the error rate due to the elimination of the human factor from a large number of processes. Another example is the active use of artificial intelligence technologies in personalizing offers to customers, which increases the level of service and, accordingly, customer satisfaction.

But while considering the success of such projects, we must not forget that the implementation of each of them was accompanied by a complex management and control system. Thus, the innovation management system is a key element of their

implementation, especially in the field of innovation in new projects.

Thus, the main goal of the article is to form a new approach to making and implementing management decisions in the context of innovations and company projects. The object of the study is the system of innovative activity of a modern enterprise. In the process of conducting the research, a modern methodological approach will be formed, which will increase the efficiency and adaptability of the company's activities in the market.

The structure of the article includes a number of sections: a literature review highlighting key scientific vectors for the development of this topic and gaps in existing research; section on methodology, results and discussion, and conclusions.

Literature review

The importance of this literature review for the current study is that it not only highlights key aspects of innovation development and project management in the context of digital transformation, but highlights the relevance of the topic to modern business practices. Due to the identified gaps and trends, this review provides a foundation for our research to explore specific strategies and mechanisms that can be used by enterprises to enhance their innovation capabilities and project management in a dynamic digital environment. This allows our research to make an important contribution to the theory and practice of innovation management, providing companies with recommendations based on the latest scientific developments and empirical evidence.

This review delves into various studies that shed light on the evolving nature of innovation and project management in the era of digital transformation.

Abdi et al. (2018) and Al-Hajj and Zraunig (2018) highlight the relationship between project management, organizational culture, and organizational learning with innovativeness in successful project completion. At the same time, the authors note the importance of internal resources and culture for promoting innovation. This perspective reflects the need for an integrated approach to modeling management decisions in the field of innovation, as proposed in the article using the IDEF0 method.

Carvalho et al. (2013) examine the determinants of innovation in small open economies, offering a multidimensional view of innovation processes. This indicates the importance of the external environment and its influence on the innovative activity of enterprises, which is consistent with the emphasis of our study on modeling a system of management decisions in a dynamic external environment. Frolova et al. (2021) provide a model for assessing opportunities to enhance enterprise innovation activity. Their work aligns closely with the theme of innovation management, offering a structured approach to identifying and leveraging opportunities for innovation within enterprises, an aspect critical in the digital age. Wendra et al. (2019) explore the relationship between dynamic capabilities, intellectual capital, and innovation performance, emphasizing the role of internal resources and capabilities in driving innovation. Popelo et al. (2023) discuss the influence of digitalization on the innovative strategies of industrial enterprises. Their findings highlight how digital technologies reshape strategic approaches to innovation, echoing the primary focus of the current article on digitalization's impact on innovation management.

Carvalho et al. (2013) examine the determinants of innovation in small open economies, offering a multidimensional view of innovation processes. This indicates the importance of the external environment and its influence on the innovative activity of enterprises, which is consistent with the emphasis of our study on modeling a system of management decisions in a dynamic external environment.

Sylkin et al. (2021) and Nosan (2022) study economic and financial security issues in the context of a dynamic external environment and a post-pandemic space, respectively. Their work points to the need to strengthen the economic security of enterprises as a key aspect of innovation and project management.

Need to say that, Yuryk et al. (2021) delve into the intricate balance between the right to medical secrecy and the employer's right to access employee health information within the digitalized workspace. Their study highlights the critical need for businesses to navigate privacy concerns and legal frameworks effectively to foster a secure and trustful environment, which is essential for innovative and agile project management. Petroye et al. (2020) examine the impact of information security and innovations on a country's image from a governance perspective. Their findings underscore the

importance of digital security measures in enhancing a nation's reputation, which in turn can attract innovative projects and investments. This study suggests that digitalization, when aligned with robust security protocols, can significantly influence the perception and success of business activities on a global scale. In other hand, Kopytko et al. (2023) present a sustainable socio-economic system model that leverages agile management technologies to foster innovations. Their research advocates for the adoption of agile methodologies in the development and management of projects, emphasizing the role of digital tools in enhancing flexibility, responsiveness, and sustainability in the innovation process. This approach is critical in today's fast-paced and ever-evolving business landscape. Clauss et al. (2019) explore the relationship between strategic agility, business model innovation, and firm performance. This study highlights the necessity for enterprises to embrace digital transformation to remain competitive and innovative in the modern economy. Okoń-Horodyńska et al. (2020) introduce a new approach to creating more effective teams in the innovation process within enterprises. They argue for the strategic

integration of digital tools and platforms to facilitate collaboration, knowledge sharing, and creativity among team members.

Ilyash et al. (2018) and Mamatova (2018) examine the role of innovation in industrial revenue generation and the development of innovative activities in international contexts. These studies provide a broader perspective on the economic implications of innovation, relevant to understanding the financial aspects of managing innovations at enterprises. Domljan and Domljan (2021) discuss enterprise-based support for innovative activities, offering a viewpoint on how businesses can internally foster and support innovation. This perspective is vital for understanding the internal mechanisms necessary for nurturing innovation in a digital context. Alazzam et al. (2023)'s work on developing an information model for E-Commerce platforms highlights the significance of adapting to digitalization in modern socio-economic systems. This research is particularly pertinent to the current study as it reflects on the practical aspects of digital transformation in commerce. Lets see main gaps in literature (Fig.1).

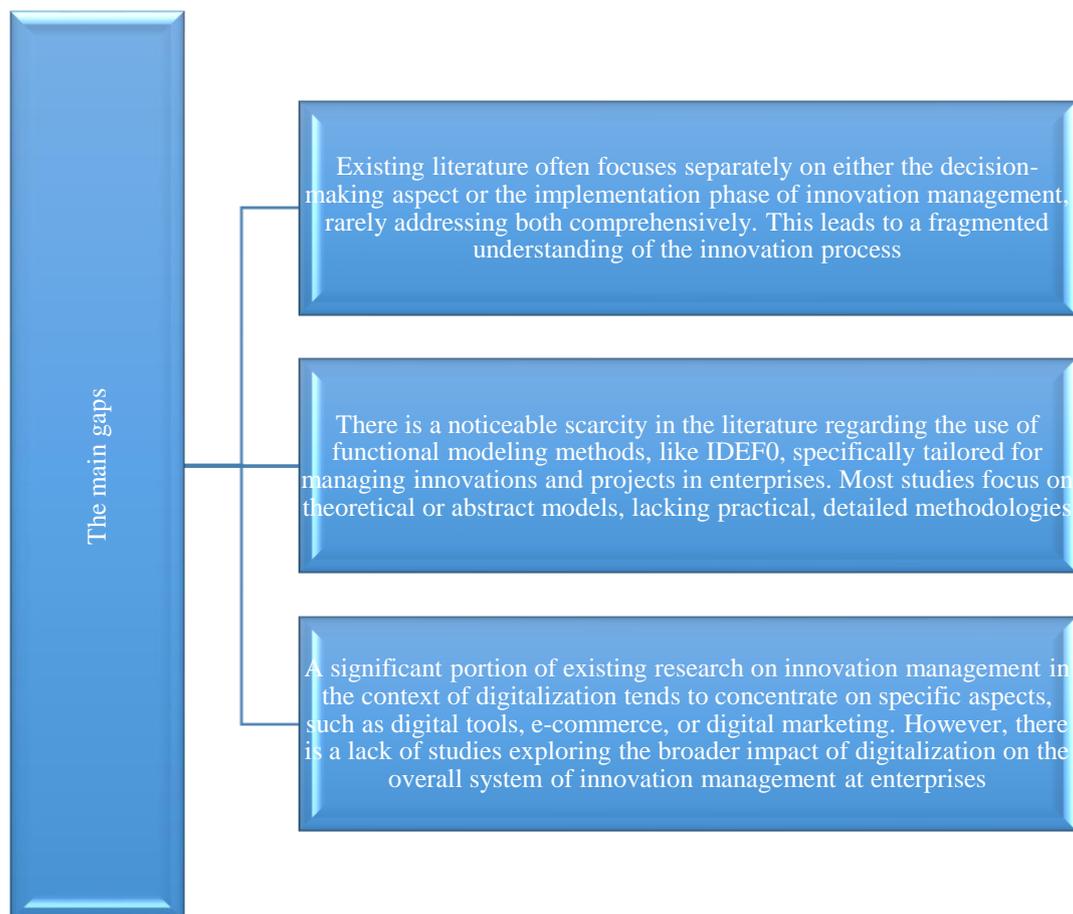


Figure 1. T The main crucial to identify key gaps in the existing literature (formed by authors)

Reviewing existing research, it becomes clear that there is a need for a deeper understanding of the relationships between digital transformation and innovation processes in companies. Despite the significant literature on this topic, there are gaps in the study of specific digital innovation management strategies and their impact on organizational performance. This review highlights the need for more research to help understand how companies can effectively integrate emerging technologies to drive innovation and project management.

The reviewed literature collectively emphasizes the multifaceted nature of innovation and project management in the digital era. It highlights the need for a structured approach to innovation, the importance of internal capabilities and resources, and the transformative impact of digital technologies on business strategies and operations. This comprehensive review sets the stage for a deeper exploration of how enterprises can effectively manage innovations and projects in an increasingly digital business environment.

Methodology

The IDEF (Integrated Definition Methods) suite of modeling methods was developed in the late 1970s and early 1980s, primarily for manufacturing and systems engineering. It originated as part of the U.S. Air Force's Integrated Computer-Aided Manufacturing (ICAM) project. The primary goal of IDEF was to promote effective communication between various stakeholders, including engineers, designers, and managers, and to provide a standardized approach to analyzing and documenting functional processes.

IDEF comprises several modeling techniques, each serving a specific purpose. Among them,

IDEF0, a method designed for modeling the decisions, actions, and activities of an organization or system, is particularly relevant to this study. The IDEF0 method is grounded in the principles of functional modeling, aiming to capture the functions of a system or process, their relationships, and the data flow among them.

The IDEF0 model utilizes a series of diagrams and symbols to represent the functions and sub-functions of a system. At its core, each diagram in IDEF0 consists of boxes and arrows. The boxes, also known as activity blocks, depict the functions or processes. These are linked by arrows that illustrate the inputs, outputs, controls, and mechanisms of each function. Inputs represent the data or resources necessary for a function, outputs are the results of the function, controls guide the operation of the function, and mechanisms are the means by which the function is performed.

The methodological approach used in the study is mixed, combining both quantitative and qualitative methods of analysis. This allows for a deeper understanding of innovation and project management processes while providing the ability to test theoretical concepts through statistical data analysis.

In this study, the IDEF0 method was employed to construct two distinct models for managing innovations and projects at enterprises. The first model focuses on the decision-making process involved in selecting and prioritizing innovations and projects. It delineates the various inputs, controls, and mechanisms influencing decision-making and the resulting outputs.

Figure 2 shows a schematic diagramming framework for the models used in this study.

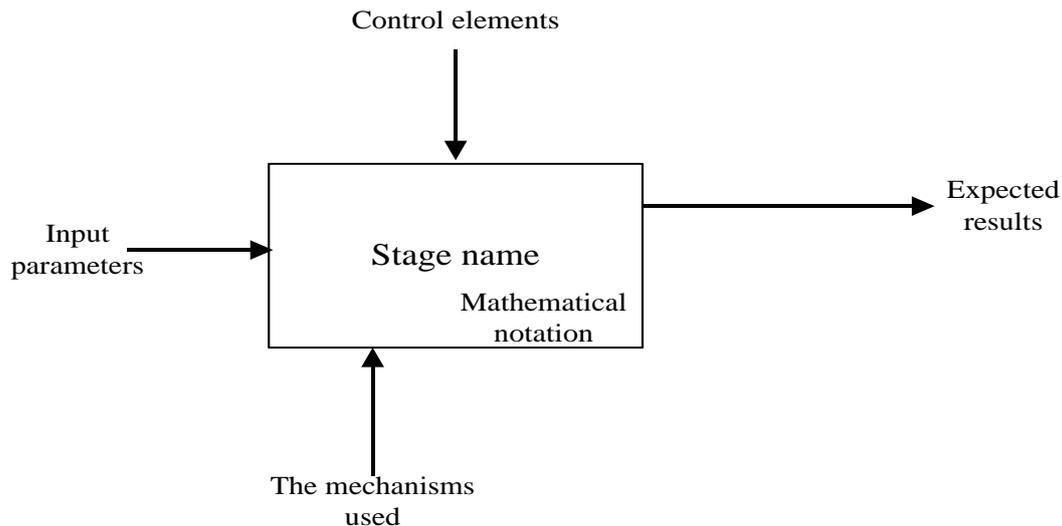


Figure 2. A schematic diagramming framework for the models used in this study (formed by authors)

The second IDEF0 model developed in this research addresses the implementation phase. This model captures the sequential activities and processes required to execute the selected innovations and projects, detailing the necessary inputs, the controls governing the implementation, and the mechanisms facilitating it.

By utilizing IDEF0, the study achieves a clear, systematic, and replicable framework for understanding and improving the management of innovations and projects in the digital era. This methodology is particularly suited for the study's objectives due to its structured approach, ease of interpretation, and ability to capture complex processes comprehensively. It facilitates the visualization of the decision-making and implementation processes in a manner that is both analytically rigorous and practically applicable, thus contributing significantly to the field of innovation and project management.

The source of data for building the models were interviews with experts in the field of project and innovation management, as well as analysis of documentation from leading companies that implement advanced innovative projects. This made it possible to collect diverse information reflecting real business processes and approaches to managing them.

Several measures have been taken to ensure the reliability and validity of the models. First of all, data triangulation was carried out, including comparison and analysis of information obtained from different sources and using different data collection methods. Also, expert assessment of the models was carried out by involving independent experts from relevant industries to check the logic and practical applicability of the developed models. In addition, the use of IDEF0 as a recognized and standardized modeling method provides additional validity, as the methodology is generally accepted in academic and professional circles.

Results and discussion

The IDEF0 method, a functional modeling methodology used for modeling the decisions, actions, and activities of an organization or system, utilizes "tree goals" to ensure a comprehensive and structured approach. When discussing the necessity of these goals in the context of IDEF0, it's important to consider the overall objectives of the methodology. IDEF0 is designed to model the functions (processes) of a system and their relationships to each other. It's a way to create a clear, high-level map of a workflow or process. The use of "tree goals" in this context refers to the hierarchical structuring of these functions and their objectives (Fig.3).

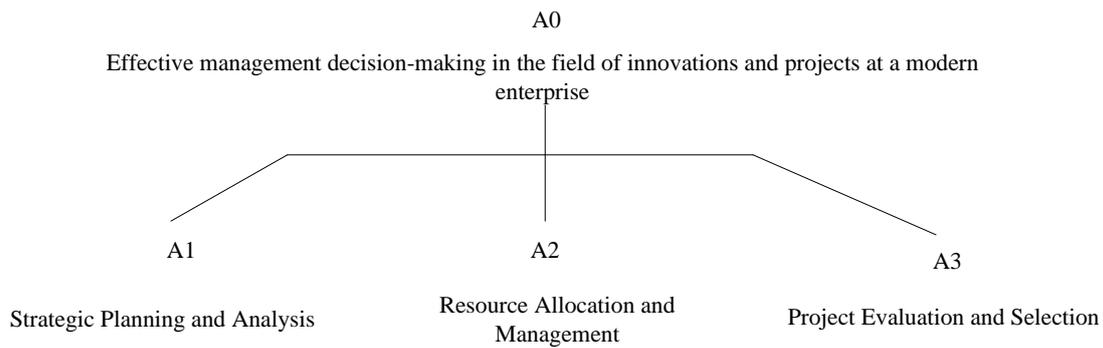


Figure 3. The tree goal for first model (formed by authors)

Each of these sub-functions (A1, A2, A3) plays a vital role in supporting the overall decision-making process in the context of innovations and projects at a modern enterprise. They are

interrelated, where the output of one process often serves as input for another, creating a cohesive framework for effective management and decision-making (Fig.4).

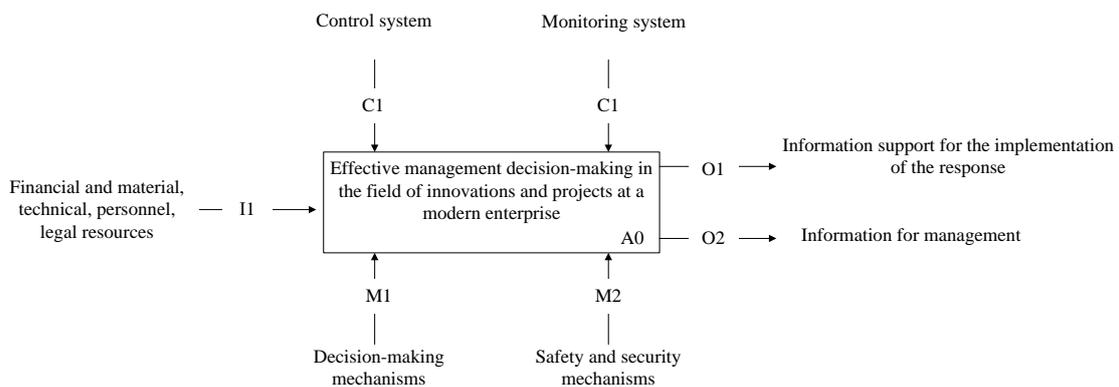


Figure 4. Black box for first model (formed by authors)

A1. Strategic Planning and Analysis. This process involves the identification of strategic goals related to innovations and projects, assessing market trends, and performing SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis. It is crucial for aligning the decision-making process with the enterprise's long-term objectives and external environment.

A2. Resource Allocation and Management. This function focuses on the effective allocation and management of resources (financial, human, technical) for innovation and project initiatives.

It ensures that the necessary resources are available and optimally utilized to support the chosen strategies and projects.

A3. Project Evaluation and Selection. This process involves evaluating various project proposals and innovation ideas based on predefined criteria, such as feasibility, return on investment (ROI), alignment with strategic goals, and resource availability. It includes the selection of the most promising projects for implementation (Fig.5).

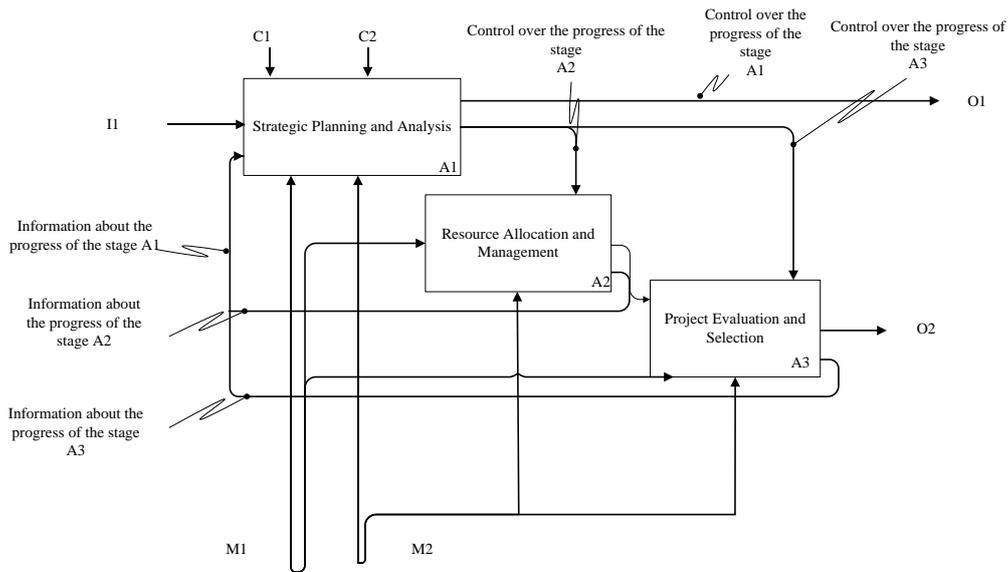


Figure 5. Model IDEF0 for effective management decision-making in the field of innovations and projects at a modern enterprise (formed by authors)

For the IDEF0 model with the top-level function (A0) defined as "Implementation of management decisions in the field of innovations and projects at the enterprise," the following sub-functions (A1, A2, A3) could be key components of this

process. These sub-functions represent the major activities or steps necessary to effectively implement management decisions regarding innovations and projects within an enterprise (Fig.6).

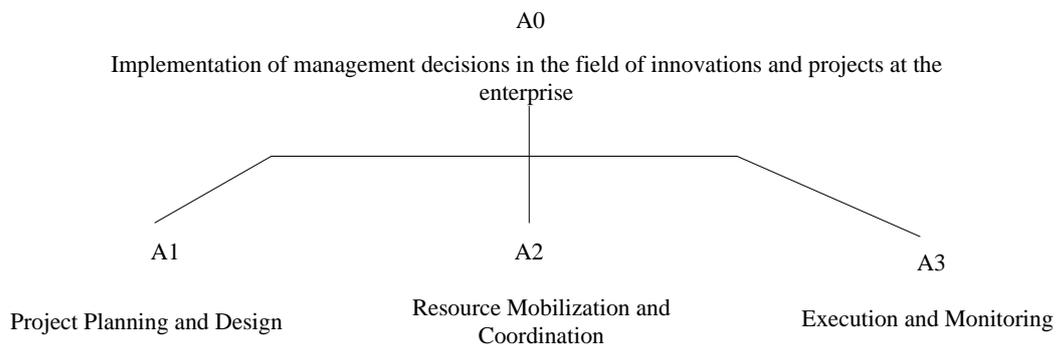


Figure 6. The tree goal for second model (formed by authors)

Each of these sub-functions (A1, A2, A3, A4) plays a crucial role in the effective implementation of management decisions in the area of innovations and projects at an enterprise. They ensure that strategic decisions are not only

executed but also monitored, evaluated, and refined, leading to continuous improvement in project management and innovation processes (Fig.7).

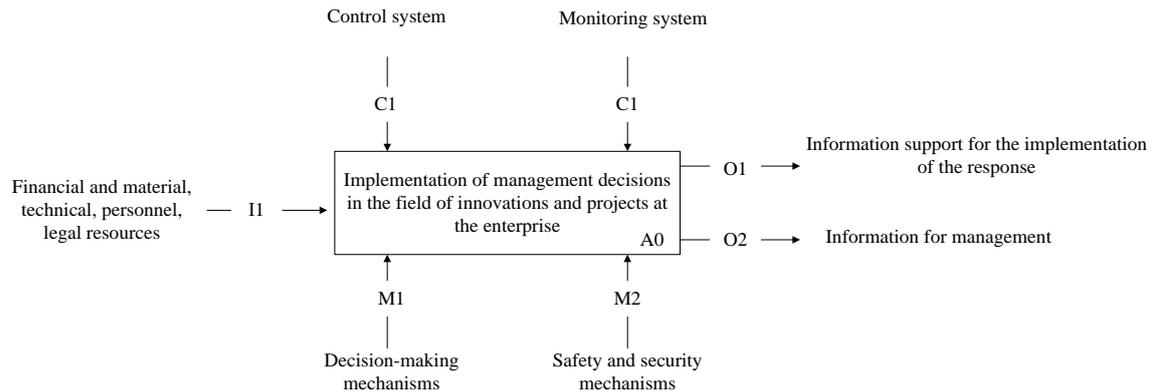


Figure 7. Black box for second model (formed by authors)

Now, lets build second model (Fig.8).

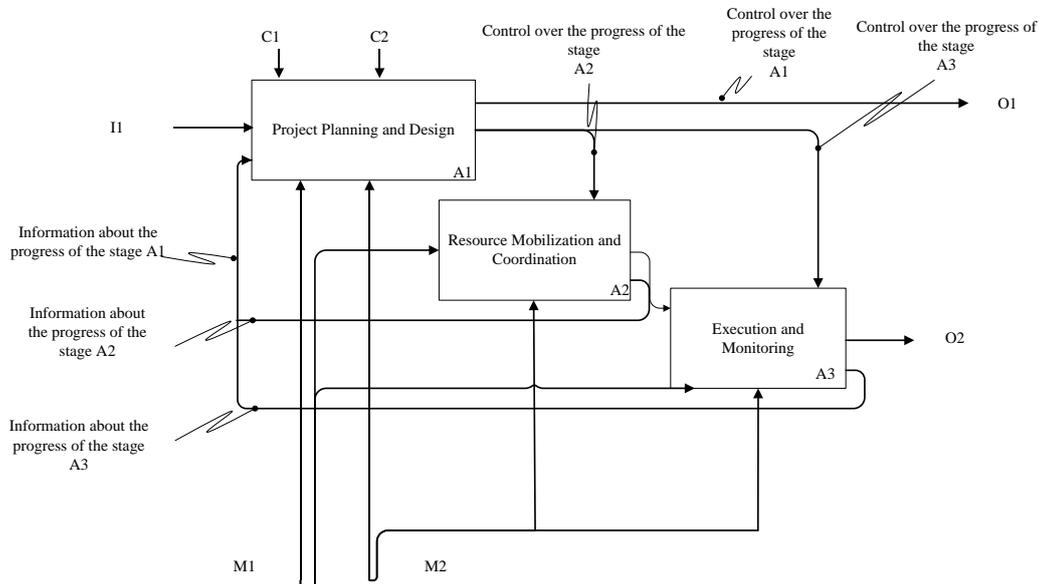


Figure 8. Model IDEF0 for implementation of management decisions in the field of innovations and projects at the enterprise (formed by authors)

A1. Project Planning and Design. This stage involves translating management decisions and strategies into detailed project plans. It encompasses the design of the project's structure, setting timelines, defining deliverables, and planning for the resources required. Effective project planning is essential to ensure that the implementation aligns with the strategic decisions made.

A2. Resource Mobilization and Coordination. This function focuses on mobilizing and coordinating the resources necessary for the execution of projects. It includes acquiring financial resources, technology, and human capital, as well as ensuring these resources are

effectively aligned and utilized throughout the project's lifecycle.

A3. Execution and Monitoring. This critical phase involves the actual execution of project plans and continuous monitoring of project progress. It includes overseeing day-to-day operations, ensuring adherence to the plan, identifying and resolving issues, and making necessary adjustments based on ongoing performance and feedback.

The utilization of the IDEF0 functional modeling method, as highlighted in the study, aligns with the growing emphasis on structured and systematic approaches to innovation

management, especially in the digital era. This is evidenced by the work of Nikonenko et al. (2020), who underscore the importance of methodological rigor in assessing institutional dynamics and economic freedom in the context of regional development and governance improvement, respectively. The application of IDEF0 in the current study extends this notion by providing a practical and replicable model for managing innovation and project decisions at the enterprise level.

The research's focus on innovative activity within enterprises resonates with the discussions by Rushchyshyn et al. (2022), emphasizing the regulatory and practical aspects of economic security in business. The IDEF0 models developed in this study contribute to this discourse by offering a roadmap for enterprises to navigate the complex terrain of innovation amidst regulatory and economic challenges.

Doroshkevych et al. (2021) further illustrate the significance of strategic and anti-crisis management in the context of innovative development and financial security. The findings of this study provide a complementary perspective, showcasing how structured decision-making and implementation processes can be instrumental in steering enterprises through periods of crisis and innovation-driven change.

Borowski's (2020) insights into the role of new technologies and innovative solutions in the development strategies of energy enterprises echo the relevance of the current study's approach to digitalization in business activities. The IDEF0 models serve as a testament to the increasing need for enterprises to adopt innovative and technologically driven strategies for sustainable development. Novykova et al. (2022) and Sylkin et al. (2018) bring attention to the adaptability of management systems in the innovative activity of construction and engineering enterprises, highlighting the dynamic nature of financial security management. The present study extends this understanding by demonstrating how adaptable and robust management systems, as represented by the IDEF0 models, are crucial in managing innovation and projects in the digital age.

In conclusion, the discussion of the study's findings against the backdrop of existing literature emphasizes the critical role of structured and adaptable management systems in driving innovation and project management in enterprises. The proposed IDEF0 models not

only align with current academic discourse but also offer practical insights for enterprises grappling with the challenges and opportunities presented by digitalization. The study underscores the necessity for continuous innovation and adaptability in management practices to stay competitive and resilient in the ever-evolving business landscape.

Conclusions

The study successfully presents a modern approach to the management of innovations and projects within enterprises, emphasizing the importance of effective decision-making in the rapidly evolving digital business landscape. The primary contribution of this article is the development and presentation of two distinct IDEF0 models, which collectively offer a comprehensive framework for both making and implementing management decisions in the realm of enterprise innovation and project management. The first IDEF0 model, focused on decision-making, illustrates the systematic process involved in evaluating and selecting innovative projects and initiatives. This model serves as a valuable tool for managers and decision-makers, providing a structured approach to navigate the complex and often multifaceted aspects of innovation management. It emphasizes the need for a strategic and informed approach to decision-making, ensuring that the chosen innovations align with the enterprise's overall objectives and market dynamics. The second IDEF0 model addresses the implementation aspect, detailing the steps necessary to successfully execute the chosen innovations and projects. This model underscores the importance of meticulous planning, resource allocation, and execution in bringing innovative ideas to fruition. It highlights the pivotal role of effective project management in translating strategic decisions into tangible outcomes and achieving the desired impact on the enterprise's operations and market position.

The innovative aspect of this research lies in the proposed approach to modeling the adoption and implementation of management decisions on innovations and projects. By employing the modern IDEF0 functional modeling method, the study offers a clear, systematic, and replicable approach to managing innovation in the digital age. This methodology is particularly pertinent given the increasing complexity and speed of change in today's digital business environment. However, the study acknowledges its limitation in focusing solely on enterprise innovation, suggesting the scope for future research to

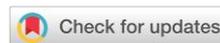
incorporate aspects of innovative security. This expansion is crucial as it can provide a more holistic understanding of innovation management, considering not just the opportunities but also the risks and challenges associated with enterprise innovation.

In conclusion, the article makes a significant contribution to the field of enterprise innovation and project management in the digital era. The development and presentation of two IDEFO models for decision-making and implementation provide a valuable framework for practitioners and scholars alike. The research paves the way for future studies to explore broader dimensions of innovation, including its security aspects, thereby enriching the discourse and practice of innovation management in the digital age.

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DOI: <https://doi.org/10.34069/AI/2024.74.02.10>

How to Cite:

Palshkov, K., Shetelya, N., Khlus, N., Vakulyk, I., & Khyzhniak, I. (2024). Impact of mobile apps in higher education: Evidence on learning. *Amazonia Investiga*, 13(74), 115-128. <https://doi.org/10.34069/AI/2024.74.02.10>

Impact of mobile apps in higher education: Evidence on learning

Вплив мобільних додатків на вищу освіту: дані про навчання

Received: January 5, 2024

Accepted: February 22, 2024

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Abstract

The article reveals the main advantages of using mobile applications in the educational process and shows their significance in increasing the level of knowledge and skills of higher education students; elements of the content of mobile learning are revealed; didactic principles are singled out and factors that educational mobile applications must meet are grouped; didactic features of mobile applications are shown in the educational process of a higher school. The methodological basis of the study is the general theoretical and methodological provisions of philosophy regarding the relationship between theory and practice of the Impact of mobile applications on higher education. The results of the conducted research testify to the fact that the use of mobile applications in the educational process to increase the level of knowledge and skills of students has a positive effect on increasing the level of skills and motivation of students to study, significantly facilitates the

Анотація

У статті розкрито головні переваги використання мобільних додатків в освітньому процесі та показано їх значущість у підвищенні рівня знань та вмінь здобувачів вищої освіти; розкрито елементи змістового наповнення мобільного навчання; виокремлено дидактичні принципи та згруповано фактори, яким мають відповідати освітні мобільні додатки; в освітньому процесі вищої школи показано дидактичні особливості мобільних додатків. Методологічну основу дослідження становлять загальнотеоретичні й методологічні положення філософії щодо взаємозв'язку теорії та практики впливу мобільних додатків на вищу освіту. Результати проведеного дослідження засвідчують той факт, що використання мобільних додатків в освітньому процесі з метою підвищення рівня знань та вмінь студентів позитивно впливає на підвищення рівня вмінь та вмотивованості студентів до навчання, суттєво полегшує освітній процес на

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educational process based on the implementation of a personalized approach outside classroom time, allows you to organize productive independent work in higher education.

Keywords: mobile applications, educational process, increasing the level of knowledge and skills of students, institutions of higher education, mobile learning.

Introduction

The development of mobile communication technologies and the global Internet (3G, 4G, and 5G) opens up new perspectives for the educational sector. In the organization of the educational sector, in the process of training future specialists, significant changes are taking place, new methods and forms are being added to the traditional methods of education, which are based on the use of mobile Internet, information, and communication technologies, and distance learning.

The widespread use and availability of mobile devices create the possibility of using them for all participants of the educational space as a means of learning in mobile learning.

One of the essential forms of educational space organization for education is mobile learning (m-learning), which is related to distance and electronic learning (e-learning). Its characteristic feature is the use of mobile devices (Plakhotnik et al., 2023).

The use of mobile devices in the educational process contributes to increasing the level of knowledge and skills of higher education students, forming research skills, overcoming the communication barrier, developing thinking, and increasing motivation to master life skills and use them in professional activities.

Mobile technologies in the educational process have firmly entered the lives of all people, and even modern preschool children learn to work with a mobile phone, tablet, and computer with ease, at the level of their own needs. Every student, to increase the level of knowledge and skills in the educational process, is ready to use and uses a mobile phone in education, even if the teacher does not promote the use of new technical means of education. Access to the Internet makes it possible to change the organization of the educational process using a mobile phone.

Taking into account the current trends in the

основі реалізації персоналізованого підходу у позааудиторний час, дозволяє організувати продуктивно самостійну роботу у вищій школі.

Ключові слова: мобільні додатки, освітній процес, підвищення рівня знань та вмінь студентів, заклади вищої освіти, мобільне навчання.

development of education, the current state of technological progress, and the financial security of higher education students to have a mobile phone at the level of a smartphone, the use of mobile technologies is already mandatory in the process of obtaining an education. Some teachers use them from time to time, and others use them purposefully and constantly, however, in the educational process, the number of participants in mobile learning is constantly increasing to improve the level of knowledge and skills of students (Pudova, 2018). Modern global information and communication networks, modern computer technology, software products, etc. form a new innovative environment for students of higher education and teachers, which increases the overall educational effect and complements the possibilities of digital and traditional learning, allowing using mobile applications in the educational process to increase the level of knowledge and skills. With this approach, the successful organization of the educational process to increase the level of knowledge and skills of students requires the scientific and pedagogical staff to implement and search for methods, new forms, and means of teaching, with the aim of changes in the theory, methodology, and practice of teaching.

Shortly, the role of artificial intelligence will grow in STEM education. And this is not just a fashion trend. By leveraging AI, teachers can tailor curricula to each student's teaching style and learning pace. Moving from a one-size-fits-all approach to a more individualized educational experience improves learning outcomes and allows students to maximize their potential. In addition, AI's ability to analyze vast amounts of educational data means that STEM curricula can be continually improved and optimized. This leads to the creation of flexible and dynamic learning plans that can be adapted in real-time to the needs of students.

It could be mentioned that in the first section, the theoretical framework is presented, in the second section the methodology of the study is

described, in the third section the results are presented and in the fourth section, the conclusions are discussed.

The following aspects are also considered in the article:

1. The importance and main advantages of using mobile applications in the educational process are to improve the level of knowledge and skills of students.
2. Didactic principles and factors that educational mobile applications
3. Didactic features of mobile applications in the educational process of a higher school.
4. The most effective design platforms for creating mobile applications.
5. The importance of using QR codes in the educational process of a higher school.
6. Experimental confirmation of the need to use mobile applications in the educational process to improve the level of knowledge and skills of students.

Literature review

Informatization of education, modern global information and communication networks, possibilities of computer technology, software products, and various aspects of the use of computer and telecommunication technologies and tools are being studied by many researchers nowadays. It could be mentioned that there is a growing amount of research on the use of mobile applications in education, but there are still few studies that focus on the context of higher education.

We are interested in researching the possibilities of creating a new innovative environment for students of higher education and teachers, that complements the possibilities of digital and traditional learning, and increases the overall educational effect, allowing using mobile applications in the educational process for quality professional education of each individual. K. Policarpo & J. Bergmann, (2021). In their work, they investigate the problem of aplicativos móveis como recursos didáticos digitais: um mapeamento na educação formal.

In turn, the authors M. Prado Ortega, R. Paucar Córdova, J. Valarezo Castro, M. Acosta Yela & K. Guaicha Soriano (2023) point out that the benefits that the students evidenced from block programming through mobile learning are the ease of use of the application, portability on your mobile device, easy to learn, drag and drop features, connectivity, and storage, tracking in

real-time by executing an educational robot and facility for error detection.

Scientists S. Criollo-C, D. Abad-Vásquez, M. Martic-Nieto, F. Velásquez-G, J. Pérez-Medina & S. Luján-Mora (2021) in their article they emphasize that with the rise of information technology and digitization, education has been faced with the need to adopt new learning models using technology to create innovative educational methodologies. Therefore, this paper focuses on describing the effect of an augmented reality mobile application (NetAR) that was developed for engineering students as a complement to traditional education. The usability results show that users are satisfied with NetAR, and the statistical data from the control group indicate that the application positively affects learning.

Investigating the problem of the relevance of mobile applications in the learning of physical education L. Vega-Ramírez, R. Notario & M. Ávalos-Ramos (2020) emphasize that mobile telephony has developed exponentially, offering a multitude of services that could be optimal for the educational field of physical and sports activity (PSA). With all this, the mobile phone could be an educational tool that awakens interest in teenagers and teachers.

L. Gorbatiuk, N. Kravchenko, H. Alekseeva & T. Rozumna (2019) substantiated the relevance and necessity of using mobile devices and mobile technologies to increase the qualitative level of linguistic competence in the process of foreign language learning of students. Mobile learning is defined as an innovative direction of electronic learning that has a significant advantage over traditional learning methods due to increased cognitive activity and learning motivation, individualization of learning, and intensification of independent activity. An analysis of mobile applications for learning a foreign language was carried out. The theoretical and methodological conditions of the formation of students' foreign language lexical competence were considered using mobile applications; the functionality, design, and structure of a mobile application for learning English were developed. To form English-language linguistic competence, a mobile application for the Android operating system was developed using the integrated Android Studio mobile application development environment. Methodical recommendations were developed by O. Bazeliuk, S. Kravets, L. Maiboroda, et al. (2019), which highlighted the practical and theoretical aspects of using mobile Internet tools in the training of future

specialists, described modern technologies of mobile Internet access, showed the effectiveness of the main trends of mobile learning, perspectives in the context of distance learning, provided practical tips for developing content for mobile learning, using it for distance learning.

The effectiveness of using mobile applications during education was analyzed by O. Dyshko, V. Kovalchuk & N. Tabak (2022). Scientists have proven that mobile applications in the context of the introduction of ICT are an important tool for the educational process of face-to-face and remote forms; described the advantages of mobile applications; examples showed the possibilities of using mobile applications as a means of visualization to increase the effectiveness of training: activation of mutual learning, diversification of classes, increase of productivity, dynamism, etc. The most important mobile technologies for education have been determined, which allow optimization of study time, and are the most effective and in demand for the study of professional disciplines by future specialists.

The question of the use of a mobile phone in the educational process when studying various disciplines was highlighted by S. Pudova (2018); attention is focused on the experience of different countries in using a mobile phone; examples of the use of a mobile learning tool common to all disciplines (working on the Internet, video recording, photography, sound recording, etc.) and software are highlighted; examples of computer programs developed for mobile phones that can be used in the study of various disciplines are given; the possibilities of using mobile phone sensors are shown.

N. Morse et al. (2021) presented the main ways of introducing innovative approaches and digital technologies in the educational process in the conditions of educational transformation. To ensure the quality of education, a high level of digital competence of an educator was identified as a key requirement.

So, we can see that nowadays interest in the integration of mobile applications in education is growing rapidly. Scientists have proven that mobile applications in the context of the introduction of ICT are an important tool for the educational process of face-to-face and distance learning. Therefore, in the educational process of a higher school, such teaching methods are needed that would facilitate and accelerate the transfer of knowledge to students, activate the process of their assimilation of knowledge, and

increase the productivity of educational work and the work of the teacher. Such methods of educational space based on the use of mobile information technologies in education can be implemented.

The use of mobile applications in the educational process to increase the level of knowledge and skills of students can make the learning process more interesting, which meets the requirements of today, providing the right information at the right time.

But despite the availability of mobile phones among students and their use in education, mobile learning is not widespread enough in higher education institutions.

The prospect of a scientific analysis of the process of the impact of mobile applications on higher education in higher education institutions is strengthened by the presence at the current stage of their digital and information-communication development of several contradictions, in particular between:

- the rapid development of the information society and insufficient preparation of future specialists for the performance of professional duties in the conditions of informatization;
- the need to increase the level of digital literacy of future specialists and the level of ICT engagement required to perform their professional tasks;
- standardization of the formation of ICT competence of future specialists and improper development of the methodology of its formation, educational and methodological, and material and technical support.

The necessity of leveling the mentioned contradictions is pedagogical the importance of the problem, as well as its insufficient reflection among scientists and researchers, and the lack of a justified methodical system of its formation in institutions of higher education determined the choice of the topic of the article.

Goal. To experimentally confirm the necessity of using mobile applications in the educational process to improve the level of knowledge and skills of students.

Methodology

The methodological basis of the study is the general theoretical and methodological

provisions of philosophy regarding the relationship between theory and practice of the Impact of mobile applications on higher education.

Based on the analysis of the positions of scientists regarding the essence of the use of mobile applications in the educational process to improve the level of knowledge and skills of students, we are convinced of their focus on improving the traditional educational process through the use of mobile means of communication, smartphones, and tablets, etc. in the context of a combination with information and communication technologies.

To solve the tasks, by the logic of the research, research methods were used: the analysis of scientific and methodical literature, which made it possible to identify the possibilities of using information technologies in professional training; analysis of regulatory documents, methodical literature, study and generalization of advanced pedagogical experience and others that regulate requirements for the level of assimilation of professional skills, knowledge, and skills of specialists; diagnostic methods (questionnaires, observations, conversations, interviews, self-assessment); experimental methods for identifying and analyzing the obtained results, as well as individual characteristics of the specialist's personality.

The experimental test included two sections: ascertaining and formative. During the experiment, the ascertainment cut revealed approximately the same professional level of both groups, which was determined with the help of input control.

When determining the sample of subjects, the general specificity of the subject of the study was taken into account. The total sample size is 40 subjects. When forming the sample, the criteria of meaningfulness, representativeness, and equivalence were taken into account. The sample was formed by random selection using the technical procedure for calculating the selection step.

The experiment continued during the academic year. The students were divided into two groups: control (CG – 22 people) and experimental (EG – 21 people).

The level of professional skills of the respondents was evaluated according to the following scale: 60-73 points (satisfactory level), 74-82 (average

level), 82-89 points (good level), and 100-90 points (excellent level).

The students of the experimental group had the English LioDuo, Lingvaleo, EnglishDom, Lingvist, and Ewa applications downloaded to their mobile phones, which they actively used during the academic year. The students of higher education who were in the control group worked without using such applications. The results of the formative stage of the experiment showed a significant increase in the success level of EG students compared to the control stage.

The scientific novelty of the research: the importance of education of the use of mobile applications to increase the level of knowledge and skills of students, which are used in education with the help of information technologies, was identified and substantiated, and the dynamics of their changes were analyzed. The results of the experimental study confirmed the applicability, optimality, and effectiveness of the proposed pedagogical conditions for the formation of an environmental culture of an ecologist in the process of professional training. The implementation of the pedagogical experiment was carried out in three stages: preparatory, main, and final.

At the preparatory stage, the purpose and tasks of the research were determined, the experimental plan was developed, methods of measurement and processing of results were selected, control and experimental groups were selected, and their homogeneity was checked.

At the main stage, an experiment was conducted. At the final stage, the results of the experiment were analyzed, their reliability was confirmed, and conclusions were drawn about the pedagogical effect of the experiment.

The reliability and validity of the obtained results, and the objectivity of their assessment were ensured by the methodological soundness of the initial positions and the qualitative mechanism for evaluating the quality under study, the use of a complex of complementary research methods, and the involvement of a group of respondents from a higher educational institution in the analysis of its results.

To assess the homogeneity of experimental and control data, statistical processing was performed using MS Excel and SPSS (Statistical Package for Social Science).

Results and discussion

1. The importance and main advantages of using mobile applications in the educational process to improve the level of knowledge and skills of students.

To date, the prospects of mobile technologies, which are considered a promising innovative means of implementing educational activities, have been proven (Polishchuk et al., 2022). The emergence of M-learning as one of the forms of E-learning is based on the development of the Internet, the requirements of the information society, and the improvement of digital gadgets. The modern standard of living makes it possible for all students of higher education to have a mobile phone (smartphone); almost all of them have access to mobile Internet.

In recent years, there has been an increased demand for the use of mobile applications in various fields, including education.

The main advantages of using mobile applications in the educational process to increase the level of knowledge and skills of students are small volume, free distribution, fast download process, etc.

Mobile applications are indispensable assistants in the organization of the organization of joint work of students, testing, development of sketches and quick prototypes, the performance of practical tasks, involvement in the discussion of lecture material, etc. (Borysenko, 2018).

Accessibility and flexibility of learning, openness and autonomy for lifelong education, implementation of an individual approach, etc. can be attributed to mobile learning, and its characteristics that determine the implementation of important educational functions (Bazeliuk et al., 2019). Ease of use, modernity, and portability are also among the main advantages of mobile gadgets (Stratan-Artyshkova et al., 2022), the possibility of scanning QR codes, etc.

Various functionalities of mobile applications in the educational process allow students not only to complete the educational task but also to effectively solve social, household, and professional issues and communicate with each other to increase their level of knowledge and skills.

From the point of view of the use of mobile applications in the educational process to increase the level of knowledge and skills of

students, it is possible to pay attention to the capabilities of smartphones, such as video and voice communication, which allow students to communicate with each other innovatively. To send messages, students, with the help of mobile applications, can react emotionally through the use of gif animations, and emojis, exchange information, and thus solve many urgent issues that require a quick response (Tereshchuk, 2016). The use of mobile phones by curators of academic groups allows them to be an intermediate chain between management, teachers, and students. S. Sharov developed a mobile application for the curator of the academic group, which stores information about students of higher education, their social status, parents, participation in clubs, etc. (Sharov, 2018). The software tool, developed for the Android mobile OS and installed on a smartphone, has a simple user interface filled with the necessary information and is useful for curators of academic groups who will have instant access to their students (Sharov, 2020). Therefore, mobile technologies, in particular, the use of mobile applications in the educational process is a promising direction to increase the level of knowledge and skills of students, the quality of the educational process, and the development of professional competence of students of higher education.

Content and elements of mobile learning. In the educational process, the term "mobile learning" (mobile learning) refers to the use of mobile and portable IT devices, in particular smartphones, mobile phones, and tablet PCs that support work in mobile networks and Wi-Fi technology and operate under the control of the operating system (Android, iOS) (Bilous, 2018).

With the help of mobile devices, you can create and open multimedia files, get access through the Internet to specialized sites, adapt reference and educational resources that contain practical tasks, and online tests, allow you to exchange information for educational purposes, etc.

The popularity of various mobile applications is growing along with the spread of mobile "devices". A mobile application is an "autonomous software product designed specifically for mobile devices to optimize the solution of some problem or task in the user's life. A mobile application is developed specifically for a given platform (Android or iOS), distributed through special application stores (Apple App Store, Google Play), and installed on the device just like a computer program (Bilous, 2018).

Undoubtedly, the use of mobile applications in the educational process is a promising direction for the development of the educational industry. Scientists define them in different ways. Let's group the main ones.

"A mobile application is an autonomous software product designed specifically for mobile devices to optimize the solution of some problem or task in the user's life" (Bilous, 2017).

"A mobile application is a stand-alone software product designed specifically for mobile devices to optimize the solution of some problem or task in the user's life" (Blazhko et al., 2020a).

"A mobile application is an information technology software artifact specially designed for mobile operating systems installed on portable devices such as smartphones or tablet computers" (Hoehle & Venkatesh, 2015).

Mobile applications are developed specifically for a certain platform (Android, iOS) and are installed on the device in the same way as a computer program. Mobile applications are distributed through application stores: AppleAppStore, GooglePlay, etc.

Today, there are many free or paid mobile applications designed for learning, which provide interactivity with assimilation and verification of the received information, and display of the information itself. A student of higher education can download any program on a modern tablet or smartphone.

It is necessary to consider in which modes they work (interactive (online) when selecting mobile applications and downloading them, or offline, and whether the technical characteristics of the mobile device allow the operation of the downloaded application.

Online:

1. Interactive, dialog mode of working with the system in the network. In this mode, the user sends requests to the system (computer on the network, server, web server) and along the same line receives back fragments of information prepared for him.
2. Network session, including the Internet. Status when connected to the Network, which characterizes two-way data exchange between the user and the corresponding Internet service. It is used as an adjective and describes various activities of users on the Internet, for example, online chat (online

communication on the Internet), online shopping (online purchase of goods), online games (online games), online searching (online search), online communities (online community). etc. Also means the user's mode of connection to a network or system slightly larger than the one he was using before the current connection (Policarpo & Bergmann, 2021).

The main elements of mobile learning were highlighted by Nigel Payne – a member of the International Advisory Board (University of Pennsylvania in Philadelphia). They are:

- mobile applications must be synchronized with mobile learning tools available on the Internet;
- mobile applications should be activated from the place where work was interrupted and should be compact;
- mobile learning provides an opportunity to use free time (Prado Ortega et al., 2023).

2. Didactic principles and factors that educational mobile applications should meet.

Mobile applications in the educational process must comply with the following didactic principles to improve the level of knowledge and skills of students:

- 1) independence and activity (the ability to complete training at a convenient time on your own, in the process of group training to show initiative with other subjects);
- 2) individual approach (selection of the level of difficulty of tasks taking into account the interests of higher education seekers and the content of education);
- 3) accessibility (free access to programs and educational information using mobile technologies);
- 4) systematicity and purposefulness (review of goals after their achievement, setting of short-term positively formulated goals) (Vega-Ramírez, Notario & Ávalos-Ramos, 2020).

Taking into account such didactic principles, the development of the methodological component of the educational mobile application should be carried out in the following directions to study professional disciplines in universities:

- graphic interpretation of theoretical concepts and estimated models;
- support for independent work;

- automation of calculations;
- generation of educational tasks (Ichanska, 2019).

For users, an important factor of an attractive and unique mobile product is its functionality:

- availability of hints regarding interaction with functionality;
- intuitive graphic interface;
- personal user profile (statistics display);
- searching for a specific material;
- automatic saving of progress;
- work with multimedia materials (different types of them);
- sending comments and reviews;
- the ability to communicate with friends in the chat, and the invitation to the friends application through social networks (Blazhko et al., 2020b).

3. Didactic features of mobile applications in the educational process of a higher school.

To increase the level of students' skills and knowledge, we will highlight the didactic features of mobile applications in the educational process:

- facilitating learning of educational material;
- subject orientation (the content of the mobile application corresponds to the content of individual educational topics, modules, or educational disciplines);
- availability of ready-made applications;
- availability of smartphones on which it is possible to install applications and their wide popularity for every student of higher education;
- the possibility of working with different types of information (graphical, symbolic, textual, or their hybrid forms);
- "speed of entry" (possibility of performing a practical task, ease of mastering based on the experience of studying other programs by the method of intuitive involvement of tools);
- the possibility of using feedback for educational assistance;
- the possibility of evaluating the activity of a higher education applicant using the control module;
- the possibility of aggregation (combining several simple in one application, for example, applications of smart tools that combine, measuring, tools);
- the possibility of a group form of involvement of students of higher education when performing a practical task in the application, etc. (Borysenko, 2018).

Examples of the most popular applications, which are recommended for use in the professional training of specialists in higher education institutions.

Mobile applications can be used in education in general and in the professional training of specialists, in particular: reference books, translators, dictionaries, professional calculators, calculators, applications with professional games, quizzes, etc.

Duolingo is a free app that helps you learn foreign languages. In addition to English, German, French, and Spanish, there are quite rare ones (Irish, Hungarian). The application is available for iOS and Android platforms.

A characteristic feature of the Lingvaleo application is a large selection of modern methods aimed at studying the theoretical foundations of the English language and is free content; personalization (the educational program of English proficiency is formed taking into account the interests of students, language level, and target orientation).

English LioDuo – has about 80 classes of different orientations, combines sound and image, British and American transcriptions, and selection by different meanings of words (selected, complex words, obsolete, etc.).

The smart application Lingvist provides the possibility of taking into account the personal requests of those seeking education, analyzing the way of learning a language, containing a language recognition mode, various thematic areas, and tracking personal successes in the educational space (Krasulia & Shumylo, 2020).

EnglishDom is an application aimed at expanding vocabulary and learning English vocabulary: it provides listening, composing words from individual letters, choosing the correct translation option, printing words; to facilitate memorization, selecting graphic images according to the principle of associative thinking; a translation and the possibility of listening to the correct pronunciation and transcription of each word are provided; monitors the progress of the educational process, evaluates the success of the student of higher education in the study of the English language.

The Ewa application is personalized and the learner can choose the level of training that corresponds to his level of preparation and capabilities, as well as with the involvement of a

choice of methods for learning a foreign language, it provides a wide range of opportunities: listening to his favorite music, reading books, watching videos and films, clips. To create mobile applications today, there are affordable and not complicated programs that do not require programming experience and special knowledge. Having a willingness to spend a small amount of time and money, and the desire to learn, you can use one of the platforms to manage your own mobile site or application.

So, while using these applications for smartphones, students of higher education gained the opportunity to improve their grammatical skills, independently expand their vocabulary, understand and assimilate what they read or heard, etc. When learning a foreign language, this approach aroused interest, reduced emotional tension, and increased the cognitive interest of students of higher education in learning.

4. The most effective design platforms for creating mobile applications.

In our research, we used several builder platforms to create mobile applications (Krol, 2018):

- 1) For Android or iOS, there's Appery, a fairly easy-to-use cloud-based mobile app builder that supports Ionic, jQuery Mobile, and Apache Cordova (Phone Gap) with access to their built-in components. The product does not require any additional software downloads, working in the cloud, there is a visual editor that uses drag-and-drop components to create the intended interface. Appery automatically generates code for any components a developer uploads. It is possible to instantly add a server and a cloud database to your application, connect to any REST API, and use it in your application if there is a need to save data. In particular, you can use the Appery plugin catalog or create your own. Real-time team collaboration on the application is easily implemented.
- 2) Mobile Roadie is an application designer that allows you to manage and create your Android or iOS application in which the development process takes place in a visual format. All types of media are supported by the platform, automatically importing keywords from Google News or RSS, Twitter, as well as automatically updating the fan wall for real-time communication with users. The function of the appearance of the application through the eyes of the user and the function of previewing the application are supported. Mobile Roadie checks the quality of the content and carries out the review process in the App Store. This software product allows you to send push notifications from your site or the platform itself. In general, the platform is language-independent and provides data transfer in various formats, including JSON, XML, CSV, PHP, and HTML. The developer is offered, at the very beginning, several options for layouts that can be customized.
- 3) TheAppBuilder is a platform that offers a group of apps for different users, supports iPad, iPhone, and Android, creates event apps, and mobile brochures, and integrates YouTube, Twitter, and Facebook videos, calendars, photo galleries, and more. Updating the content of the application and its structure is activated within 60 seconds after making changes, it is easy. You can make changes and publish to multiple mobile platforms even after the application has been published. The designer has two approaches: with the help of an online application creation tool or TheAppBuilder itself to fill the application with content and establish its structure and the platform with which the developer is going to work.
- 4) Good Barber provides a platform for creating applications for Android and iPhone, as well as for optimized web applications. Control is supported for every detail of the application for any of the platforms without writing a single line of code. At the beginning, a selection of design templates, access to Google Fonts, and many icons are offered. Data from web applications can replace the current site because they can be optimized for mobile devices, desktop computers, and tablets. The user receives quick visual feedback every time any parameters are adjusted in their application.
- 5) Appy Pie is a cloud-based product for creating do-it-yourself mobile applications that allow users without programming skills to create their own mobile applications online. There is no need for any download or installation, just drag and drop the pages. The work is carried out with the ability to send push notifications online, integrate social network channels, track and view location analytics using GPS, websites, blogs, video, audio, etc. When using this platform, there is a meeting scheduling tool, and various topics are offered to the user.
- 6) AppMachine – the platform is designed to create professional mobile applications for

Android and iOS and is easy to use. The user can combine different blocks that offer different functions: photo, text, app integration with Facebook, Twitter, video, etc., using a drag-and-drop interface, create your design by choosing a color, navigation, icons, fonts, and layout control and monitoring progress with the Previewer. This platform allows you to scan a website for key content that can be transferred to an Android or iOS app. It is published and promoted after the application is ready and tested for operation, and user data is analyzed. AppMachine takes care of the app to appear on Google Play and the App Store.

5. The importance of using QR codes in the educational process of a higher school.

In the educational process, the use of QR codes, which teachers have recently been actively using in the educational process, is of great importance. Translated from English, the abbreviation QR (quick response) means "quick response". This is a matrix code (two-dimensional barcode), which was developed by the Japanese company "Denso Wave" in 1994, which provides 2953 bytes of information in one small square, i.e. 1817 hieroglyphs or 4296 letters or 7089 numbers (1-2 pages of text in A4 format). The advantage of a QR code is that it can be easily recognized by a mobile phone camera or scanning equipment. Today, such codes are relevant in education, they are used in any catalog, and in museums near paintings or exhibits for educational information about the exhibit, its author, etc. The QR code allows you to quickly read, decode, and encode: texts, active links for downloading information, URLs of various sites, etc.; it allows you to go easily and quickly to the website to download files on a mobile device. For educational reading, QR scanners and QR codes are attractive ways to use mobile phones (Bazeliuk et al., 2019).

So, the mobile application in the educational process provides an opportunity to view courses offline and online, to record the progress of a student of higher education, provide the means of simplified interaction with course teachers and authors, etc. to improve the level of knowledge and skills of students.

A smartphone, a tablet, a laptop, and a personal computer allow every student of higher education to get the most out of their studies and always stay in touch with the teacher. To a large extent, mobile technologies facilitate the education process, because, using a tablet or smartphone, every student of higher education

can complete their tasks anywhere and anytime. There are many applications for the development of electronic courses that are available under an open-source license. Every student of higher education has the opportunity to update his application to the latest version without losing the already existing progress from the previous version.

6. Experimental confirmation of the need to use mobile applications in the educational process to improve the level of knowledge and skills of students.

Before experimenting, it was assumed that the use of mobile applications in the educational process during the study of professional disciplines by students of higher education would contribute to the formation of professional competence among students.

To confirm the proposed hypothesis, the following tasks were solved during the experiment:

- the initial level of formation of students' professional competence is determined;
- experimental training using mobile applications was conducted;
- an analysis of its results was carried out.

The experimental test included two sections: ascertaining and formative. During the experiment, the ascertainment cut revealed approximately the same professional level of both groups, which was determined with the help of input control.

40 students of higher education who had approximately the same level of knowledge were involved in the pedagogical experiment. The experiment continued during the academic year. The students were divided into two groups: control (CG – 22 people) and experimental (EG – 21 people).

The level of professional skills of the respondents was evaluated according to the following scale: 60-73 points (satisfactory level), 74-82 (average level), 82-89 points (good level), and 100-90 points (excellent level).

The students of the experimental group had the English LioDuo, Lingvaleo, EnglishDom, Lingvist, and Ewa applications downloaded to their mobile phones, which they actively used during the academic year. The students of higher education who were in the control group worked without using such applications. The results of

the formative stage of the experiment showed a significant increase in the success level of EG students compared to the control stage. In addition, EG students, thanks to the self-assessment method, showed an increase in the level of cognitive interest in studying at a higher education institution and in learning English, in particular, at the same time, students preferred the following applications: EnglishDom, Lingvleo English LioDuo. So, the results of the conducted research confirmed the conclusions about the effectiveness of using mobile applications in the educational process to increase the level of knowledge and skills of students, in particular, in learning English.

At the stage of the formative experiment, the students of the experimental group were offered training using mobile applications. According to the results of the test control of the level of formation of professional competence, the average quality of knowledge of the respondents of the control groups was 62.3%, of the experimental groups – 85.2%. The data of the experiment confirm the effectiveness of using mobile applications for the formation of professional competence.

So, the results of the experimental test proved that the higher education students of the experimental group demonstrated a higher level of professional skills than the students of the control group. This testifies to the effectiveness of using mobile applications in the educational process of a higher school to increase the level of knowledge and skills of students. In particular, the use of applications allows you to independently and more freely improve skills and abilities outside the classroom.

The second part of the experiment aimed to use smartphone applications to identify the impact of the gamification method not only on increasing the level of professional training, and English language proficiency of students, but also on changing the motivation of respondents to study professional disciplines at a higher education institution. The use of applications increases interest in learning thanks to interactive and bright content and gives the opportunity to freely study any discipline at any convenient time.

After completing the experiment, students of higher education were asked to take part in a survey and determine the impact of the used applications on the cognitive interest in studying professional disciplines using a self-assessment method on a 10-point scale. At the same time: the highest score is 10, and the lowest is 0. The

effectiveness of independent work was taken into account according to the criteria of influence on professional communication skills, correct pronunciation, knowledge and compliance with rules, increase in vocabulary, etc.

The results of the survey of respondents were as follows:

English LioDuo – 8 points;
Lingvleo – 7 points;
EnglishDom – 7 points;
Lingvist – 7 points;
Ewa – 5 points.

Thus, the most effective application for smartphones according to EG students, which not only increases the level of knowledge but also stimulates cognitive interest in learning disciplines through the creation of game content, is the EnglishDom application.

The results of the conducted research testify to the fact that the use of mobile applications in the educational process to increase the level of knowledge and skills of students has a positive effect on increasing the level of skills and motivation of students to study, significantly facilitates the educational process based on the implementation of a personalized approach outside classroom time, allows you to organize productive independent work in higher education.

For a high-quality educational process, to implement the specified innovative technologies and methods, it is advisable to train teachers in the use of mobile applications in the educational process to increase the level of knowledge and skills of students.

For this purpose, the developed questionnaire offered questions related to the assessment of the importance of using mobile applications in professional activities.

The analysis of the research results showed that both students and teachers are interested in the ability to effectively use in the educational process and in the ability to own digital tools, which were grouped by purpose. Respondents had to give each mobile application one of the levels of relevance to increase the level of knowledge and skills of students: low, medium, and high.

So, to identify the effectiveness of using mobile applications in the educational process to improve the level of knowledge and skills of

students, we organized testing among students (25 test questions and 25 visual recognition test tasks). For this, the interviewees were divided into two groups: control (n=31 people) training took place according to the traditional scheme, and experimental (n=30 people), training process involved the introduction of mobile applications. The total number of points determined the level of respondents' mastery of professional knowledge (high, average, low). Having chosen the correct answer, the respondents had to give answers to the test tasks. As a result of the study, it was found that at the beginning of the experiment, there were no significant differences between the respondents of the experimental and control groups regarding the mastery of professional knowledge, which indicates their homogeneity. After the end of the experiment, changes were observed regarding the results of the questions in the tests:

- with a low level of mastery of professional knowledge, the number of respondents decreased – in the control group by 24.4%, in the experimental group – by 33.7%;
- the number of respondents with an average level increased – in the control group by 13.3%, in the experimental group – by 6.8%;
- the number of respondents with a high level increased – in the control group by 10.0%, and in the experimental group – by 24.2%.

At the end of the experiment regarding the use of mobile applications in the educational process to increase the level of knowledge and skills of students, better dynamics were observed in the experimental group. So, the data of the experiment confirm the effectiveness of using mobile applications during the training of future specialists.

The obtained results indicate that students of higher education are more interested in using mobile applications in the educational process than teachers. It is obvious that students of higher education need to use the presented resources in the educational process, in particular, the most relevant for them is the use of mobile applications in the educational process for obtaining digital content, discussion, communication, and evaluation. In turn, teachers are more motivated to master the tools for working with electronic documents, which indicates their readiness to use electronic document management.

Conclusions

the development of new teaching methods,

provide a large number of educational multimedia materials and allow you to fully communicate with students and study their cognitive interests. The use of mobile applications for students of higher education contributes to the development of skills: searching for information on a certain topic and purpose, making a comparative analysis, public presentation of work results, grouping of information and monitoring, etc.

The importance and main advantages of using mobile applications in the educational process to increase the level of knowledge and skills of students are shown; the content and elements of mobile learning are disclosed; the didactic principles and factors to which educational mobile applications must comply are singled out; didactic features of mobile applications in the educational process of a higher school are shown. Examples of the most popular applications, which are recommended to be used in the professional training of specialists in higher education institutions, are given, the most effective designer platforms for creating mobile applications are analyzed and the importance of using QR codes in the educational process of higher education is shown. The necessity of using mobile applications in the educational process to increase the level of knowledge and skills of students has been experimentally confirmed.

The results of the conducted research testify to the fact that the use of mobile applications in the educational process to increase the level of knowledge and skills of students has a positive effect on increasing the level of skills and motivation of students to study, significantly facilitates the educational process based on the implementation of a personalized approach outside classroom time, allows you to organize productive independent work in higher education.

To ensure the optimal mode of formation of the Impact of mobile applications on higher education, it is recommended to practice such organizational forms of classes as collective work on the use of mobile applications in the computer class; a subject office with a multimedia board; online classes; virtual tour; Internet project, etc.; pair or group activity of students using mobile applications computer class, subject office; individual activity of students using mobile applications: remote training (for maintaining or organizing the educational process, organization consultations for students); use of online

conferences (forums, chats).

The main contribution of the study to knowledge about the use of mobile applications in education is the identification and substantiation of the importance of teaching the use of mobile applications to increase the level of knowledge and skills of students, which are used in education with the help of information technologies, as well as the dynamics of their changes were analyzed.

Consideration of the readiness of higher school teachers to use electronic document management requires further research.

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DOI: <https://doi.org/10.34069/AI/2024.74.02.11>

Baliun, O., Solomka, P., Fisenko, T., Holovko, O., & Kasianchuk, V. (2024). Experience in implementing the ecological concept of CSR (On the example of ukrainian fashion brands). *Amazonia Investiga*, 13(74), 129-142.
<https://doi.org/10.34069/AI/2024.74.02.11>

Experience in implementing the ecological concept of CSR (On the example of ukrainian fashion brands)

ДОСВІД ВПРОВАДЖЕННЯ ЕКОЛОГІЧНОЇ КОНЦЕПЦІЇ КСВ (НА ПРИКЛАДІ УКРАЇНСЬКИХ ФЕШІОН БРЕНДІВ)

Received: December 29, 2023

Accepted: February 23, 2024

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Abstract

The relevance of the chosen topic is due to the lack of scientific research on the ecological responsibility of Ukrainian fashion brands. The study aims to uncover the significance of the ecological component of corporate social responsibility in the practice of Ukrainian fashion brands and to determine its impact on consumer trust levels. The methodological basis of the research consists of a combination of general scientific and sociological methods.

The study of Ukrainian fashion brand experiences has shown that ecological activities are mostly used situationally, particularly by local-level designer brands. Based on the analysis of Ukrainian experiences, technologies, and tools of ecological practices applied in brand social responsibility programs have been systematized into the following categories: eco-

Анотація

Актуальність обраної теми зумовлена браком наукових досліджень щодо екологічної відповідальності українських fashion-брендів. Мета дослідження полягає у розкритті значення екологічного складника корпоративної соціальної відповідальності у практиці українських fashion-брендів та визначенні його впливу на рівень довіри споживачів. Методологічною основою дослідження є сукупність загальнонаукових та соціологічних методів. Дослідження українського досвіду fashion-брендів засвідчило, що екологічна діяльність здебільшого використовується ситуативно, зокрема дизайнерськими брендами локального рівня. На основі аналізу українського досвіду було систематизовано технології та інструменти екологічних практик, що

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production, eco-products, eco-events, eco-processes, eco-cooperation, eco-strategies, and eco-communications.

The current state of consumer behavior and societal attitudes towards the eco-activities of fashion brands has been investigated. Within the research framework, a sociological online survey was conducted, which confirmed the hypothesis that Ukrainian society recognizes the necessity of transitioning to conscious ecological clothing consumption. However, responsible consumer behavior is not observed simultaneously, leading to the development of a phenomenon where fashion production follows Western trends in implementing eco-initiatives, thereby shaping a culture of conscious ecological consumption.

Keywords: consumer, corporate social responsibility, ecological responsibility, fashion-brand, media activity.

Introduction

The rapid development of entrepreneurship and globalization processes in the environment business raises questions about the environmental responsibility of companies, which is arguably one of the foremost aspects of corporate social responsibility (CSR).

The fashion industry is one of the most polluting industrial sectors globally, so brands producing clothing, footwear, and accessories must rethink their business practices and implement comprehensive systems of effective tools for ethical environmental management as part of CSR. International experience demonstrates numerous practical advantages of conducting responsible business, while the Ukrainian market is only beginning to formulate concepts regarding methods of ethical business activities in its strategies.

The environmental awareness of Ukrainian consumers, which has recently become more pronounced, consistently urges brands to formulate their business concepts consciously and to choose pathways for enterprise development considering the impact the company can project on the environment. Currently, the focus is not only on minimizing environmental harm but also on the contribution an organization can make to enable the world to function sustainably in the future.

застосовуються у програмах соціальної відповідальності брендів, за такими категоріями: ековиробництво, екотовари, екозаходи, екопроцеси, експівпраця, екостратегії, екокомунікації. Було досліджено поточний стан споживацької поведінки та ставлення суспільства до екодійальності fashion-брендів. В рамках дослідження проведено соціологічне онлайн-опитування, яке дало можливість підтвердити висунуту гіпотезу, що українське суспільство усвідомлює необхідність переходу до свідомого екологічного споживання одягу, але водночас не спостерігається відповідальності споживацької поведінки, що зумовлює розвиток такого феномену, коли fashion-виробництво наслідує західні тренди із впровадження екоініціатив, за допомогою чого і формує культуру свідомого екологічного споживання.

Ключові слова: екологічна відповідальність, корпоративна соціальна відповідальність, медіактивність, споживач, фешион-бренд.

The relevance of the chosen topic is driven by the lack of comprehensive and systematized scientific works analyzing the environmental responsibility of Ukrainian fashion brands. Also lacking are studies on Ukrainian consumers' clothing purchasing needs and their expectations regarding the eco-initiatives of Ukrainian fashion brands. Ukrainian consumers are highly reliant on current fashion trends. Despite economic difficulties, they regularly update their wardrobe each season, mostly through brands that promote fast fashion. This consumer behavior is influenced by a certain historical burden when during the times of the Soviet Union, women and men were deprived of the opportunity to have modern, nice clothing.

This necessitates the need for conducting scientific research on such an important component of corporate social responsibility as environmental protection in the fashion industry. After all, the application of eco-initiatives in the practical activities of companies can serve as a communication tool capable of shaping a positive reputation.

The goal of the research is to uncover the essence and significance of the environmental component of CSR in the practices of Ukrainian fashion brands. The working hypothesis of the research is based on the assumption that Ukrainian society recognizes the need to

transition to conscious ecological clothing consumption given quality production and appropriate pricing. However, responsible consumer behavior is not observed simultaneously, leading to the development of a phenomenon where it's not society demanding eco-responsibility from the producer, but rather the producer shaping eco-culture and contributing to raising consumer awareness about environmental threats. This necessitates setting the following objectives for this research: identify and generalize the main directions of environmental responsibility among Ukrainian fashion brands; and determine the level of environmental awareness among Ukrainian consumers of fashion products through sociological research.

Theoretical framework or literature review

The scientific discourse on environmental protection began in 1962 after the release of biologist Carson's (1962) book "Silent Spring". A significant breakthrough in the academic discipline of business and strategy was made by Porter & Kramer (2006), who argued that companies should create competitive advantages by integrating social and environmental issues into their core business strategies, thus incorporating sustainability into their strategic framework.

The problem of the impact of fast fashion on the environment is topical in scientific discourse. In particular, researchers De Ponte, Liscio & Sospiro (2023) emphasize the need for implementing effective management strategies to reduce the impact of fashion waste on the environment. Ukrainian researcher Fiialka (2017) pays attention to the behavior of companies regarding the use of greenwashing in the Ukrainian market and argues that environmental initiatives of brands should be supported by effective actions, especially in the context of environmental concerns, as these issues are urgent, and consumer deception can affect companies both financially and emotionally.

Additionally, the research foundation is supported by an interesting approach to the classification of environmental innovations proposed by Zarebska & Michalska (2016), who distinguish between process, product, organizational, and marketing innovations. Ukrainian experience in forming environmental strategy is presented in the work of Kamyshnykova (2017), who has proposed an algorithm of actions for the effective

implementation of environmental initiatives in CSR business.

Dovhun & Krykavskyy (2017), Tarayevska & Rishchuk (2021) focus on the peculiarities of implementing the environmental component of corporate social responsibility in Ukraine. In the research work "Ecodesign and initiatives of sustainable development in the dimension of passion of artistic and design creativity," Ukrainian scientists note that the future development of the fashion industry is linked to the use of environmentally friendly and technological fabrics. Researchers predict that new creative searches are due to the vital need for a new philosophy of world perception, which will influence ecodesign in the future (Lahoda et al., 2023). On the other hand, Mahmoud, Kumar, Fuxman & Mohr (2023) raise the question in the scientific discourse of whether sustainable materials can truly be considered a source of luxury and if the perception of climate change risk will affect that attribution.

The modern legal aspect of regulating state environmental policy in Ukraine, an adaptation of international legal experience within the European integration framework, is disclosed by researchers Kryzhevskyy, Ripenko, Nikitin, Kozin, & Kuzmenko (2023). Separate aspects of the role of social investment projects for business and for the country's economic development in general are considered by researchers Minochkina et al. (2023).

Overall, the topics of development in the Ukrainian fashion business and, in particular, its environmental responsibility, are quite new and under-researched for Ukrainian scholars. Mostly, Ukrainian experts pay attention to the practices of their foreign colleagues and explore the theory and history of environmental responsibility (Galushka & Kondratenko, 2020; Gerasymenko, Chuprina, Davydenko, Chubotina, Khomenko & Kudrevsky, 2023).

Understanding the importance of environmental protection from the harmful effects of fast fashion and implementing appropriate CSR practices in enterprises is crucial for shaping and developing socially responsible businesses in Ukraine. In particular, the studies by Kvasnytsya (2019) and Tymoshenko & Kotsiubivska (2021) emphasize the importance of forming eco-concepts in the fashion industry.

Within our work, the results of research presented by Correa et al. (2021) regarding the attitudes of young millennials towards brand

social marketing actions are also intriguing. In particular, the dependence of the effectiveness of brand communication actions on Generation Y on their alignment with the social ideals of young people. The results of this study are integrated with sociological research conducted within our work. This will allow Ukrainian fashion brands to effectively shape strategies for environmentally responsible business in the future.

Methodology

In the research, the authors employed a comprehensive interdisciplinary approach that combines both general scientific and specialized methods of information processing. Specifically, methods such as description and observation were used to identify primary information. Methods such as analysis and synthesis, comparison and generalization, as well as media monitoring, were used to investigate the key components of environmental responsibility among Ukrainian fashion brands. This allowed us to summarize and identify the main tools for implementing environmental initiatives by Ukrainian fashion brands. Based on this, diagrams were graphically composed to demonstrate a synthesized understanding of the directions for implementing the environmental CSR concept by brands and to determine their relative importance.

Content analysis, conducted based on media monitoring, enabled research into determining the media activity of fashion brands. Within the scope of the work, a sociological research method was also applied to identify the attitudes of Ukrainian consumers towards the environmental responsibility of clothing manufacturers. We surveyed 50 independent respondents of different age groups. Google Forms service was used to organize the survey, which offers advantages such as prompt dissemination and retrieval of data, anonymity, automatic generation of graphs, and a wide selection of resources for survey creation. The survey questions were formulated to cover various aspects of consumer behavior in clothing purchases and to ascertain the importance of environmental aspects of fashion brands for consumers

Results and discussion

Fashion brands are companies engaged in the manufacturing and sale of clothing, footwear, and accessories. Globalization has been a driving force in this direction, contributing to the

maximization of clothing production speed, which, in turn, has led to increased exploitation of natural materials and resources. Therefore, environmentalists consider the fashion industry one of the most polluted industrial sectors.

Closely related to the fashion industry is the concept of "fast fashion," which leads to excessive consumption and a large amount of waste. Clothing categorized as fast fashion is relatively inexpensive because it is of low quality and is not recyclable; it targets consumers who want to change their clothes regularly to follow trends (Fombrun & Shanley, 1990).

Meanwhile, manufacturers have noticed that consumers are gradually becoming more discerning and increasingly considering the materials and production methods of the clothing they wear. Thus, fast fashion begins to displace "slow fashion" — a movement that combines social and environmental consciousness and responsibility in consumption and is based on the development, production, and purchase of high-quality and durable clothing. Environmental responsibility is manifested in the protection of environmental resources, reducing carbon footprint, and striving for zero waste (Stanton, 2021). In this context, collaboration between business and government in environmental protection is an important direction of activity. In Ukraine, in 2020, the Government of Ukraine approved the Concept for the Implementation of State Policy to Promote the Development of Socially Responsible Business (SRB) for the period up to 2030 (Orden N.º 66, 2020). The main directions of SRB development in environmental protection include:

- Implementation of innovative environmentally safe and energy-efficient technologies;
- Prevention of negative environmental impact;
- Promotion of waste utilization (Orden N.º 66, 2020).

The document outlines ways to address environmental issues through the following tools: organizing environmental protection systems by enterprises; seeking modernized ways to improve environmental indicators; training employees on environmental protection, health, and safety issues; promoting rational consumption of natural resources; reducing harmful emissions into the atmosphere; preserving biodiversity; organizing an environmental management system (Orden N.º 66, 2020).

The level of awareness among Ukrainian businesses about the importance of implementing environmental protection programs is demonstrated by the latest study of the Pro Bono Club Ukraine international network of corporate social responsibility on the Ukrainian market, which was conducted on the eve of the Russian-Ukrainian war. The results of the sociological study allow us to conclude that the majority of companies implement educational projects, improve working conditions and staff development, and organize charity fundraisers. Unfortunately, environmental protection is not a priority for Ukrainian companies (CSR Ukraine, 2021).

Overall, in Ukraine, environmental aspects of the CSR system are manifested in the following types of company activities:

- Formulating policies for environmentally responsible enterprises;
- Conducting environmental audits;
- Collaborating efforts to implement initiatives with internal and external stakeholders;
- Supplying goods according to environmental standards;
- Producing environmentally friendly products (Kamyshnykova, 2017).

In the mass-market segment in Ukraine, clothing manufacturers are beginning to focus consumer attention on certain aspects of their eco-activities. Our attention will be focused on brands that have already taken leading positions in the mass-market segment, including Goldi, JUL.

The Ukrainian women's clothing manufacturer JUL has focused its main efforts on eco-responsibility in the following aspects: primarily using natural fabrics in production; and producing packaging boxes exclusively from recyclable materials. Additionally, the brand releases limited collections, which promotes conscious consumption and reduces waste from unsold items. The brand's main communication platform is its website, where the company should ideally showcase information about its eco-responsibility. However, currently, there is no information about the brand's environmental activities in the media, which is not supported by any evidence in the form of reports, thus it cannot be taken seriously and may not instill trust among stakeholders.

The brand Goldi, a mass-market clothing manufacturer positioning itself as environmentally sustainable and responsible,

informs stakeholders on its corporate website that it uses only renewable energy sources and has completely abandoned natural gas consumption. The company also focuses on preserving Ukrainian water bodies through the use of a special water purification system. Regarding eco-products, the Goldi brand seeks to increase the supply of biodegradable materials (Shtuka, 2021). Similar to the JUL brand, Goldi does not make any informational materials confirming its environmental activities publicly available. Such an approach can be considered irresponsible in terms of communication with consumers, especially considering that the JUL brand has high media activity in Ukrainian fashion publications such as Vogue, Marie Claire, Cosmopolitan, Elle, The Village, Harper's Bazaar, HD Fashion, L'Officiel.

When considering the quality of JUL brand content, the focus in publications is only on presentations of new products, trends, clothing compatibility, etc., with no attention paid to the component of environmental responsibility. The clothing manufacturer Goldi is an inactive participant in the media space, which is a strategic mistake for the brand in communicating with stakeholders.

In Ukraine, business strategies for environmental responsibility are more focused on designer brands, which accordingly do not belong to the mass-market segment but are exclusive manufacturers. Let's analyze the positions of such brands regarding environmental responsibility and the consistent implementation of environmental initiatives, including Ksenia Shnaider, Bevza, Katya Silchenko, Litkovskaya, My Sleeping Gypsy, No Clip Yes Zip (NCYZIP).

Kseniaschnaider brand is a manufacturer of designer clothing that is now well-known and recognized in Europe, the USA, and other countries worldwide. The designers are considered pioneers of eco-friendly fashion in Eastern Europe, primarily based on the production of recycled denim (Marchenko, 2020). The company processes about 500 pairs of jeans for recycling per month, which amounts to nearly 5 tons per year. In one season, Ksenia Shnaider produces approximately 200 kg of textile waste and manufactures about 3,000 recycled products per year. The uniqueness of the brand's offering lies in the fact that each item is exclusive, as it is composed of individual and unique parts of recycled fabrics or those that typically go to waste (Prys, 2020a). In 2016, the company entered the international arena by successfully launching a trendy product called

demi-denim, which introduced the brand's philosophy: combining vintage denim fabric with different clothing pieces. It is worth noting that the brand actively communicates with consumers, and regularly conducts educational activities through its communication platforms regarding environmental responsibility.

Bevza is a Ukrainian clothing brand that emphasizes the ethical treatment of nature as the company's core value. Bevza is one of the most popular Ukrainian brands globally and showcases its clothing at fashion weeks in the USA and Europe. The company collaborates with Italian factories that have a 100% closed cycle and produce environmentally friendly raw materials (organic fabric dyeing, certified recycled materials, etc.) and plans to further expand cooperation with international companies. In the development process of Bevza products, innovative technologies are used to manufacture eco-friendly goods. The Bevza brand actively seeks to popularize conscious consumption and environmental awareness both in the Ukrainian market and abroad. The main environmental responsibility stems from the choice of raw materials, creating clothing using eco-friendly techniques, and promoting understanding of the concept of "sustainable fashion" through initiatives that can draw attention to social issues (Prys, 2020b). The company is quite active in the media. Well-known Ukrainian and international publications such as *Vogue*, *FW-Daily*, *Buro247*, *The Village Ukraine*, etc., write about the brand and its ecological initiatives.

The next brand we present for consideration is the Coat by Katya Silchenko, which is also well-known in Ukrainian and international markets. According to the concept of sustainable development underlying the brand's philosophy, responsibility is based on intelligent production. K. Silchenko sees awareness of environmentally sustainable consumption in planning the demand for her clothing offerings (Bilous, 2021). In 2020, the brand presented an autumn collection made from environmentally sustainable materials, stating that the raw materials were sourced from factories collaborating with global brands, such as the environmentally conscious brand Stella McCartney. Famous online publications such as *Vogue.ua*, *L'Officiel*, *Elle.ua*, and others have noticed the ecological approaches in the production of the Coat by Katya Silchenko.

The designer clothing brand Litkovskaya declares its environmental responsibility mainly

through specific collections dedicated to environmentally sustainable motives. For example, in the fall of 2020, Litkovskaya presented a demi-couture clothing line called Artisanal, which translates to "made traditionally or non-mechanically," corresponding to the concept of ecological sustainability. In this collection, the designer used fabric scraps, vintage items, and remains of archival collections. The products from the collection were unique, and due to the limited nature of the collection, they will not go to waste. Additionally, the garments were crafted by artisans from Carpathian villages using ancient techniques on wooden looms. The main focuses of the collection are preserving Ukrainian traditions and adhering to the principles of environmental sustainability and slow fashion (Misyuk, 2020).

Therefore, it is evident that Litkovskaya's brand's commitment to sustainable development is limited and manifested in specific clothing collections rather than in overall production. Regarding communication coverage, the brand has high activity indicators in both Ukrainian and international publications: *Vogue*, *Harper's Bazar*, *L'Official*, *Elle*, and others.

My Sleeping Gypsy is a Ukrainian brand of unique women's clothing that produces embroidered shirts, embroidered dresses, jumpsuits, and more. The brand focuses on "slow fashion" production and states that it will never sell clothing on a mass scale. The clothing is made from natural fabrics such as linen and silk. The company sources linen fabrics from local producers and processes silk from second-hand sources. My Sleeping Gypsy also adheres to limited edition collections, focusing on the quality and environmental sustainability of its products. The production of My Sleeping Gypsy clothing takes place in Ukraine, minimizing transportation and aiming to reduce carbon emissions. Only local artisans are involved in creating the garments to control the production chain in line with principles of environmental sustainability, thereby supporting small artisan communities. The brand has completely abandoned sales and does not have outlet stores (Nyzovets, 2023), instead focusing on the quality of its products. My Sleeping Gypsy primarily emphasizes environmental sustainability in production and products (Birkner, 2020). Despite being recognized in Europe and the USA, information about the brand in the online space is scarce, although it is represented on many international online platforms for sales (such as *farfetch.com*).

The next clothing brand we include for consideration is No Clip Yes Zip (NCYZIP), founded by blogger M. Tymoshenko and designer N. Fishchenko in 2019. The concept of this young brand aligns with conscious consumption and emphasizes the importance of moving away from the principles of fast fashion. The brand creates modular clothing from recycled materials. Overall, the brand's products allow for interchangeable sleeves, collars, pockets, hoods, etc., in different colors and materials of varied textures. This concept fits into the framework of ecological consumption because instead of buying multiple garments, one can constantly modify the existing clothing by using individual components as needed. There is limited information about the brand online, indicating its relative novelty and the Ukrainian audience's unpreparedness to accept such an approach to consumption. However, there are noticeable active communication strategies on social media, especially on Instagram, indicating a focus on a young audience, which nowadays holds an active stance on ecological and conscious consumption.

Therefore, the main activity of designer fashion brands is focused on producing eco-friendly goods using innovative technologies, making the companies unique both in the Ukrainian market and worldwide. Ukrainian brands actively promote the wearing of ecological items through fashion events such as global fashion weeks and various Ukrainian or international ecological projects. Brands also aim to obtain ecological certifications, as seen in the case of Bevza, which attests to the seriousness of their sustainable development intentions. However, complying with international standards is an expensive procedure, and not every young brand can afford it. Additionally, information about the awareness of Ukrainian brands is increasingly spreading, and in recent years, international online publications have been writing about them, confirming the relevance and success of their ecological statements in the fashion space.

Based on the analysis of the activities of Ukrainian designers advocating for ecological clothing consumption, a histogram of the most commonly used sustainable development initiatives has been compiled (see Figure 1).

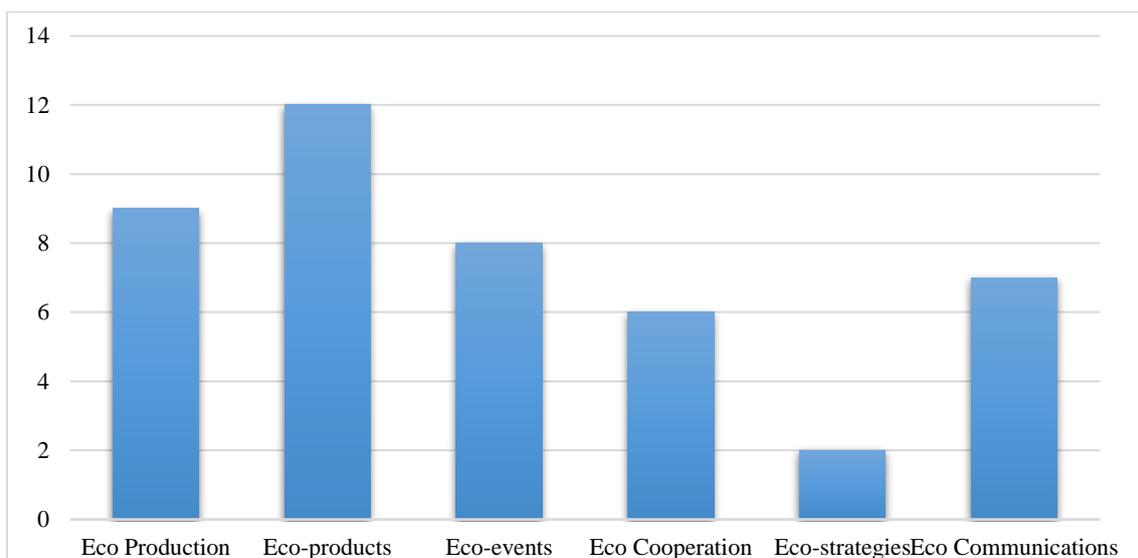


Figure 1. The using ratio of eco-categories by Ukrainian companies.

Source: Authors' computation.

Leading positions are occupied by eco-product categories as the primary element through which brands can demonstrate their attitude towards the environment. Eco-production ranks second in both histograms as a complement to eco-products. In Ukraine, eco-strategies, about which companies still express uncertainty at the official level, hold a low position, while international companies express a clear position on ways to achieve environmental goals. It is also worth emphasizing cooperation, which helps to achieve

a common environmental objective. Foreign companies are more open to cooperation and strive to expand their network of external stakeholders as much as possible. In Ukraine, brands are only beginning to unite efforts to implement environmentally sustainable projects.

Similarly, we detail the process of environmental initiatives for each Ukrainian designer brand to make a comprehensive comparative analysis. (see Figure 2).

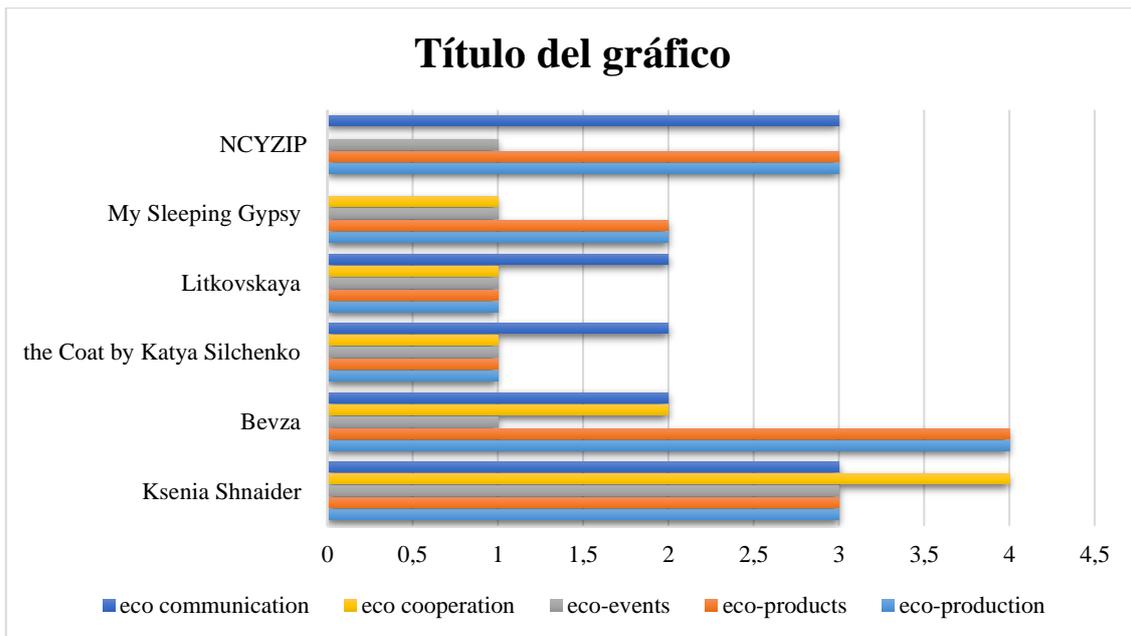


Figure 2. The distribution of the use of eco-categories by Ukrainian companies. Source: Authors' computation.

On the histogram (see Figure 2), we can see the parallel involvement of all environmental responsibility processes used by Ukrainian brands. Most companies are just beginning to implement eco-initiatives, but some activists have already achieved positive results in terms of paying attention to social issues both locally and internationally. It is possible to talk about the prospects of Ukrainian business, which can pay attention to the environmentally sustainable fashion industry as business communities and society in general.

However, none of the investigated Ukrainian brands have an environmental responsibility

strategy reflected in the company's goals, mission, values, etc. We only observe individual components of communication initiatives based on environmental initiatives. There is no mention of corporate social responsibility as an official system regulating the processes of brand activities in all analyzed Ukrainian fashion brands. It can be noted that most eco-initiatives have a situational nature, corresponding to the concept of current implementation "here and now" (see Table 1). Therefore, Ukrainian fashion brands need to focus primarily on implementing a comprehensive environmental management system as a separate concept or as a component of an integrated CSR.

Table 1. Types of brands' environmental responsibility

Brand	Eco-concept as positioning	Eco-responsibility as part of CSR	Situational eco-responsibility
Ksenia Shnaider	+		
Bevza	+		
the Coat by Katya Silchenko			+
Litkovskaya			+
NCYZIP	+		
My Sleeping Gypsy	+		

Source: Authors' computation.

To determine the need for the implementation of brand environmental responsibility, an online survey of 50 independent respondents from different age groups was conducted. The purpose of the sociological study is to identify existing and potential consumer needs of Ukrainian

society when purchasing clothing, assess the level of environmental awareness, analyze expectations for the launch of eco-initiatives by Ukrainian fashion brands, evaluate the nature of perception of environmentally responsible brands, and understand which communication

channels contemporary society trusts the most. The demographic data of the participants are as follows: 69.4% are women and, accordingly, 30.6% are men. Age indicators: 40% are aged 20-24 years; 34% are 32+; 14% are 16-20 years old; 8% are 24-28 years old, and 4% are 28-32 years old.

The main group of questions related to consumer characteristics, respondents' attitudes toward Ukrainian manufacturers, ecology, and changes

regarding sustainable development in the fashion industry. The next question of the survey was dedicated to the quality of goods: "What do you pay attention to when buying clothes?", and a whopping 86% of respondents emphasized the quality of products. In second place is attractiveness (64%), followed by the naturalness of materials (54%), compliance with trends (30%), and the environmental friendliness of materials (only 20%) (see Figure 3).

What do you consider when buying clothes?

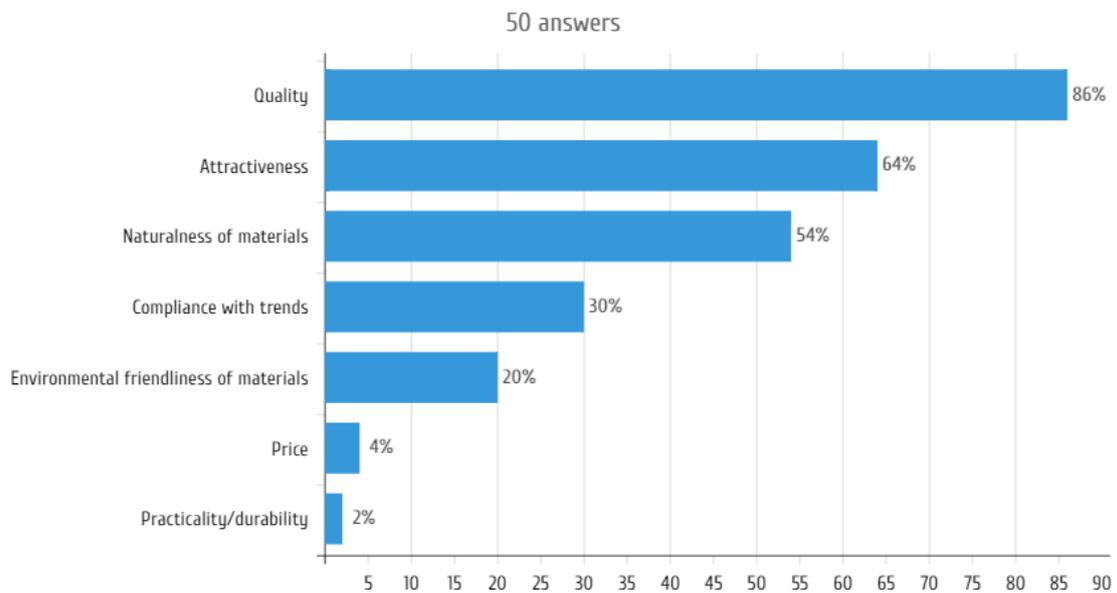


Figure 3. Criteria for choosing clothing by respondents. Source: Authors' computation.

Therefore, quality is the most important criterion for Ukrainian consumers when choosing clothing, while environmental friendliness is the least demanded. Questions regarding the environmental aspects of brands' work focused on the methods of clothing production before

purchase: 81.6% of respondents are not interested in how clothes are made, with only 8.2% willing to learn about the specifics of garment creation. Meanwhile, 6% indicated occasional interest, and 2% would like to show interest in the future. (see Figure 4).

Are you interested in the production methods of clothes before buying?

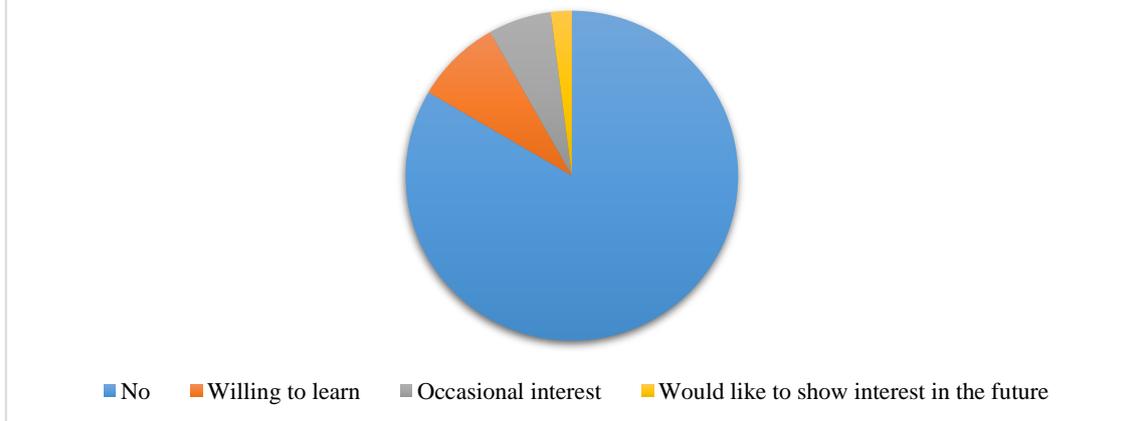


Figure 4. Respondents' awareness of the methods of creating clothes.

Source: Authors' computation.

Considering the almost total indifference of Ukrainian consumers to how manufacturers produce clothing (from what materials, with what equipment, under what conditions, etc.), it is interesting that when asked, "Are you concerned about the environmental damage caused by the fashion industry?" 58% answered "yes," and 38%

answered "no" (see Figure 5). In response to the question, "Do you think Ukrainian fashion brands should pay more attention to their environmental footprint?" 92% answered affirmatively, and 6% expressed indifference (see Figure 6).

Are you concerned about the environmental damage caused by the fashion industry?

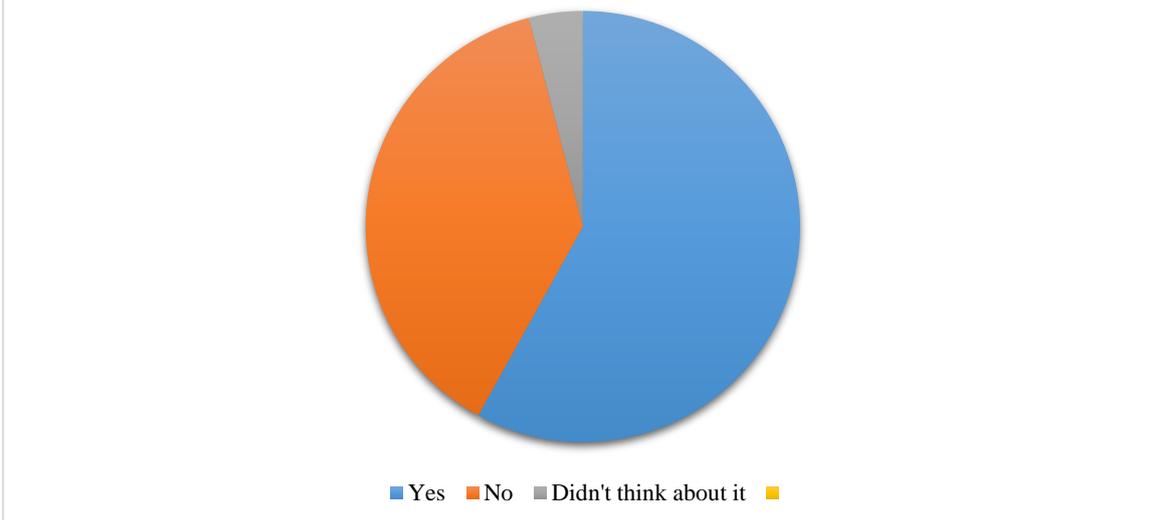


Figure 5. Respondents' attitude towards environmental damage caused by Ukrainian brands.

Source: Authors' computation.

Do you think Ukrainian fashion brands should pay more attention to their environmental footprint?



Figure 6. Respondents' attitude towards the responsibility of Ukrainian clothing manufacturers for the ecological footprint.

Source: Authors' computation.

The survey results reveal a dissonance in respondents' answers to questions regarding the environmental practices of Ukrainian brands, as the first directly relates to the consumer's actual attitude toward one aspect of eco-friendliness in clothing production, while the second and third encompass the global context of the harm caused by the fashion industry to the environment. This is a kind of manipulative tactic because, essentially, all three questions have a similar underlying message but are formulated differently. Society reacts actively to the loud phrases "environmental damage" and "fashion industry" and agrees that the textile industry indeed negatively impacts the environment, so it's worth paying attention to and worrying about. However, when the question is straightforward and doesn't contain any triggers, respondents honestly admit that they are not particularly interested in the methods of clothing production, even though it is one of the key factors that cause the most harm to the environment. In other words, it can be argued that Ukrainian society is indifferent to the environmental threats of the fashion industry, likely due to low awareness.

It's worth focusing on the environmental activities that respondents expect from Ukrainian clothing brands: 68% of survey participants indicate that manufacturers should produce items from environmentally friendly materials, 60%

emphasize adherence to international standards, 50% support measures to promote conscious consumption and the implementation of the "green office" concept. Slightly fewer, 48%, agree on the creation and promotion of eco-projects; 40% are interested in implementing eco-efficient consumption; 34% expect the formulation of environmental goals and their publication on official websites; 30% support collaborations with partners and the publication of environmental reports; 28% advocate for cooperation with NGOs.

Studying the perception of information regarding the environmental activities of Ukrainian fashion brands through communication channels will help understand which dissemination tools are currently more effective. This will help orient in the aspects of developing an environmental concept. Thus, in response to the question "How do you feel about information in the news/internet/social media about the environmental initiatives of Ukrainian fashion brands?" 77.6% of respondents give a positive answer, meaning they believe the company is making an important contribution to sustainable development; 12.2% of respondents do not trust information sources and perceive it as a planned PR campaign, while 10.2% show absolute apathy towards this issue (see Figure 7).

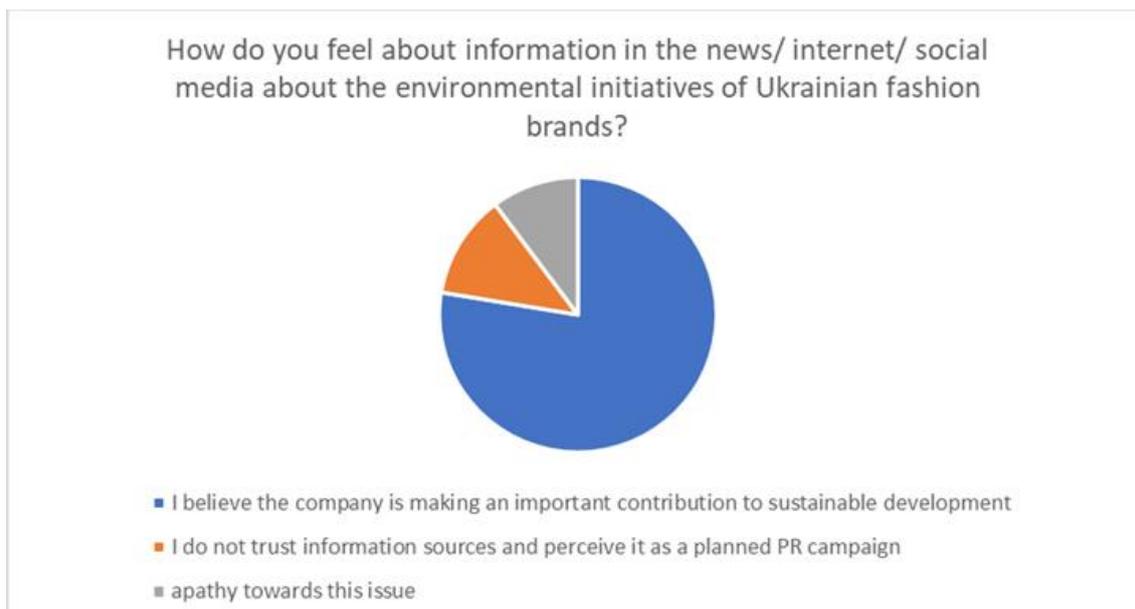


Figure 7. Respondents' perception of information about environmental initiatives of brands in social networks.

Source: Authors' computation.

The online survey also included an open-ended question about respondents' expectations of the environmental activities of fashion brands. In particular, survey participants mentioned the following aspects of their vision of sustainable development: prospects for rapid growth; adherence to European norms and rules; affordability of eco-friendly clothing in terms of pricing policy; environmental responsibility of mass-market brands; creating clothing from recycled materials that will shape the values of conscious consumption and provide a new perspective on waste and excessive consumption; active promotion of conscious consumption. In response to the question "Are you ready to fully transition to conscious consumption?" 54% answered "yes" and 36% answered "no". Additionally, 4% openly responded "50/50" and indicated that they are willing to switch to conscious consumption if it does not force them out of their comfort zone.

More than half of the surveyed respondents stated that they are willing to transition to conscious ecological consumption but on the condition of quality production. As seen from the survey results, the audience is ready to endorse such environmental initiatives by brands that will contribute to building a positive reputation and contribute to the growth of business efficiency and success.

Overall, we can observe the situational implementation of environmental initiatives by fashion brands. Our analysis only confirms the

findings of the international network Pro Bono Club Ukraine (CSR Ukraine, 2021), which were mentioned earlier, regarding the low prioritization of environmental protection projects for businesses. The fashion brands selected for our analysis mostly target not only the Ukrainian audience but also the international one, which is more demanding in terms of business environmental responsibility. Therefore, most of the eco-initiatives of these brands were directed towards external consumers. Ukrainian consumers, as indicated by the results of our sociological research, are less demanding regarding the environmental responsibility of businesses. This suggests that at the moment, the environmental responsibility of brands does not have a significant impact on consumer preference or sales levels.

Conclusions

Based on the results of the study, it can be concluded that the Ukrainian market is only beginning to take environmental issues seriously. In turn, brands have successful corporate responsibility results within global and large enterprises present in the domestic space. In a broader context, issues of conscious consumption and environmentalism are raised by designer brands that, in addition to ecological sustainability, also focus on social initiatives, particularly caring for employees. However, such activities still have a situational character as there is no clear ecological concept within the

comprehensive CSR of Ukrainian fashion companies.

Based on the analysis of the domestic experience of integrating the environmental component of CSR into the activities of fashion brands, as well as the results of the conducted sociological research, we have managed to confirm the hypothesis of this study that a trend is emerging in Ukrainian society regarding the importance of transitioning to conscious clothing consumption. However, consumers are currently exhibiting passive behavior regarding environmental responsibility. This has led to the emergence of a phenomenon where Ukrainian fashion brands are adopting the practices of foreign companies regarding the application of the environmental component of corporate social responsibility during production and sales activities through situational methods, shaping the culture of "eco-fashion." Meanwhile, in the United States and Europe, consumers demand that companies conduct eco-responsible business activities, where neglecting consumer needs can worsen reputation indicators.

Based on the research findings, it can be assumed that in Ukraine, it is necessary to activate the implementation of brand environmental responsibility - raising awareness among Ukrainian society about environmental threats and meeting their interests or even the need for the production of quality clothing from organic materials.

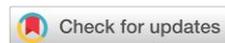
It should not be expected that all fashion brands will be environmentally conscious, just as consumers are not. However, as our research has shown, brands that enter the international market feel the need to develop and implement environmental concepts. The main directions of their future activities include the comprehensive development of the brand's mission, vision, and values as integral components of brand reputation formation. The development and implementation of individual elements forming a comprehensive environmental concept should include:

- Designing environmental responsibility policies;
- Developing a plan of action for joining the UN Global Compact;
- Collaboration with organizations certifying materials and production methods;
- Active informational campaigns promoting conscious consumption and environmental responsibility.

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DOI: <https://doi.org/10.34069/AI/2024.74.02.12>

How to Cite:

Shevtsova, O., Tiahur, L., Tsyhaniuk, L., Kachurynets, S., & Bodnaruk, I. (2024). The role of art education in personality development. *Amazonia Investiga*, 13(74), 143-155. <https://doi.org/10.34069/AI/2024.74.02.12>

The role of art education in personality development

Роль мистецької освіти у розвитку особистості

Received: January 8, 2024

Accepted: February 25, 2024

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Abstract

We consider art education as the result and the very process of a person's assimilation of a system of skills, abilities, and knowledge, and on their basis, the formation of humanistic qualities of the individual, an aesthetic worldview, the development of creative potential, and artistic abilities. Learning, in the unity of developing, motivational, educational, and educational functions, as a process of personal education, is the main way of obtaining art education. Attention is drawn to an important aspect of the educational function of art education – moral education based on the moral component of art. The functions of art education are analyzed in detail and their role in personality development is shown. We conducted an experimental study to verify the created innovative environment of professional training of students in the conditions of the primary educational process for artistic and educational activities for personality development. Due to several developed measures

Анотація

Ми розглядаємо мистецьку освіту як результат і сам процес засвоєння людиною системи навичок, умінь, знань і на їхній основі формування гуманістичних якостей особистості, естетичного світогляду, розвиток творчого потенціалу і художніх здібностей. Навчання, в єдності розвиваючої, мотиваційної, освітньої, виховної функцій, як процес едукативної особистості, є основним шляхом здобуття мистецької освіти. Звернуто увагу на важливий аспект виховної функції мистецької освіти – моральне виховання, що базується на моральній складовій мистецтва. Детально проаналізовано функції мистецької освіти та показано їх роль у розвитку особистості. Нами проведено експериментальне дослідження з метою перевірки створеного інноваційного середовища професійної підготовки студентів в умовах початково-виховного процесу до мистецько-освітньої діяльності для розвитку

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that were applied during the formative stage of the experiment, the creation of just such an innovative environment was realized in the conditions of the primary educational process during the professional training of students for artistic and educational activities.

Keywords: art education for personality development, academic and mass art, music, choreography, design, visual arts.

Introduction

Now the problem of the influence of art education on a person, its social role, and its influence on the formation of a person's worldview is gaining importance. In connection with the acuteness of the problems that have arisen with the crisis-ridden modern society, the determination of the role of art in socialization and the formation and development of the individual is of particular practical significance today. One of the features of modern everyday life, from the point of view of art education in personality development, is the spread of anti-human art in society, which promotes sexual depravity, violence, and other social vices. Art forms a complete personality and forms the order of people's thoughts and feelings. "If the educational value of other forms of social consciousness has a private character: morality forms moral norms, politics – political views, philosophy – a worldview, science prepares a person for a specialist, then art has a complex effect on the mind and heart, and there is no corner of the human spirit that it could not touch with its influence" (Diachenko, 2020).

People have long understood the importance of the humanitarian layer of knowledge. Starting from the V century. to n. e. Socrates gave research priority "not to nature, not to the cosmos, not to the elements, but to the purpose and properties of a person who should see, feel himself as a person, preserving the heritage of the past, creating the present and projecting the future. A special and important place in the system of humanitarian knowledge is occupied by artistic pedagogical education, which belongs to a specific type of science" (Oleksiuk, 2016).

Art education as a holistic system of personality development is based on the fundamental principles of education and national education: conformity to nature, nationalism, cultural conformity, ethnicization, historicism, democracy, and humanism. It is the

особистості. Через низку розроблених заходів, що були застосовані під час формувального етапу експерименту, реалізувалося створення саме такого інноваційного середовища в умовах початково-виховного процесу при професійній підготовці студентів до мистецько-освітньої діяльності.

Ключові слова: мистецька освіта для розвитку особистості, академічне і масове мистецтво, музика, хореографія, дизайн, образотворче мистецтво.

humanization of the educational process, in particular art education, that involves an organic connection and constant strengthening of education with world and European traditions, the origins of national culture, and the achievements of world art (Shulhina & Riabinko, 2017).

The goal of art education is the development of creative abilities, creativity, aesthetic taste, and emotional intelligence of pupils and students. It contributes to the formation of a personality that can express itself through various types of art, understand and appreciate cultural values, and perceive the world through the prism of artistic perception. In the conditions of the modern world, during the period of reorganization of the education system and the educational sphere, which is currently in the most active phase, cultural and artistic education directly plays an important role in the formation of a highly moral and developed creative personality.

Art education contributes to the development of personality, influencing its aesthetic improvement and broadening of the worldview. This contributes not only to personal growth but also to the enrichment of the cultural environment of society, creating new values and raising the quality of life. Art education promotes the development of creativity, imagination, and critical thinking. It gives a person the opportunity to reveal his creative potential and find new, non-standard solutions in various spheres of life. Art stimulates self-expression and inner development, helping to maintain emotional stability and harmony in today's world. Art brings people together, stimulates innovation, and promotes tolerance and understanding. The importance of art education lies in the fact that it forms a harmonious, creative, and conscious personality capable of making positive changes in the world.

Thus, in the article we considered the following urgent questions: the role of art in human development and social life; an important basis of human-centered pedagogy is art pedagogy; content and role of art education in personality development; functions of art education and their role in personality development; conducted experimental research to create an innovative environment for professional training of students for artistic and pedagogical activities.

Literature review

In solving the issue of personality formation and development, great importance belongs to artistic culture in general and, in particular, to art, its spiritual component. Art education has been the subject of philosophical research since ancient times. Now many theories of art differ in their nature, but it cannot be said that its social significance and specificity are fully understood. Modern scientists are mastering and solving controversial issues of the role of art education in personality development.

Thus, the theoretical and methodological point of view was analyzed by O. Krasovska (2017), and the principles of professional training of future specialists in the field of art education were defined; foreign experience is presented and progressive conditions in the professional training of specialists in the European Union countries in the field of art education are highlighted; the stages of development and formation of the practice and theory of art education are outlined; the structural-functional model and concept of the process of professional training of specialists using innovative technologies in the field of art education are proposed; a system of professional training of students was developed with the involvement of modern educational innovations, regarding the implementation of the methodology in the practice of higher education institutions in the field of art education.

Art, a phenomenon of human life, is multifaceted and too complex to be able to create its complete and final theory at a certain moment of personality development. Therefore, A. Diachenko (2020) considers the process of socialization, which contributes to the development of the personality and shapes it, as well as the process of self-realization of the personality, which depends on the development of self-awareness, creative activity, and communication skills of a person to a large extent. All these tasks can be solved by art education, which becomes modern society for a

modern person a way to solve life's difficulties, one of the means of self-realization. The scientist attaches great importance in his research to works of art that affect both the human consciousness and the field of human feelings; considers aspects of the impact of art education on the formation of the worldview of a modern person, proving the importance of the transformative and developmental functions of art education, which revive the role of art for the individual.

The connection "artistic values – artistic cognition – emotional intelligence" by O. Komarovska (2020) was analyzed and the projection on the emotional intelligence of artistic cognition was made. It is shown that common positions are based on emotional skills, which are extrapolated to the recipient's understanding of the emotional world of the work. Artistic cognition is presented "as a permanent process that includes acceptance of the emotional impulses of the work as an objective value, artistic empathy, reflection, self-reflection of impressions, which enables the formation of personal value".

Scientists single out the direction of pedagogy – artistic pedagogy. Thus, O. Oleksiuk (2016) highlights the conceptual foundations of post-classical artistic pedagogy and analyzes the conceptual provisions of the scientific rationalization of artistic pedagogy from the point of view of modern art education, in particular, its paradigmatic nature of changes. Scientists V. Shulhina & S. Riabinko (2017) analyzed the main component of art pedagogy – the creative activity of the individual. In the methodology of their research, in the development of the modern paradigm of art pedagogy, the application of art history and psychological concepts of creativity, as a paradigm of art education, is taken. It was found that "the peculiarity of art pedagogy is determined by the fact that it is at the junction of science and art, as it aims to study the processes of learning and personal education using art".

O. Shramko (2019), topical issues of the purpose of art education and its role in the process of building a modern society are clarified. Using methodological principles (cultural and cultural-philosophical), the author emphasizes the functions of art education, which today outline "strategic directions for understanding the crucial importance of the involvement of the individual in art as a determining factor of influence on the spiritual world of a person and the effectiveness of art pedagogy in the process of spiritual

renewal of society".

The research of N. Huralnyk (2007) is interesting for teachers of the music and pedagogical field, pianists-performers, scientists, students, and graduate students, where innovative systems and methodical and technological teachers-pianists of the last century are analyzed, a generalization of methodical, scientific-theoretical, and practical achievements of representatives of the piano school is proposed XX century in the context of general and musical pedagogy; appropriate periodization was provided and a research project of the main trends in the development of music pedagogy was submitted; the prospects of musical-creative and scientific-pedagogical development of the piano school are determined; directions of its functioning in the cultural and educational space are highlighted.

H. Calderón (2022) emphasizes that art Education continues to be a topic of deep debate in different educational spheres, in search of achieving a place of recognition in the educational field, given the undervaluation it has concerning other areas of knowledge. This qualitative and quantitative research, which is an ex post facto study with a descriptive scope, investigates the epistemological and methodological foundations in teachers, students, and in the documents of self-evaluation and evaluation for accreditation purposes of a Bachelor's degree program in Art Education.

F. Levandowski, S., Alves Collares & D. Camargo (2021) addresses the importance of art in the Pedagogy course, emphasizing research, experimentation, and reflection. The results show that the understanding of children and their potential experienced in Early Childhood Education diverges from the conceptions contained in the guiding documents and those practices that reduce the creation proposals through models and limited material persist, reflecting on the intern's actions.

G. Rodrigues, M. Bortoleto & D. Lopes (2023) emphasize that the study adopted the exploratory research of multiple bibliographic, multimedia sources, analyzed through Interpretive Analysis. The results show that many circus manifestations occur in Basic Education, carried out by artists, teachers, and art educators. The results pointed out that professional artistic presentations; courses, workshops, conferences, and others; Tours-Lessons; extracurricular projects and complementary activities do not constitute school knowledge because they are not articulate with the curriculum.

The modern theory of art education, as well as the development of scientifically based recommendations for the formation of a developed artistically and culturally creative personality, is on the way to identifying the objective regularities of art education.

The researchers considered aspects of the influence of art education on the formation of the worldview of a modern person and proved the importance of the transformative and developmental functions of art education, which revive the role of art for the individual. The connection between "artistic values – artistic knowledge – emotional intelligence" was analyzed. The scientists singled out the direction of pedagogy – art pedagogy, in particular, highlighted the conceptual foundations of post-classical art pedagogy and analyzed the conceptual provisions of the scientific rationalization of art pedagogy from the point of view of modern art education, in particular, its paradigmatic nature of changes. Foreign experience is presented and progressive conditions in the professional training of specialists in the European Union countries in the field of art education are highlighted; the stages of development and formation of the practice and theory of art education are outlined; a structural-functional model and concept of the process of professional training of specialists using innovative technologies in the field of art education are proposed.

Methodology

To show the role of art education in personality development and to verify the created innovative environment of professional training of students in the conditions of the primary educational process for artistic and educational activities for personality development.

Research methods were used in the research process:

- theoretical: analysis of educational, scientific, and methodical literature, systematization, and comparison, which made it possible to outline the directions of development of advanced progressive ideas in this field, to find out the level of scientific development of the research problem, to determine the methodical foundations of the problem; modeling and generalization of professional training of students in the conditions of the primary educational

- process for artistic and educational activities for personality development.;
- empirical: survey, indirect and direct observation, control works, diagnostic methods, which allowed to summarize and systematize the material; a pedagogical experiment (declarative, formative stages) to reveal the real state of professional training of students in the conditions of the primary educational process for artistic and educational activities for personality development;
 - mathematical: (mathematical analysis, processing of melons);
 - statistical: for summarizing, statistical digital processing of the obtained results.

We conducted an experimental study to verify the created innovative environment of professional training of students in the conditions of the primary educational process for artistic and educational activities for personality development.

Research relies heavily on the accuracy and reliability of the data. In research work, the quality of data collection and analysis not only adds weight to the research but also contributes to the formation of sound conclusions, which is the key to academic success.

The following digital data collection tools were useful in the study:

- Google Forms - a simple tool for creating surveys that allows you to collect data from respondents, create different types of questions, and collect answers in spreadsheets.
- SurveyMonkey - a modern survey tool that offers a wide range of customization options and analytical tools for analyzing the collected data.
- JSTOR, Google Scholar, and other academic search engines provide access to scholarly articles, books, and other academic resources that may be useful for literature review and theoretical data collection.
- Zotero or Mendeley - bibliography management programs that help organize research materials, store references, and format bibliographies and citations according to different citation styles.
- Microsoft Excel or Google Sheets - spreadsheets are useful for organizing and analyzing collected data when working with quantitative data.

- SPSS, R, or Python for more advanced data analysis, statistical analysis, and processing of volumes of data.

The total sample size is 84 students of higher education who took part in the experimental study. The control group and the experimental group consisted of 42 respondents. When forming the sample, the criteria of meaningfulness, representativeness, and equivalence were taken into account. The sample was formed by random selection using the technical procedure for calculating the selection step.

The content of the pedagogical experiment, the formative stage, was aimed at: - creating an innovative environment in the conditions of the primary educational process during the professional training of students for artistic and educational activities.

Students with the same level of knowledge were grouped into experimental and control groups. Respondents were offered written work where they had to give answers to questions related to clarifying the theoretical and methodological foundations of art education.

Students were given 0.5 points for each question, for each incomplete answer, and 1 point for a correct answer.

According to the level of knowledge of the respondents, the obtained points were summarized according to the scale:

- elementary level of knowledge - 0.5 - 4 points;
- reproductive level of knowledge 4.5 - 8 points;
- constructive level of knowledge 8.5 - 11.5;
- productive and creative level of knowledge 12-15.

In the process of experimental work, we applied the Kolmogorov-Smirnov statistical criterion to identify differences in empirical data and assess their statistical reliability, which characterize the cognitive readiness of CG and EG students according to the levels of professional-pedagogical skills and knowledge of a methodological-artistic nature. We used this method because we needed to compare two distributions (one empirical distribution with another empirical distribution or an empirical distribution with a theoretical distribution), which allows us to assess the reliability of the differences and find the point where the sum of

the accumulated differences between the two distributions is the most optimal.

Due to a series of developed measures that were applied during the formative experiment, the creation of just such an innovative environment was realized in the conditions of the primary educational process during the professional training of students for artistic and educational activities.

The implementation of the pedagogical experiment was carried out in three stages: preparatory, main, and final.

At the preparatory stage, the purpose and tasks of the research were determined, the experimental plan was developed, methods of measurement and processing of results were selected, control and experimental groups were selected, and their homogeneity was checked.

At the main stage, an experiment was conducted. At the final stage, the results of the experiment were analyzed, their reliability was confirmed, and conclusions were drawn about the pedagogical effect of the experiment.

The reliability and validity of the obtained results, and the objectivity of their assessment were ensured by the methodological soundness of the initial positions and the qualitative mechanism for evaluating the quality under study, the use of a complex of complementary research methods, and the involvement of a group of respondents from a higher educational institution in the analysis of its results.

To assess the homogeneity of experimental and control data, statistical processing was performed using MS Excel and SPSS (Statistical Package for Social Science).

The results of the experimental study confirmed the applicability, optimality, and effectiveness of the proposed pedagogical conditions for the formation of the environmental culture of an ecologist in the process of professional training.

Results and discussion

1. The role of art in human development and social life.

Art plays a huge role in the development of a person and the life of society. It strongly influences the development of personality, being an artistic reflection of reality and forming thoughts, feelings, life principles, and morality.

It is necessary and especially relevant in our time to involve people in art. In the process of the historical development of mankind, art has always occupied the main place in the system of formation of a person's worldview and personality. It was considered as a certain spiritual means, as a part of the world, as knowledge of the surrounding reality. They attached healing importance to all types of art, considering that with the help of art, a person "cleanses" his soul and his body. The modern stage of the development of society provides a young person with various factors that negatively affect the formation of personality in the process of life. A society where pseudo-norms come to the fore, and ethical and moral values and norms lose their meaning, needs a special means of forming consciousness in the young generation. It is the uniqueness, versatility, and inexhaustibility of art and its possibilities that open a new way to the generation of a harmonious personality. For now, the main priority is – disclosure through creativity of the inner world of a person. Art, the importance of which in the education of the young generation is steadily increasing, is a way to solve many life problems of a person, a special means of self-realization of the individual, because it is possible to cope with today's current lack of spirituality and immorality only thanks to the desire to learn about the surrounding world, increase creative potential, and form the perceived importance of universal human values (Diachenko, 2020).

2. An important basis of human-centered pedagogy is art pedagogy.

Separation of art pedagogy into an independent field was proposed and proved the need for such a direction of pedagogy by O.Kuchai & N. Shetelya (2023): "Given the special role of art in the development of a person's ability to make broad creative generalizations of feelings and thoughts, one can argue about the need to separate a new field of pedagogical knowledge and introduce it into scientific circulation of the corresponding concept – "art pedagogy", which has specific means of realizing the goals of education and upbringing in the modern humanitarian paradigm".

The concept of "art pedagogy" is identified with the concept of "pedagogy of art education", which are understood as artistic pedagogical technologies, as laws of creating a powerful cognitive and active field of aesthetic potential (Kuchai & Strityevych, 2023).

An important foundation of human-centered pedagogy is art pedagogy, which determines the guidelines for the development of human-centered pedagogy based on creativity, humanization, cultural relevance, aestheticization, and dialogicity. It should be creativity, not art criticism (Habowski, Milbradt & Conte, 2020).

Art pedagogy is at the intersection of art and science because it aims to study the processes of upbringing and education of the personality, and its development using art. This is the peculiarity of art pedagogy. This is where the connection between artistic creativity and pedagogical science takes place (Yaroslavtseva & Kuchai, 2020). Modern art pedagogy is on the way to developing substantiated scientific recommendations regarding the formation of a developed artistic cultural personality, and the identification of objective patterns of art education and training (Nieto & Balanzó, 2023). The national revival of many states of the modern world is not limited to the restoration of the cultural heritage of previous eras. National revival needs a special vision of national culture. "This is a feat of resurrection of that which does not pass away, has a thorough, universal existence for the nation, and therefore for all mankind. "The path to the four freedoms" proposed by the EU is a path through strengthening the role of culture. It is undeniable that the preservation of the national identity of each state is the main condition for the existence of the EU" (Shulhina & Riabinko, 2017).

In art pedagogy, great attention is paid to the multidimensional characteristics of the spiritual potential of an individual, from the standpoint of revealing essential forces. Delineating in the cultural process the spiritual essential forces of the individual, depending on the social spheres, surpassing the abilities of the person himself in his empiricism, the filling with the content of social life, where the individual is organized, becomes the "concentrates" of the moral, aesthetic, theoretical world attitude, becomes of great importance. The heuristic capacity of the potential can be specified by the formulation of the aesthetic artistic potential, which is "a measure of the possibilities to actualize its aesthetic essential power in a real cultural situation and super-materiality through the ability to integrate a dialogue with the world" (Kuchai, 2015). The socio-cultural potential of artistic activity determines the capacity and significance of the essential forces of the individual. Since the way of human activity in real beings does not exist outside of the whole set

of human relationships, outside of human essential forces, outside of human needs, interests, abilities, and aspirations, "it is part of the essential human forces as their most important component, which characterizes him at the level of a cultural being" (Huralnyk, 2021).

3. Content and role of art education in personality development.

Let's consider the role of art education in personality development and the content of art education, which includes a system of special, cultural, art-historical knowledge and methods of activity, performance, and creation of artifacts, practical and intellectual skills of perception, the experience of emotional and valuable attitude to art and creative activity on a phenomenological basis levels.

Therefore, we consider art education as the result and the very process of a person's assimilation of a system of skills, abilities, knowledge, and, on their basis, the formation of humanistic qualities of a person, an aesthetic worldview, the development of creative potential and artistic abilities.

Learning, in the unity of developing, motivational, educational, and educational functions, as a process of personal education, is the main way of obtaining art education. A person, precisely in the process of learning, learns different ways of activity: the reproductive way (according to the model), the way of transforming activity, and creative activity. Today, art education replaces the traditional informative function with an activity component (Shulhina & Riabinko, 2017).

In the process of aesthetic cognition, art education, developing the goal-oriented sphere of the personality, forms its activity and creative characteristics, on which the following will depend: the significance of its contribution to the process of spiritual renewal of a person and its effectiveness in any sphere of culture of its self-realization.

4. Functions of art education and their role in personality development.

Let's pay attention to an important aspect of the educational function of art education – moral education based on the moral component of art – always, from the present to antiquity, art was considered as a factor of the most important influence on the moral world of an individual. The ancient Greeks, starting from the concept of

kalokagatia (beautiful, morally perfect, good, kind), considered the ideal of education to be the harmony of inner and outer, beautiful, moral, perfect, the unity of beauty and goodness. It is not for nothing that ancient pedagogical systems necessarily included art as the most effective means of correcting and forming character, creating an ethos – a certain psychological attitude. It has always been, is, and will be mandatory to raise a good and beautiful person – a moral and aesthetic ideal of personal perfection. Achieving such an ideal is impossible without the involvement of a complex of dance, music, and poetry, as a necessary component of the formation of a morally stable citizen. The history of humanism speaks of extraordinary attention to the problem of moral education using art (Amorim & Ferri, 2020).

Art education is a phenomenon that has a complex effect on the formation of the spirituality of an individual in mutual complementarity and interconnection and is fundamentally multifunctional. Before revealing the main functions of art education and showing their role in personality development, we note that none of the functions of art education works by itself. And therefore, one cannot be sure of the superiority of any one specific function of art education. Their tasks are solved next to the educational function (allows art to influence the feelings and thoughts of society both individually and in general, and art makes catharsis the formation of an individual's worldview), the following main functions: information-cognitive, communicative, socialization function. (de Carvalho & da Cunha, 2021).

The information-cognitive function is necessary to ensure the process of artistic inheritance and is manifested in the storage, accumulation, systematization of information, and consolidation of the results of the artistic activity of generations, which is transmitted to the next generation in the process of upbringing education and artistic knowledge. rules of life. (Marques & Mendes, 2022).

The communicative function provides in the process of artistic cognition communication, through art and creates a limitless communicative space using the art of live, interactive communication at different levels – intercultural and interpersonal, including non-verbal and verbal ways of communication. In addition, art education, applying the communicative function, provides an opportunity to master the artistic sign systems created by art itself – its own language of art, to

record in them one's own spiritual world, and to assimilate and understand the spiritual world of a certain era and culture, society, and artist recorded in them (Komarovska, 2020).

The function of socialization is the most important of the functions of art education because it ensures the individual's assimilation of values, knowledge, social experience, norms of behavior, and national traditions that correspond to a given culture and a given society. A significant place is given to humanizing or human-creating functions, which gather all the previous ones under a single point of view. In this way, art education appears as a cultural space and a means of developing personality qualities, inherent properties of a spiritually formed personality. The criterion here is the moral and value component fundamental to modern society, which independently determines the content of personal self-realization and the individual responsibility of the subject of culture and its degree for choosing paths, as a unifying integral of the most essential components of the concept of spirituality (da Costa, Marquezan & dos Santos, 2022).

The emotional function ensures the activity of all the listed functions because no function can work if this immanent function of art and education using art is not included in the work, which explains the reason for the effectiveness of art pedagogy and reveals the nature of artistic activity. Emotional involvement in art is based on the emotionality of art education through an artistic image that is capable of creating emotions, awakening personal feelings that make a person empathize, worry, grieve, rejoice, sympathize, etc. and at the same time teach to control emotions. Art makes a person indifferent to nature, to life, to loved ones, etc., precisely by developing the sensual sphere of a person. Therefore, the most powerful means of influencing the process of spiritual formation of the personality is possessed by art education – the emotional power of artistic and figurative understanding of reality. "By awakening and deepening human feelings, art prompts thought to work, forms moral principles, expands the worldview, creates ideals and, ultimately, not only enriches the sensual sphere of a person but also significantly expands the horizons of his consciousness, directly influencing the formation of the spirituality of an individual" (Shramko, 2019).

The following functions of art education solve their tasks in a person's life next to the educational function, information-cognitive,

communicative, socialization function, humanizing or humanizing function, emotional function: social-transformative, compensatory, artistic-conceptual function, predictive, informative and communicative function, aesthetic function, hedonistic function.

Socially transformative and compensatory. These functions are manifested as an ideological and aesthetic influence on the worldview of an individual, which directs a person to purposeful activity. From this point of view, art education encourages humanity to develop, is the driving force of all changes in society, and directs the emergence of the formation of one's own personality and human aspirations for self-development. (Komarovska, 2020).

The artistic-conceptual function makes it possible to understand the artist's thoughts about the world in general through the prism of the artistic work, to see the place of the individual in the world, and to determine the attitude towards the person.

The function of foresight contributes to the art of predicting the future and makes it able to correlate reliably with human intuition. The fact that art itself can predict social changes in society is important.

Informative and communicative functions consist of the fact that each work of art, accessible to a certain circle of people, carries certain information, and art unites people and encourages them to exchange knowledge, communicate, and interact. (Oleksiuk, 2016).

The suggestive function creates conditions for a positive emotional impact of art on human feelings and thoughts, on a person's personality, improving or destroying it.

The aesthetic function of art is an important factor in the formation of abilities, aesthetic taste of a person, his principles, needs, habits, and values. So, we see that art in the world orients a person.

The hedonistic function manifests itself in art in skill and freedom, enabling enjoyment and self-expression. It does not matter whether a person is committed to any art form or whether he loves it. As a conclusion, art is an integral part of society and the life of all people. Art influences and will influence our attitude to life and our outlook – against our will or according to our wishes (Diachenko, 2020).

5. Experimental study.

To create an innovative environment for the professional training of students for artistic and educational activities and the development of personality, we conducted an experimental study (concentrative stage) of the analysis of the formation of the leading components of professional readiness for artistic and educational activities of future teachers.

Students with the same level of knowledge were grouped into experimental and control groups. Respondents were offered written work where they had to give answers to questions related to clarifying the theoretical and methodological foundations of art education.

Students were given 0.5 points for each question, for each incomplete answer, and 1 point for a correct answer.

According to the level of knowledge of the respondents, the obtained points were summarized according to the scale:

- elementary level of knowledge – 0.5 – 4 points;
- reproductive level of knowledge 4.5 – 8 points;
- constructive level of knowledge 8.5 – 11.5;
- productive and creative level of knowledge 12-15.

This distribution makes it possible to say that in CG and EG, future teachers do not have adequate knowledge of methodological and artistic nature to carry out artistic and educational activities.

Only 28.3% of CG respondents and 29% of EG respondents demonstrated a reproductive level and 22.1% of CG respondents and 17% of EG respondents demonstrated a constructive level of knowledge. We note that the percentage of respondents with a productive and creative level is very low (4.3% in CG and 3.9% in EG). We see that the majority of respondents have formed methodological and artistic knowledge at the elementary and reproductive levels.

Summarizing the empirical data obtained as a result of the written work on the identification of students' cognitive readiness makes it possible to say that almost half of the respondents who performed control written work in the field of artistic and educational activities of the future teacher revealed an elementary level of knowledge.

Therefore, we see that the traditionally established approaches to the professional training of future teachers in the field of art education do not allow for the formation of methodological and artistic knowledge at the proper level, and therefore the readiness of future specialists to carry out the process of artistic and aesthetic education and education of students is not formed and the necessary competencies are not formed. This indicates the need to create an innovative environment for the professional training of students for artistic and educational activities and personality development.

In the process of experimental work, we applied the Kolmogorov-Smirnov statistical criterion to identify differences in empirical data and assess their statistical reliability, which characterize the cognitive readiness of CG and EG students according to the levels of professional-pedagogical skills and knowledge of a methodological-artistic nature. We used this method because we needed to compare two distributions (one empirical distribution with another empirical distribution or an empirical distribution with a theoretical distribution), which allows us to assess the reliability of the differences and find the point where the sum of the accumulated differences between the two distributions is the most optimal.

The obtained data make it possible to conclude that 14.4% of CG respondents and 14% of EG respondents frankly admitted that they do not know about the field of art education of teachers, in both groups almost half of the respondents estimate the level of their knowledge about artistic and educational activities as a reproductive level (56.2% in CG and 55.8% in EG). At the same time, in CG, a larger number of respondents indicated that they have insufficient knowledge about the task and purpose of the teacher's artistic and educational activity (68.2%), and in EG, 64.3% of respondents said this.

According to the results, indicators were recorded close to these values in the following aspects:

- in the CG – methods of diagnosing the artistic competence of an individual, functions, directions, content of the teacher's artistic and educational activity, technology of artistic and creative activity and artistic and educational activity, knowledge of art history;
- in EG – features (in the context of using innovative technologies) of the teacher's

artistic and educational activities, tasks, goals, functions, directions of the teacher's artistic and educational activities, and methods of diagnosing students.

18.9% of respondents in the control group and 20.2% of the experimental group assessed knowledge about various aspects of artistic and educational activities at a constructive level. The largest number of respondents (34.4% in CG and 31.9% in EG) showed that they possess knowledge, goals, and tasks at a sufficient level, and know about the methods and forms of artistic and educational activity of the teacher. We claim that future specialists identify the forms and methods of educational work with the methods and forms of artistic and educational activity, the knowledge they have acquired in the process of studying pedagogical courses. So, the diagnosis and the data obtained, based on our research work, indicate that a trend is being observed: in aspects that are specific to artistic and educational activities (mastering the technologies of integrated study of artistic disciplines, artistic and educational activities, artistic and artistic technologies); future teachers indicate the inadequacy of their knowledge level or feel a lack of knowledge.

The data obtained in the course of the experimental work indicate that the students of higher education do not have properly developed general thinking and pedagogical abilities for artistic and educational activities at the stage of the ascertaining experiment. Therefore, they still cannot solve the tasks of professional and pedagogical activity productively, carry out the education of the child, promote his cognitive interests, influence the emotional state, and choose productive tools and mechanisms of pedagogical influence on the personality. Therefore, it is necessary to create an innovative environment for the professional training of students for artistic and educational activities and personality development; need improvement and correction of the program, and professional training plans for future teachers.

Having evaluated the statistical reliability of the differences among students of CG and EG using the Kolmogorov-Smirnov criterion between the levels of formation of the cognitive component, we did not find significant signs of differences between the groups regarding knowledge of general pedagogical and specific technologies of artistic and educational activities and technologies of artistic creativity.

We conducted an experimental study (the formative stage of the experiment) to check the created innovative environment of professional training of students in the conditions of the primary educational process for artistic and educational activities for personality development.

84 students of higher education took part in the experimental study. The control group and the experimental group consisted of 42 respondents. The content of the pedagogical experiment, the formative stage, was aimed at: – creating an innovative environment in the conditions of the primary educational process during the professional training of students for artistic and educational activities.

In the modern conditions of social life, the problem of designing pedagogical reality to increase the efficiency of art education, which made it possible to include the individual in the process of professional training, created conditions for the acquisition of personal and professional competencies during the professional training of students for artistic and educational activities, as well as ensuring social success throughout life, is urgent. In this context, the need to create a special educational environment becomes important.

Due to a series of developed measures that were applied during the formative experiment, the creation of just such an innovative environment for professional training of students was realized.

1. Creation of situations of success and reflection in laboratory, practical, and lecture classes in the conditions of the primary educational process of an innovative environment of professional training of students for artistic and educational activities for personality development, where the special content was based on the technology of cooperation of higher education students and teachers, aimed at consistent enrichment of teacher's pedagogical skills and professional experience of higher education students.
2. Stimulation of spiritual and creative self-improvement, and self-realization of students of higher education through their artistic and pedagogical activities. This aspect involved taking into account the views and attitudes of higher education students towards the artistic and educational activities of personality development, and the formation of a worldview as a system of

3. Individualization and differentiation of the learning process for further artistic and educational activities for personality development using a system of technologies, the basis of which is a person-oriented approach (workshops, problem-based lectures, flipped learning, practical classes, etc.). Providing the educational material with an artistic and educational direction for the development of the personality of a personally meaningful content. Structuring educational material of artistic and educational direction for personality development from the standpoint of organizing independent and search-creative activities of higher education students.
4. Application of active forms of training and methods of the educational process to reflect the capabilities of future specialists in their professional activities in the artistic and educational direction for personality development.

Based on the use of productive and creative technologies of artistic and educational direction for personality development, we organized and conducted a series of laboratory classes in the form of master classes on fine arts, the basics of folk decorative, and applied creativity.

Interactive and intensive technologies were introduced into the educational process: brainstorming, discussions, role-playing and business games and their discussions, training, self-presentations and presentations, creative workshops and master classes, portfolio technology, etc.

At the end of the formative stage of the experiment, the purpose of which was to check the created innovative environment for professional training of higher education seekers in the conditions of the primary educational process for artistic and educational activities for personality development, we have positive changes, which is explained by the effectiveness of the proposed activity approach about the methodological and artistic direction of the content of higher education education.

Thus, if at the end and the beginning of the formative experiment no significant differences were found in the CG, the number of respondents who belong to the constructive and productive-creative level increased to a large extent in the EG.

In EG, at the beginning of the formative experiment, the productive and creative level of readiness was confirmed by 7.5% of the respondents, the constructive level by 13.5%, then at the end of the experiment these indicators were 24.1% and 49.8%, respectively (the increase in these levels is 16% and 29.7%). At the same time, the number of future specialists who demonstrated reproductive (from 47.5% to 22.9%) and elementary (from 28.9% to 8.8%) mastery of the knowledge system in the created innovative environment for professional training of higher education graduates decreased. education in the conditions of the primary educational process to artistic and educational activities for personality development. In the course of the formative experiment, we achieved the highest overall increase among other indicators, which amounted to 23.3%.

The students of higher education, who were in the EG based on the data we received after writing the written work, indicated that at a sufficient level, they know the integrated study of artistic disciplines, the technologies of artistic and educational activities, about the task, purpose, methods and forms of artistic – educational activity of the teacher. Students of higher education indicate that the level of their knowledge of artistic and educational activities for personal development is sufficient and they feel the strength of this knowledge.

Conclusions

In the article, we showed the role of art education in personality development and verified the created innovative environment of professional training of students in the conditions of the initial educational process for artistic and educational activities for personality development.

Attention is drawn to an important aspect of the educational function of art education – moral education based on the moral component of art. The functions of art education are analyzed in detail and their role in personality development is shown (educational, informational-cognitive, communicative, socialization function, humanizing or human-creating, emotional, social-transformative, compensatory, artistic-conceptual function, prediction function, informative and communicative, aesthetic, hedonic function).

We conducted an experimental study to verify the created innovative environment of professional training of students in the

conditions of the primary educational process for artistic and educational activities for personality development. The content of the pedagogical experiment was aimed at checking the created innovative environment in the conditions of the primary educational process during the professional training of students for artistic and educational activities.

In the process of experimental work, we applied the Kolmogorov-Smirnov statistical criterion to identify differences in empirical data and assess their statistical reliability, which characterize the cognitive readiness of CG and EG students according to the levels of professional-pedagogical skills and knowledge of a methodological-artistic nature. We used this method because we needed to compare two distributions (one empirical distribution with another empirical distribution or an empirical distribution with a theoretical distribution), which allows us to assess the reliability of the differences and find the point where the sum of the accumulated differences between the two distributions is the most optimal. Due to several developed measures that were applied during the formative stage of the experiment, the creation of just such an innovative environment was realized in the conditions of the primary educational process during the professional training of students for artistic and educational activities.

The results of the experimental study confirmed the applicability, optimality, and effectiveness of the proposed pedagogical conditions for the formation of the environmental culture of an ecologist in the process of professional training. Further research will be aimed at substantiating the field of pedagogical knowledge "art pedagogy".

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DOI: <https://doi.org/10.34069/AI/2024.74.02.13>

How to Cite:

Biletska, L., Kulyk, O., & Shumak, I. (2024). Insurance of virtual assets: problems of theory and practice. *Amazonia Investiga*, 13(74), 156-164. <https://doi.org/10.34069/AI/2024.74.02.13>

Insurance of virtual assets: problems of theory and practice

Страховання віртуальних активів: проблеми теорії та практики

Received: December 20, 2023

Accepted: January 28, 2024

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Abstract

Many companies use large volumes of virtual assets to run their business, but traditional insurance products are not effective enough to address the unique challenges of virtual assets. In addition, legal regulation in this area is dynamic and ambiguous. This shows that the study of the insurance of virtual assets is an urgent task, as it responds to the modern challenges associated with digital technologies and creates a basis for the development of effective strategies and tools in the field of insurance.

The purpose of the study is to clarify problematic issues in the theory and practice of insurance of virtual assets. The research methodology consists of the following methods: legal analysis method, empirical method, historical method, concept analysis method and argumentation analysis method, system method, analogy method, induction and deduction method.

It is concluded that classic insurance products may be inadequate to solve the unique risks of virtual assets, while there is a need to develop new insurance products that take into account digital threats and losses, becoming a necessity. In addition, the lack of a clear legal framework in the field of insurance of virtual assets creates a consequential gap, and, therefore, the need to develop and implement standards and regulations has become an urgent task for the diversification of legal regulation.

Анотація

Багато компаній використовують великі обсяги віртуальних активів для ведення свого бізнесу, однак класичні страхові продукти є недостатньо ефективними для вирішення унікальних викликів віртуальних активів. Крім того, правове регулювання у даній сфері є динамічним та неоднозначним. Це свідчить про те, що дослідження проблем страхування віртуальних активів є актуальним завданням, оскільки воно відповідає на сучасні виклики, пов'язані з цифровими технологіями та створює базу для розробки ефективних стратегій та інструментів у галузі страхування. Метою дослідження є з'ясування проблемних питань у теорії та практиці страхування віртуальних активів. Методологію дослідження складають такі методи як: метод правового аналізу, емпіричний метод, історичний метод, метод аналізу понять та метод аналізу аргументації, системний метод, метод аналогії, метод індукції та дедукції. Підсумовано, що класичні страхові продукти можуть бути неадекватними для вирішення унікальних ризиків віртуальних активів, при цьому, існує необхідність у розвитку нових страхових продуктів, що враховують цифрові загрози та втрати, стає необхідністю. Крім того, відсутність чіткої правової рамки у сфері страхування віртуальних активів створює важливий прогалину, а тому наголошено на необхідності розробки та впровадження

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Keywords: cryptocurrency, virtual assets, insurance, security, stability, financial market, problematic issues, digital resources.

стандартів та нормативів стає актуальною задачею для урізноманітнення правового регулювання.

Ключові слова: криптовалюта, віртуальні активи, страхування, забезпечення, стабільність, фінансовий ринок, проблемні питання, цифрові ресурси.

Introduction

In the conditions of rapid development of digital society and technological innovations, the issue of ensuring the security of virtual assets is becoming increasingly meaningful. The growing use of digital platforms and virtual tools in business, personal life, and other areas leads to the emergence of new risks that require study and resolution by the insurance sector. Insurance of virtual assets becomes a complex and urgent problem both for the theory and practice of insurance. At the same time, numerous challenges and issues arise related to the development of adequate insurance strategies, perseverance of insurance premiums, risk assessment, and determination of responsibility in conditions of digital uncertainty. In essence, virtual asset insurance opens up a wide area for research in the fields of finance, technology, and legal regulation. With the growing interest in this direction, it becomes noteworthy to develop not only theoretical concepts but also practical tools to ensure the effective functioning of the insurance system of virtual assets in conditions of uncertainty and rapidly changing technological landscape.

The object of research is the insurance of virtual assets, namely the concept, legal regulation, and problematic issues in scientific doctrine and practical application.

This study focuses on the fundamental aspects of the problems and possible ways to solve the issues of insurance of virtual assets, covering both theoretical and practical aspects of this vital issue in the context of today's digital world.

The tasks of the research are as follows:

1. To analyze the features of virtual assets and their regulation in modern conditions.
2. Pay attention to the issue of legal support for insurance of virtual assets.
3. Investigate problematic issues of insurance of virtual assets and consider ways to solve them.

The article consists of an abstract, introduction, methodology, literature review, main text, conclusions and a list of used literature.

The following specific terms were used during the study:

Virtual assets are a term that covers any digital instrument that has a generated value and is suitable for exchange or use for specific purposes.

Insurance risks - a certain event for which insurance is provided and which has signs of probability and randomness of occurrence.

Cryptocurrency is a digital currency designed to work as a medium of exchange through a computer network that is not reliant on any central authority, such as a government or bank, to uphold or maintain it.

Token - a unit of account, which is not a cryptocurrency, intended to represent a digital balance in some asset, in other words, performing the function of a "substitute for securities" in the digital world.

Theoretical framework or literature review

The research of Arkhireyska (2021) analyzed the regulatory and legal regulation of virtual assets in Ukraine. According to the scientists, the issue of regulating the activities of participants in the virtual assets market should be referred to the competence of the NBU and the National Securities and Stock Market Commission. The author also noted that the adoption of the law "On Virtual Assets" is a significant step by the authorities to regulate the market of virtual assets, including the crypto industry.

Antoniv (2022) turned his attention to insurance during the war. In particular, the author came to the conclusion that insurance contracts are valid regardless of the introduction of martial law in Ukraine, with standard force majeure clauses that are also applied in other types of contracts. Instead, the researcher draws attention to the fact

that, as a rule, insurers do not cover "war" risks and exclude war zones and territories not controlled by the government from the insurance territory.

Chichkan (2021) conducted an analysis of the place and importance of state social insurance in the modern system of social protection of the population, indicating the complexity and ambiguity of approaches in this area. It was concluded that, on the one hand, mandatory social insurance is considered as the basis and optimal way of organizing the social protection system, which is based on historical experience, international standards and is recognized in the scientific works of many modern scientists (as stated above). On the other hand, the level of material support provided through mandatory social insurance is not high enough and indicates the need to immediately find ways to improve the functioning of this system.

Behal (2023) considered crypto-insurance as a protection tool. The author notes that there are already mechanisms in the world to insure the risks of crypto companies, including several crypto insurance companies that provide insurance services for cryptocurrency assets and other risks related to cryptocurrencies. However, this market is new and not very developed, so some companies may face problems of receiving insurance payments in case of risks. In Ukraine, for example, such a system does not work at all, and insurance companies do not offer crypto-risk insurance. In another study, Behal and Zarazhevska (2023) reviewed European regulations for cryptos. Ukraine is preparing a new law on virtual assets.

Features of crypto-currency insurance in Ukraine are considered in the work of Gavrilyuk (2019). The major opinion of the author is that the profitability and growth potential of cryptocurrency capitalization, as well as high risks, necessitate the development of an insurance mechanism in the crypto industry. The development of insurance opportunities corresponding to the realities of the development of the digital economy is becoming one of the essential tasks of both the domestic and global insurance industry, which allows for the stable growth of cryptocurrency markets and the digital economy.

Kryvoshlyk and Shkurchenko (2022) investigated the types of cryptocurrency insurance in the world. In particular, it is stated that the types of insurance include: insurance of cryptocurrency storage; crime insurance; general

business insurance for cryptocurrencies; and insurance for decentralized finances. In another work, Kryvoshlyk and Dymnich (2022) investigated cryptocurrency insurance under conditions of legal uncertainty. It was remarked that the future development of cryptocurrency insurance depends entirely on the conditions of legal regulation of the cryptocurrency market in general in the world and, in particular, in Ukraine.

In the study of Lytvyn (2023), the main provisions of the law on the circulation of virtual assets were analyzed. The author has analyzed in detail the issue of taxation and the risks of payments with virtual assets.

Additionally, Makarov & Arzhevitin (2022) examined virtual assets in the context of monetary policy. It is noted that the introduction of the e-hryvnia into circulation as a monetary policy tool with interest accrual will significantly strengthen the interest channel of monetary transmission and contribute to the achievement of the goals set by the central bank and the growth of non-inflationary monetization of the economy. At the same time, the introduction of a third form of money into circulation would probably give rise to new risks, which are proposed to be mitigated by proper parameterization of the new form of money.

Nagaychuk and Tretyak (2018) analyzed the possibilities of using blockchain technology in insurance. It was concluded that the use of blockchain technology in the field of organization of service for policyholders will enable insurers to achieve positive financial results by reducing costs, primarily liquidation, and collection, and increase the efficiency of the company's activities in general. Pavlysh (2022) drew attention to the fact that insurers began to refuse clients who have assets on the FTX exchange.

The question of the future of cryptocurrencies was investigated by Panfilova (2021). The conducted research showed that cryptocurrencies and digital assets will continue to be the subject of intensive reformative legal regulation, will be in the field of scientific research and will be affected by global economic changes.

The object of Poplavskyi (2016) research is cryptocurrency as an object of economic analysis in insurance companies. It is concluded that at the moment the analysis of cryptocurrencies in insurance companies is not of practical interest in Ukraine due to the position of the state regulator.

Shinkarenko, Rogova, and Panivnyk (2018) drew attention to the peculiarities of regulatory regulation of cryptocurrencies in foreign countries. At the current stage of regulatory development, it can be remarked that there are no unified standards for the regulation of cryptocurrencies in any jurisdiction and each central bank and authorized body is guided by its approaches: from formal permission or the application of general principles of regulation in the field of payments to the complete protection of such activities.

Finally, Miravalls (2021) and Qureshi (2022) investigated the issue of virtual currency insurance and concluded that it is an essential tool for ensuring business and wallet security.

Therefore, from the above analysis of the literature, it can be concluded that currently there are problematic issues regarding the insurance of virtual assets, in particular, the recognition of virtual assets as insurable, as well as the predictability of insurance risks, etc. At the same time, a number of scientists noted that the use of blockchain technology in the field of organization of policyholder service can be progressive and effective in the activities of an insurance company. In general, all authors agree that in today's environment, virtual currency insurance is an important tool to ensure the security of businesses and wallets.

Research methodology

To investigate the problematic issues of insurance of virtual assets, various methods of scientific research were used.

Legal analysis: By using the method of legal analysis, the regulatory regulation and legislation related to insurance of virtual assets was investigated. In particular, the provisions of Regulation (EU) 2023/1114 of the European Parliament and of the Council of 31 May 2023 on markets in crypto-assets, and amending Regulations (EU), the Law of Ukraine "On Virtual Assets"¹⁷ and the draft Law on Amendments were analyzed to the Tax Code of Ukraine and other legislative acts of Ukraine regarding the regulation of the turnover of virtual assets in Ukraine. Overall, the legal analysis indicates that while there are some regulatory frameworks in place for virtual assets in Ukraine and the EU, specific provisions addressing the insurance of virtual assets may be lacking. There is a need for further development and refinement of laws and regulations to ensure adequate protection for individuals and businesses holding

virtual assets and to facilitate the growth of the insurance market in this area.

Empirical method: The empirical method made it possible to conduct several observations on the change in the attitude of countries to cryptocurrency and its regulation. Thanks to the benefit of this research method, it was analyzed how the position regarding the need to insure virtual assets is developing. The empirical findings underscore the dynamic nature of attitudes towards insuring virtual assets and the importance of ongoing research and analysis in shaping regulatory frameworks and industry practices.

Historical method: The use of the historical method was reasonable for the study of insurance of virtual assets, as it allows considering the evolution of this field at different stages of the development of technology and the insurance market. With the help of this method, the stages of formation and development of insurance of virtual assets were considered, which types of virtual assets underwent changes in their insurance history, and which challenges arose at different stages were determined. The evolution of laws and regulations related to the insurance of virtual assets was also considered. Determining how the legal environment influenced the development of the insurance market and how it adapted to technological changes. The historical method provided a comprehensive understanding of the insurance of virtual assets by contextualizing its development within broader historical trends and regulatory frameworks. It shed light on the challenges faced, the adaptations made, and the trajectory of future developments in this evolving field.

Logical analysis: Logical research methods for solving problems and studying particular aspects of the research object played a significant role in the research. In particular, the concept analysis method was used to uncover and clearly define key terms and concepts related to virtual asset insurance. This made it possible to clarify the understanding of the research subject and create a logical basis for the analysis. The argumentative analysis method facilitated the consideration of arguments that support or refute specific claims regarding virtual asset insurance. Logical research methods enhanced the rigor and coherence of the study, enabling researchers to systematically analyze and interpret the complexities of virtual asset insurance. By clarifying key concepts and evaluating arguments, researchers advanced understanding

in this area and contributed valuable insights to the field.

System method: The system method made it possible to consider the insurance of virtual assets as a complex phenomenon. Thus, the interaction of various components of the system was studied, their structure was determined, and principal elements were identified.

Analogy method: The analogy method is utilized to compare the insurance of virtual assets with known situations. This can help in understanding the essence of the problem and exploring possible solutions. For example, an analogy was drawn between the insurance of real and virtual assets.

Deduction method: The use of deduction to draw logical conclusions from general rules or principles, or the help of induction to draw general conclusions from specific facts or examples, has contributed to the comprehensive investigation of theoretical and practical issues in cryptocurrency insurance. The combination of deduction and induction in the investigation of cryptocurrency insurance facilitated a holistic and nuanced analysis of both theoretical frameworks and real-world phenomena. By employing these logical methods, researchers were able to generate valuable findings and recommendations that contribute to the advancement of knowledge in the field of cryptocurrency insurance.

Results and discussion

Regarding the features of virtual assets and their regulation in modern conditions

The emergence and spread of virtual assets are attracting the attention of researchers around the world. The use of virtual assets for settlement, accumulation of capital, and obtaining speculative profits occurs against the background of competition with public fiat money. This creates competition with government fiat money, breaks the central bank's monopoly on money issuance, and poses a threat to financial stability. The issue of regulation of virtual assets is becoming extremely relevant for our country since Ukraine occupies a leading place in the world ranking of countries in possession of cryptocurrency.

Virtual assets and their circulation determine the need for insurance as an integral part of the existence of cryptocurrencies. To minimize possible losses associated with the instability of

this market, they actively consider insurance as an effective tool. Among the risks and threats that can lead to the loss of funds on crypto exchanges, the following should be considered:

- 1) Cryptocurrencies are characterized by high volatility compared to traditional assets.

In this context, insurance can help compensate for losses associated with sharp price fluctuations in the cryptocurrency market.

- 2) Cyber Attacks and Fraud.

Insurance can protect against financial losses in the event of cyber attacks and fraud.

- 3) Risks associated with attacks on infrastructure and supply chains.

Insurance helps in restoration of functioning and compensation of losses in case of hacker attacks.

- 4) Security risks associated with password theft and unauthorized access to accounts.

Insurance can provide protection against financial loss due to the compromise of personal accounts.

- 5) Use for Gambling and Money Laundering:

Insurance can help detect and prevent financial crimes in the cryptosphere.

Given these risks and the specifics of virtual assets, insurance can provide the necessary level of protection and peace of mind for cryptocurrency market participants. However, the effectiveness of this tool greatly depends on proper regulation and recognition of its relevance to modern challenges in the field of cryptocurrencies.

Legal provision of insurance of virtual assets

The operation of cryptocurrency exchanges in most countries is still superficially regulated, and in some jurisdictions, there is no clear and transparent regulation at all. Some countries even ban crypto-assets entirely, but investors still find ways around these restrictions and carry out crypto-trading. In such conditions, the question arises of how to ensure the security of payments, the integrity of accounts, and the confidentiality of data. With the intensive development of technology and the increase in the number of products on the crypto market, attackers are actively trying to attack exchanges, wallets, and

accounts, using methods from password theft to financial fraud. Every day, the cryptocurrency sector faces a large number of threats, risks, and scams, and effective countermeasures are necessary. One of the possible solutions is the introduction of crypto insurance. This type of insurance can provide users, traders, and owners

of crypto exchanges with a certain level of protection and a sense of security. However, the successful implementation of crypto-insurance depends on proper regulation of this sector. Only clear and effective regulation can ensure trust and security in this direction (Behal, 2023).

Table 1.
Legal regulation of insurance of virtual assets

Regulatory and legal regulation	Key provisions
Regulation (EU) 2023/1114 of the European Parliament and of the Council of 31 May 2023 on markets in crypto-assets, and amending Regulations (EU) No 1093/2010 and (EU) No 1095/2010 and Directives 2013/36/EU and (EU) 2019/1937.	<p>Electronic money tokens (EMTs) – tokens representing electronic money; Asset-referenced tokens (ARTs) – tokens linked to assets; All other crypto assets (including service tokens). What is not included in the scope of regulation: Cash, deposits, financial instruments, securitization (raising funds from the placement of asset-backed securities), pension payments in the state and accumulated pension system, insurance products, and virtual assets determined by individual characteristics (NFT).</p> <p>The law is aimed at establishing rules for service providers related to the circulation of virtual assets and determining liability for violations of these rules. It is based on the current standards of the International Anti-Money Laundering Group (FATF). It is important to note that the Law does not regulate the taxation of operations related to virtual assets. The scope of application of the Law is limited to specific legal relationships, in particular cases when:</p> <ol style="list-style-type: none"> 1) The parties determined that the law of Ukraine applies to the transaction, the subject of which is a virtual asset, in whole or in part. 2) Both parties to the transaction relating to the virtual asset are residents of Ukraine. 3) A person conducting transactions with virtual assets in his own interests (recipient of the virtual asset) is a resident of Ukraine. 4) In the case of providing services related to the turnover of virtual assets, the subjects of legal relations must have a registered location or a permanent representative on the territory of Ukraine. <p>(Law 2074-IX, 2022)</p>
Law On virtual assets	

Data provided by Law No. 2074-IX (2022) and European Parliament (2023).

Therefore, from the above analysis (Table 1), the presence of legal regulation of virtual assets can be seen. However, this regulation does not apply to insurance.

In addition, at the beginning of November, a draft law was registered in the Verkhovna Rada, which concerns the specifics of taxation of operations with virtual assets, but does not contain provisions on insurance¹⁹ (Draft Law 10225-1, 2023).

For the implementation of crypto-insurance, a special legal framework is needed, which would regulate the activities of insurance companies in the field of cryptocurrencies and take into account the interests of insurance companies in the relevant market segment (Organization for Security and Cooperation in Europe. (2022)).

It can be reasonably concluded that Ukraine currently does not have the necessary laws and by-laws that would determine the provisions on

crypto-insurance. According to experts, the crypto-insurance market needs further development and improvement of mechanisms that would take into account the specifics of the cryptocurrency business.

On problematic issues of insurance of virtual assets and ways to solve them

Various approaches and types of insurance are used to insure clients against the risks of virtual currencies. For example,

- 1) Insurance of the storage of virtual assets (covers losses related to the storage of cryptocurrencies, which is relevant for wallets, the passwords to which can be lost or forgotten – if the owner loses access to his wallet or cryptographic keys, the insurance can compensate for the losses).
- 2) Protection of crypto-key storage (covers the protection of crypto-key storage, which is critical for the security of crypto-currency

assets, so in case of loss or theft of the keys, the insurance company can compensate the client).

- 3) Key recovery and disaster recovery (insurance can include key recovery and disaster recovery mechanisms to ensure that the cryptocurrency owner never loses access to their assets. This can be important in situations where a password is forgotten or other unforeseen circumstances arise (Allianz Global, 2022).
- 4) Insurance against company closures and bankruptcy (if a company that holds cryptocurrency assets closes or goes bankrupt, insurance can help compensate for the loss of customers who trust this company).
- 5) Indemnity for losses from cyber attacks (insurance may cover losses caused by cyber-attacks, phishing, or other online threats that may result in loss of assets). (HCP National Insurance Services, 2022).

These types of insurance can become important for customers in the world of cryptocurrencies, where the storage and management of assets involve unique risks. Insurance products should be properly designed and regulated to provide effective customer protection in this dynamic market segment (Frost, 2022).

Crime insurance can include coverage for claims by crypto companies for loss of money, securities, inventory, and digital assets.

General business insurance for cryptocurrencies can use classic business insurance policies such as directors and officers insurance and professional indemnity insurance. These contracts can be useful for insuring a business's digital assets and cryptocurrency portfolio. Directors and officers insurance of crypto companies can protect them from claims arising from their actions taken within the scope of their duties (Risk Management, 2023).

Decentralized finance insurance for cryptocurrencies, also known as smart contract insurance, can be an important security element. Smart contracts are used to automate transactions, and a DeFi insurance policy can verify the legitimacy of the software and the correct execution of transactions according to the terms of the smart contract. This simplifies the identification of unforeseen risks and ensures the safety of participants in the cryptocurrency environment.

Although there are various types of insurance in theory, due to the complexity of operating and regulating assets, in practice many problems arise due to the peculiarity of the asset's virtuality.

Risk insurance mechanisms for crypto companies already exist around the world, including several crypto insurance companies that provide insurance services for crypto assets and other risks related to cryptocurrencies. Since this market is new and not very developed, some companies may face difficulties in receiving insurance payments in case of risks. However, such a system does not function at all in Ukraine, and insurance companies do not offer crypto-risk insurance services.

Ukraine faces challenges in the field of insurance of virtual assets, but can solve them with the help of the following measures:

- 1) Insufficient regulation: The government should develop and implement relevant regulations and legislation that will take into account the specifics of virtual assets and insurance in this area.
- 2) Lack of education: Campaigns on the conscious use of virtual assets and insurance can increase the level of education among the population and reduce risks.
- 3) Cyber Security: Ensuring a high level of cyber security is important to prevent theft and cyber attacks that can damage virtual assets. The government should develop and maintain cybersecurity standards and measures.
- 4) Financial stability of insurers: Insurance companies must have sufficient resources and financial stability to indemnify losses related to the loss of virtual assets.
- 5) International cooperation: The government should actively cooperate with international organizations and other countries to share experience and best practices in the field of insurance of virtual assets.

By implementing these measures, Ukraine can ensure the stability and protection of virtual assets of its citizens and businesses, which will contribute to the further development of the digital economy and the innovation sector.

The results of the study show that virtual asset insurance is a complex and constantly evolving issue. There are various types of insurance available, but the market is still new and underdeveloped. In Ukraine, there is no specific

regulatory framework for virtual asset insurance, which hinders the development of the market.

The findings of this study add to the existing literature on virtual asset insurance by providing a comprehensive overview of the current landscape and identifying the main challenges facing the market. The study also offers recommendations for the future development of the virtual asset insurance market.

Conclusions

- 1) According to the first task, it was concluded that virtual assets, such as cryptocurrencies, digital tokens, and intellectual property in electronic form, represent a new class of assets that differ from traditional material resources. This is due to their digital nature, the ability to be anonymous and decentralized, high volatility, and the difficulty of determining value. This necessitates the establishment of new standards and regulations that will take into account their unique characteristics.
- 2) In consonance with the second task regarding the legal provision of insurance of virtual assets, it was supposed that the development of virtual assets requires a clear and adapted-to-reality legal framework to ensure the protection of the rights and interests of the parties in the insurance of virtual assets. Also, note that the development of international standards and cooperation in the field of insurance of virtual assets can improve the efficiency and stability of this field at the global level.
- 3) In line with the third task, the problematic issues of insurance of virtual assets were investigated, and the ways of their solution were considered. It is deduced that the increase in the number of cyberattacks and cybercrime aimed at virtual assets can be avoided with the help of the development of insurance products to cover losses from cyber threats, the expansion of cyber insurance, and the active role of insurance companies in cyber security. The problem of uncertainty in the value of virtual assets can be eliminated by using advanced methods for assessing the risks and value of virtual assets, as well as developing digital risk assessment standards. The lack of insurance products specifically adapted to the requirements of virtual assets is being overcome by the introduction of new insurance products to cover.

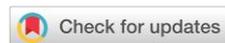
Therefore, insurance of virtual assets is becoming more and more relevant in the context of the development of the digital economy. However, for the proper protection of investors and users, appropriate regulation of both insurance procedures and a common understanding of the definition of "virtual assets" is necessary.

We believe that for the effective functioning of insurance of virtual assets and ensuring the protection of investors and users, it is important to develop appropriate regulation. In particular, it is necessary to clearly define in the legislation that virtual assets are the object of insurance and what are their legal characteristics. Another important condition is the standardization of the terms of insurance policies and the introduction of licensing requirements for insurance companies that provide virtual asset insurance services to ensure their financial stability and compliance with standards. Another important aspect is ensuring the systematic monitoring of the activities of insurance companies in the field of virtual assets and conducting regular audits to verify their activities and compliance with requirements, as well as ensuring the proper protection of the rights of consumers of insurance services of virtual assets, including the right to receive information about insurance conditions and the dispute resolution process. These recommendations can form the basis for the development of effective and safe regulation of insurance of virtual assets, which will promote the development of this industry and ensure the protection of investors and users. Regarding further scientific research, we consider it expedient to analyze the international legal experience of insurance of virtual assets.

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DOI: <https://doi.org/10.34069/AI/2024.74.02.14>

How to Cite:

Atorina, V., Imber, V., Viktorenko, I., Balakirieva, V., & Loboda, O. (2024). Environmental awareness for teachers: A sustainable future. *Amazonia Investiga*, 13(74), 165-179. <https://doi.org/10.34069/AI/2024.74.02.14>

Environmental awareness for teachers: A sustainable future

Екологічна свідомість вчителів: стале майбутнє

Received: December 28, 2023

Accepted: January 28, 2024

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Abstract

The article shows the significance of the formation of environmental awareness of each individual on a global scale. The approach of scientists to the disclosure of the content of ecological consciousness, its structure, and its varieties has been studied. The position of consideration of ecological consciousness is proposed, which is presented from two positions (the first position – based on the acquired experience of ecological being, the awareness of a person's mental sense of personal responsibility; the second position – the phenomenon of ecological consciousness in the "society – nature" system). The main approaches in preparing future primary school teachers for the formation of environmental consciousness are highlighted; principles that ensure the development of environmental awareness of primary school teachers; and components of environmental awareness (technological, managerial, communicative). To verify the

Анотація

У статті показана значущість формування екологічної свідомості кожної особистості у світовому масштабі. Досліджено підхід науковців до розкриття змісту екологічної свідомості, структури та її різновидів. Запропоновано позиції розгляду екологічної свідомості, яка представлена з двох позицій (перша позиція – на основі набутого досвіду екологічного буття, усвідомлення людиною психічного почуття власної відповідальності; друга позиція – феномен екологічної свідомості у системі «суспільство – природа»). Виокремлено основні підходи при підготовці майбутніх учителів початкових класів до формування екологічної свідомості; принципи, що забезпечують розвиток екологічної свідомості учителів початкової школи; компоненти екологічної свідомості (технологічний, управлінський, комунікативний). З метою перевірки сформованості компонентів екологічної

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formation of the components of environmental awareness among students of higher education in higher educational institutions, an experimental study of the formation of environmental awareness among primary school teachers was conducted and the need for the formation of environmental culture among schoolchildren was proven in primary school when a person develops his personality as a future citizen, which proves the relevance of the selected research topic.

Keywords: formation of environmental awareness, future primary school teachers, project activity, primary school, environmental culture.

Introduction

The current ecological crisis in the world actualizes the formation of ecological orientations and attitudes in people and speaks of the need to ecologies the consciousness of the entire society. It is the environmental crisis in the world that has reached a global level, which requires the formation of a solid foundation for the ecological thinking of the individual, which must be provided by environmental education. Therefore, the promotion of fundamental ecological knowledge and the formation of ecological consciousness and ecological culture of each person and society as a whole is the main goal of ecological education. Achieving this goal will ensure the formation of people's ecological thinking, which is necessary today for making economic decisions – ecologically justified at the level of regions, industries, enterprises, each country, and the world in general (Vlasenko, 2019). Therefore, since the solution to urgent modern environmental issues is impossible without changes in the ecological consciousness of the individual, the question of the formation of ecological consciousness today belongs to the global socio-psychological problems. At the same time, primary school plays an important role in the formation of environmental awareness. The primary school itself is the starting point of "abandonment from the destructive consumerist way of life of a person to a thrifty and restorative one (Gabarda Méndez et al., 2021).

The new requirements of society for education, starting from primary school, determine the need for quality training of an ecologically literate generation of young people who can implement an eccentric approach to interaction with nature. The modern Paradigm of education places the education of environmental literacy at the center of educational activity, which leads to the

свідомості здобувачів вищої освіти вищих педагогічних закладів освіти було проведено експериментальне дослідження формування екологічної свідомості у вчителів початкової школи та доведено необхідність формування екологічної культури школярів саме в початковій школі, коли у людини здійснюється становлення особистості як майбутнього громадянина, що доводить актуальність обраної теми дослідження.

Ключові слова: формування екологічної свідомості, майбутні учителі початкових класів, проєктна діяльність, початкова школа, екологічна культура.

formation of environmental awareness and the formation of environmental competence of the individual and society. Fulfillment of this task is impossible without affirming the priority of life forms as a condition for the existence of humanity and, the accumulation of positive practical and scientific experience of the interaction of nature and man (Kotiash, 2019).

The development and functioning of the environment, and the attitude of each person towards it mostly depend on the formation of environmental consciousness, emotional relationships with nature, and the strength of the foundation of primary environmental knowledge formed in primary school age. Therefore, the formation of environmental consciousness among future primary school teachers plays a major role in the training of future primary school teachers in higher education institutions and is the main factor in the development of the ecological culture of the young generation of the world. Our research will focus on such important global issues.

The problem of the formation of environmental consciousness of teachers acquires special importance in the theory and methodology of professional education. Therefore, in the article we considered the main aspects of this problem. Namely: the significance of the formation of environmental awareness of each individual on a global scale; the approach of scientists to the disclosure of the content of ecological consciousness and its varieties; positions of consideration of ecological consciousness and its structure; basic approaches to the formation of environmental consciousness in the preparation of future primary school teachers; principles that ensure the development of environmental awareness of primary school teachers;

components of environmental awareness; the use of project activities for the formation of environmental awareness among primary school teachers; conducted an experimental study of the formation of environmental awareness among primary school teachers.

Literature review

Depending on the orientation of ecological ideas, scientists reveal the essence of ecological consciousness in future specialists, distinguish types of ecological consciousness, show its importance for society, in the educational process investigate psychological and pedagogical problems of the formation of ecological consciousness and age aspects of the problem of ecological consciousness. In particular, V. Rohoza (2020), within the scope of his research, examines the problem of the formation of eco-values among future teachers of natural sciences.

Nowadays, in the process of project activities, the problem of forming environmental competence of the future primary school teacher is relevant. V. Koval & A. Shevantaieva (2018), based on the study of the experience of scientists from different countries, analyzed the essence of the concepts: of "project activity" and "ecological competence". They devoted their research to the justification of the need to use project activities in the educational process to increase the level of environmental competence of future teachers in higher education institutions. The same problem is dealt with by T. Ninova (2018), who considered the concept of "ecological competence" and substantiated the concept of "ecological consciousness". It determined the components and structure of the environmental consciousness of the future teacher and analyzed the survey of students, and future teachers of primary classes to identify their level of environmental consciousness and ecological knowledge.

However, in the discursive field of the scientific investigations outlined above, the problem of the formation of ecological consciousness, its essence, components, and levels of formation was not highlighted. Taking into account the fact that nowadays ecological culture is one of the most important means of socialization of students and a way of their self-realization, all the efforts of the educational process should be directed to the effective use of the necessary levers of its formation, taking into account the existing state of the natural environment, ecological deformations that leave an imprint on

personal sphere, reveal the need for unconditional fulfillment of ecological imperatives and the search for optimal forms of interaction between man and nature.

Contradictions were revealed, indicating the need for future primary school teachers to improve the process of forming environmental awareness. I. Kotiash (2019) also studies the process of training future primary school teachers in a higher education institution. The scientist reveals the content of forming the readiness of future specialists to solve issues of human health preservation, environmental safety, nature protection, and rational use of natural resources. Justifies the need for future primary school teachers to develop a system of environmental knowledge (scientific ideas, concepts, facts, etc.), skills, and abilities; proves the importance of the development of consciousness and ecological thinking, indicates the importance of the formation of an ecological culture, the need to maintain a healthy lifestyle, and the appropriate ecological behavior of the individual in the natural environment. That is, it proves the need for environmental culture, self-awareness, environmental literacy, and the formation of environmental competence of the future primary school teacher, which is a necessary component of the teacher's professional training. Continues the study and consideration of modern approaches to the formation of environmental consciousness of future teachers of primary school N. Vlasenko (2021). The researcher, in the process of teaching the integrated course "I Explore the World", found out the ways of forming the ecological consciousness of future primary school teachers, analyzed the current state of the formation of the teacher's ecological consciousness in the primary school, with the aim of quality education of the young generation, which will be able to rationally reproduce and use natural wealth and coexist harmoniously with nature. It represents the professional training of a teacher by integrating methodological approaches to teaching (activity, axiological, competence, interdisciplinary).

Despite a large number of scientific and scientific-practical developments, in particular, in the field of environmental education, the environmental situation in the world is not only not improving, but also worsening. Awareness of environmental problems and acquired environmental knowledge have almost no effect on the environmental awareness and environmental activities of the individual.

H. Popova & O. Derkach (2021) not only researched the state of development of the concept of "ecological competence of the future primary school teacher", but also derived their own concept, which interprets it as: "an integral quality of the personality, which includes its eco-appropriate characteristics, properties; as a result of environmental education, which integrates relevant knowledge, skills, and abilities, which are the basis for the formation of thinking, consciousness, worldview of an individual; as professional readiness for ecological pedagogical activity.

O. Kuchai, N. Hrechanyk, A. Pluhina, A. Chychuk, L. Biriuk & I. Shevchuk (2022) revealed the content of information culture formation of the future primary school teachers; showed the world experience of using multimedia technologies in the training of future primary school teachers in an open democratic society; researched the forms and methods of introducing multimedia technologies into the educational process. They described the information culture of the primary school teacher and revealed it as "a certain level of information competence of a specialist, which allows him to realize himself in the process of creative information activity through the use of information technologies, prepares him for independent education".

R. Tuay-Sigua, M. Pérez-Mesa & Y. Porras-Contreras (2023) in their study sought to account for the ideas and experiences of teachers in education for sustainable development in the city of Bogotá, Colombia. Based on a qualitative study with an interpretive approach through an open questionnaire, the aim was to investigate educational proposals developed in institutions in urban environments. The results intersect with the proposal of sustainability typologies from the epistemological, axiological, and ontological components.

G. Lucenko, N. Hrechanyk, T. Gavrilenko & O. Lutsenko (2022) analyzed the peculiarities of the formation of research activities of primary school students. The study showed that "the introduction of project work allows the teacher to create a pedagogical situation in which the student formulates a goal and achieves it, while simultaneously developing key skills that will become the basis of their wider learning".

Scientists emphasize that the laid foundations of the formation of environmental consciousness have acquired further development in pedagogy

by the growing relevance of environmental issues and their understanding as a vitally important problem of society.

As a result of the research analysis, we note that the ecological state of the modern planet has caused a deep interest in solving this problem at the level of education. It has been proven that future primary school teachers need to have a high level of environmental knowledge, environmental thinking, and behavior. However, with numerous studies by scientists from different countries, the issue of the formation of environmental consciousness of future primary school teachers has been incompletely covered. A study of the specialized literature on the issue makes it possible to outline several contradictions:

- between the ecological challenges faced by humanity, attempts to solve them, which involve an axiological component, and the ability of modern education to prepare people and society to solve environmental problems measurement;
- between the importance recognized at the level of society and the state environmental values, involving the latter in everyday practice and their real promotion and affirmation, in particular using professional pedagogical education;
- between the requirements of educational standards, which contain value and meaning components of professional competencies of future teachers, and the lack of development of relevant pedagogical technologies for their formation in the process of professional training;
- between the need for effective formation and assimilation of ecological values in the process of professional training of future teachers and inadequately developed pedagogical conditions for ensuring such a process.

Taking into account the relevance of environmental education and the education of schoolchildren, the need to change current approaches to the training of highly qualified teachers, and the insufficient level of scientific and methodical development of the outlined problem, the topic of the article was chosen.

Purpose of the article. To show the significance of the formation of environmental awareness of each individual; single out the main approaches in the preparation of future primary school teachers to the formation of environmental awareness; principles that ensure the

development of environmental awareness of primary school teachers; components of environmental awareness and experimentally verify the formation of environmental awareness of higher education students.

Methodology

The modern ecological state of the planet caused the solution of this problem at the level of education and caused the expansion and deepening of the methodological basis in educational practice.

Methodological approaches to the formation of environmental awareness are the basis of training future primary school teachers.

In the article, we used *research methods*:

- theoretical – comparison and comparison of scientific and methodical sources; analysis of psychological, philosophical, pedagogical, and sociological literature on the researched question, to determine the essence of the main concepts of the research and the possibility of substantiating the conceptual and methodological foundations of the research;
- empirical – pedagogical observation, monitoring, interviewing, questionnaires, conversations, analysis of activity products;
- a pedagogical experiment – to check the effectiveness of the formation of environmental awareness among future primary school teachers.

Statistical methods were used to generalize qualitative and quantitative characteristics, and process, and verify experimental data.

The research was conducted in three stages.

- the diagnostic stage involved the organization of an ascertaining experiment. At this stage, based on the conducted monitoring analysis, we found out the actual state of formation of environmental awareness among future primary school teachers and explored promising ways to improve professional training;
- the content stage involved the accumulation of empirical material on the formation of environmental awareness among future primary school teachers; clarification of the hypothesis and selected research methods; establishment of a structure for the formation of environmental awareness among future primary school teachers;

modeling of the pedagogical system of training future specialists of primary school for the formation of environmental consciousness. Carrying out the formative stage of the experiment;

- the control stage involved the processing, analysis, and systematization of the obtained results, the implementation of factor analysis of the results, statistical processing of the experiment data, their registration, and implementation in the practice of work of higher education institutions.

During the theoretical analysis, we found insufficient attention to such elements of environmental consciousness as interests, needs, attitudes, motives, beliefs, etc., which contribute to the environmental protection activities of students and the orientation of the ecological worldview.

To check the formation of the components of environmental consciousness of higher education graduates of higher pedagogical educational institutions, an experimental study of the formation of environmental consciousness among primary school teachers was conducted.

58 students of the educational degree "Bachelor" took part in the study. During the experiment, diagnostic methods were used: questionnaires and observations to simultaneously cover a certain number of respondents and obtain empirical materials by recording facts and conditions, phenomena where they occur. During the research, we singled out the most relevant elements of the formation of environmental consciousness among students of higher education.

The experiment was conducted at several universities: Oleksandr Dovzhenko Hlukhiv National Pedagogical University; and Vinnytsia State Mykhailo Kotsiubynskyi Pedagogical University. Permission to experiment was approved by the academic councils of these universities and considered by the ethics.

To assess the homogeneity of experimental and control data, statistical processing was performed using MS Excel and SPSS (Statistical Package for Social Science).

Research relies heavily on the accuracy and reliability of the data. In research work, the quality of data collection and analysis not only adds weight to the research but also contributes to the formation of sound conclusions, which is the key to academic success.

The following digital data collection tools were useful in the study:

- Google Forms – a simple tool for creating surveys that allows you to collect data from respondents, create different types of questions, and collect answers in spreadsheets.
- SurveyMonkey – a modern survey tool that offers a wide range of customization options and analytical tools for analyzing the collected data.
- JSTOR, Google Scholar, and other academic search engines provide access to scholarly articles, books, and other academic resources that may be useful for literature review and theoretical data collection.
- Zotero or Mendeley – bibliography management programs that help organize research materials, store references, and format bibliographies and citations according to different citation styles.
- Microsoft Excel or Google Sheets – spreadsheets are useful for organizing and analyzing collected data when working with quantitative data.
- SPSS, R, or Python for more advanced data analysis, statistical analysis, and processing of volumes of data.

Results and discussion

1. The significance of the formation of environmental awareness of each individual on a global scale.

In the 21st century, the priority of ecological education for the younger generation and all layers of society has been determined. On a global scale, great importance is attached to environmental education and the formation of environmental consciousness of each individual. The Cabinet of Ministers of the European Union issued a resolution defining the priority tasks of environmental education: raising public awareness of environmental safety issues; ways to overcome pollution in the environment are proposed, among which the foundations of active, full-fledged participation of every person in preserving the environment are laid.

The European Parliament, starting in 1993, emphasized the mandatory introduction of the environmental component into all educational spheres and directed the training of teachers to the ecological education of young people. One of the main tasks of the Fifth European Community Environment Program was to integrate the ideas of environmental policy into all spheres of life of

the population. The educational policy of Great Britain, Denmark, Spain, Germany, Sweden, and Finland states the fact that it is in these countries that environmental education is of great importance for all areas of the population, and special attention is paid to the professional training of teachers, in particular in primary schools, for environmental education children J. Castera, P. Clement, F. Munoz, F. Bogner studied: features of the environmental attitude of teachers when working at school; the influence of higher education in training future teachers on the formation of environmental awareness, key competencies, value systems, behavior in the natural environment, etc. and proved the importance of environmental education in teaching and developing the environmental awareness of each individual (Castera et al., 2018). Forstner-Ebhard's research is interesting and important, which substantiates the importance of the "Green Pedagogy" course, which is available in Europe, which helps "to ensure a holistic view of environmental problems, to form an indifferent attitude towards the environment" (Millán, 2021). To implement the "Green Pedagogy" course, the following teaching methods are used: trips and excursions, case studies, problem-based learning, the use of media and interactive learning, experimental work, and reflective evaluation of each completed task. The formation of ecological awareness should begin with empathy for living and non-living nature, studying the environment, and understanding its interrelationships (Cárcamo-Vásquez & Gubbins-Foxley, 2023).

The most important link in the system of continuous environmental education, which should carry out the formation of the ecological consciousness of each individual, is the elementary school, where the teacher lays the foundations of a responsible, conscious attitude to personal and social value, to the natural environment. And it is possible only under the condition of appropriate professional training of teachers (Kotiash, 2019).

2. The approach of scientists to the disclosure of the content of ecological consciousness and its varieties.

Ecological awareness contains a set of theories, views, and emotions that reflect the problems of coexistence (relationship) of nature and society in terms of their optimal solution to the possibilities of nature and the specific needs of society. Ecological consciousness is defined from the practical side as:

- awareness by society (individuals) of the negative consequences of the environmental crisis;
- aggravation of the ecological situation;
- the habit, concerning nature, the ability to act in such a way as not to disturb the cycles and connections of the natural environment;
- promote environmental protection;
- improvement and restoration of natural resources for the sake of future generations, not just their current existence.

It is the development of the ecological consciousness of each person that determines his activity, his behavior, and the ecological culture of the individual. A person reveals his own attitude to his living environment through consciousness, he can adapt nature to his own needs, change nature, and adapt to the surrounding world space (Vlasenko, 2019).

Therefore, environmental consciousness is defined as awareness by society or a person of the negative consequences of the development of the ecological crisis of society; aggravation of the ecological situation; the habit and ability to act in nature so as not to disturb the cycles and connections of the entire natural environment; to contribute to environmental protection and its improvement.

We substantiate the varieties of ecological consciousness (anthropocentric, ecocentric).

Anthropocentric ecological consciousness is characterized by the following postulates:

- Man is the highest value;
- nature is the object of one-sided human action;
- nature is the property of man;
- the nature of the goals and motives of interaction between nature and man is pragmatic.

Ecocentric ecological consciousness is characterized by the following postulates:

- human understanding of the essence of environmental problems, their sources, and the nature of society's development;
- personal participation of an individual in environmental protection measures;
- awareness of the possibilities and role of environmental education in solving relevant problems;
- the moral responsibility of a person concerning nature;

- the ability to conduct educational work (Prima et al., 2017).

Ecocentric environmental awareness is important in the context of our research. It presupposes a conscious understanding of the importance of environmental education by future elementary school teachers, their valuable, motivated attitude to the identification of ecologically appropriate behavior, nature conservation activities, to manifestations of empathy to problems that constantly arise in the natural environment. The formation of an individual's environmental consciousness takes place under the influence of the close environment, parents, and necessarily in the process of a person's education. It is the personality of the teacher, from primary school with a high level of ecological culture, ecological awareness, and competence, who is a model for students to follow, is a model of appropriate environmental behavior, is a person who will prove to students of the educational space the value of preserving their own health, will instill a caring attitude towards natural resources, which will contribute to the protection of the environment (Popova & Derkach, 2021).

3. Positions of consideration of ecological consciousness and its structure.

In the world, environmental awareness is represented from two positions.

The first position is based on the acquired experience of ecological existence, a person's awareness of a mental sense of personal responsibility.

The second position – the phenomenon of ecological consciousness in the system "society – nature" represents a spiritually established responsibility based on the experience of the ecological existence of the entire society. With this approach, ecological consciousness is a set of ecological knowledge, beliefs, ideas, emotions, and views that reflect the relationship between nature and people, the ecological conditions of an individual's life in the process of relating to nature, the regulation of the "society – nature" system, which takes into account the activities of each person in the natural environment (Barbosa & Costa, 2020).

Environmental consciousness has a three-component structure (Kuchai et al., 2023):

- cognitive component – a mental reflection of the internal environment, social

- environment, natural environment, and artificial environment;
- behavioral component – self-regulation and self-reflection in the environment (technology and interaction strategies);
 - emotional component – attitude to the internal, social, natural, artificial environment.

Deterioration of the ecological situation on a global scale, and aggravation of contradictions in the relationship between nature and society can lead to a violation of the ecological balance, which will create a world catastrophe and this causes anxiety for humanity. Getting out of this situation requires the combined efforts of all humanity and significant social and economic transformations. Harmonization of such relationships is possible only with the development of an environmental awareness of society, which is especially important for the younger generation. Therefore, great attention should be paid to the formation of the environmental consciousness of primary school teachers during studies in institutions of higher education (Vlasenko, 2019).

4. Basic approaches to the formation of environmental consciousness in the preparation of future primary school teachers.

Axiological approach. In the conditions of the educational process, the nature and direction of interaction of future primary school teachers is determined by their value system. The destructive or constructive nature of professional and social activity depends on its correlation with the value orientations of the team, society, other people, and the entire social community. Therefore, in the preparation of future primary school teachers, during the formation of their ecological consciousness, it is important to use an axiological approach.

Active approach. When training future primary school teachers and forming their environmental awareness, an activity approach is necessary for practical experience of environmental activities; formation of independent and professional planning of one's activities depending on the situation; the ability to practically apply environmental knowledge in solving, clarifying, and preventing environmental problems; improvement of the environment; effective study of environmental disciplines.

Competency approach. The introduction of a competency-based approach to the training of

future primary school teachers and the formation of their environmental awareness solves the problem of applying a significant amount of knowledge to solve specific problem situations, life tasks, and theoretical knowledge.

Interdisciplinary approach. Environmental education and the formation of environmental awareness among future primary school teachers require a combination of different disciplines. An interdisciplinary approach and its qualitative application are the main things in solving this problem. In practice, an interdisciplinary approach can be implemented by introducing and developing relevant topics in professional disciplines (Vlasenko, 2019).

In all approaches, there are sensory, intellectual, and activity components that provide the basis of the structure of ecological consciousness as a holistic formation (Kuchai et al., 2017).

Ecological culture formed based on ecological awareness and ecological competence of future primary school teachers is the main condition for the sustainable development of the entire society, and the coordination of social, ecological, and economic factors of development (Zasiekina, 2020).

5. Principles that ensure the development of environmental awareness of primary school teachers.

The highest level of mental reflection of the social, artificial, and natural environment and the inner world of a person is ecological consciousness, which is also a reflection of the role and place of the individual in the ecological world, taking into account the self-regulation of such reflection. Ensuring the development of environmental awareness among primary school teachers is possible if the principles are followed (Vlasenko, 2019):

- reflection (expansion and awareness) of acquired knowledge about natural objects, personal meaning and methods of interaction, subjective attitude, and empathy;
- communication with the natural world;
- identification (identification with objects of nature of oneself);
- modeling in teaching actions, and environmental situations (business environment, plot, simulation, role-playing games);

- activity (participation in a practical orientation in various types of environmental work);
- the creation of an educational ecological environment under the age characteristics of the child to form the ecological consciousness of the individual.

6. Components of environmental awareness.

Let's highlight the main components of environmental consciousness: technological, managerial, and communicative.

The technological component of the environmental consciousness of the future primary school teacher includes the creation of environmental programs; accumulation of practical experience in creating ecological trails; the ability to organize scientific research, educational research, and ecologically oriented activities; implementation of projects; organization of an ecological club of teachers and students of higher education for practice-oriented activities; using the possibilities of all types of pedagogical practice, problem-based, interactive, heuristic educational technologies, computer technologies in environmental education, etc.

The management component of the environmental consciousness of the future primary school teacher exists to obtain results that would correspond to the tasks of ecological education and consists of the ability of the teacher himself to organize various types of joint work of schoolchildren. It is implemented based on interconnected principles of selection of the content of ecological concepts in the management of the system of ecological knowledge. The content of the management component includes justification and selection of one's own model of action; assessment of the professional environmental situation; and implementation of the selected solution. With this approach, environmental education in institutions of higher education is aimed at the development of the personality of a person ready for ecological and pedagogical activities as a professional and individual.

The communicative component of environmental awareness includes the teacher's ability to convey knowledge in an accessible form to younger schoolchildren; and the ability of a future elementary school teacher to learn new environmental knowledge throughout his life. It is based on: knowledge of the means of influence on schoolchildren and the content of environmental awareness, taking into account the

individual, age-specific characteristics of the child, it provides for the preparation of the establishment of relationships "teacher and parents", "children and teacher"; on the ability to build communication and establish relations with schoolchildren based on maximum democracy, cooperation, the desire to establish a democratic way of life while communicating with nature; on the equality of schoolchildren and adults for mutual demands, respect, and trust in nature conservation practical activities (Kotiash, 2019).

7. The use of project activities for the formation of environmental awareness among primary school teachers.

When forming the environmental awareness of teachers in institutions of higher education, it is mandatory to use project activities to ensure the formation of such key competencies as communication, research, information, and others. The method of projects in institutions of higher education combines productive and research activities with the process of acquiring skills and knowledge, based on the personal interests of a person. This approach ensures the integration of knowledge and skills and promotes the implementation of interdisciplinary connections from various educational disciplines. The form of the project can be in the form of presentations for lessons; non-traditional lessons; methodological manuals and recommendations; systematization of the development of didactic games; and development of ecological holidays (weeks, projects). This is inherent in the independent choice by the students of higher education of the methods and means of implementing the idea, project topics, and presentation forms with the aim of quality project work for the future teacher (Koval & Shevantaieva, 2018).

The project is characterized by the following requirements and features:

- use of research methods;
- integration of various learning tools and methods;
- solving an important social problem;
- theoretical, cognitive, and practical significance of the obtained results;
- use of interdisciplinary connections and, a combination of knowledge from different fields (Kuchai & Bida, 2018).

In the process of project activity in institutions of higher education, almost all the work is done by the student (from setting the problem, choosing the topic of the project, and ending with the

analysis of his activity and the presentation). With this approach, the teacher performs the role of a consultant, models various situations, directs the activities of the student of higher education, motivates the student to think, and transforms the educational environment. The use of project activities in the process of training future primary school teachers allows for a form of environmental awareness among primary school teachers, raises the interest of education seekers in nature; develops their creative independence; contributes to the improvement of success and the formation of environmental competence of a specialist due to the expansion, deepening, generalization of educational material; improves the ability to choose the necessary information from various sources; provides a combination of collective and individual activity. Therefore, the application of project activities in the educational process plays a large role in the formation of the environmental consciousness of future primary school teachers and provides opportunities for students to acquire skills and acquire new knowledge (Koval & Shevantaieva, 2018).

8. An experimental study of the formation of environmental awareness among primary school teachers.

During the theoretical analysis, we found insufficient attention to such elements of environmental consciousness as interests, needs, attitudes, motives, beliefs, etc., which contribute to the environmental protection activities of students and the orientation of the ecological worldview.

An experiment was conducted to check the formation of the components of environmental awareness of higher education graduates of higher pedagogical educational institutions. 58 students of the educational degree "Bachelor" took part in the study. We used a complex of psychological, pedagogical, and sociological research methods. During the experiment, diagnostic methods were used: questionnaires and observations to simultaneously cover a certain number of respondents and obtain empirical materials by recording facts and conditions, phenomena where they occur. During the research, we singled out the most relevant elements of students' environmental awareness. Let's analyze the answers to the questions of the questionnaire, which aimed to find out the manifestation of the elements of environmental awareness of higher education students.

The results indicated that the majority of respondents see nature primarily as the environment:

- 33.7% – the habitat of all non-living and living organisms
- 26.8% – human habitat
- 1.0% is an environment hostile to humans

Thus, almost a quarter of future primary school teachers perceive nature in the form of separate components:

- 11.3% – components of inanimate nature
- 17.4% – living nature
- 5.4% of future primary school teachers see nature as their native, close, own
- 3.8% – clean space
- 2.4% – rest
- 2.1% – neglect, dirt
- 1.6% – unclear, hidden

We have found out that the perception of nature has a very wide spectrum in the minds of students: to the hostile environment as a whole and starting from the habitat. After analyzing the data, we claim that the majority of respondents perceive the natural environment in the form of certain of its components.

Investigating the features of future elementary school teachers' perceptions of their environment, it was established that:

- 39.2% – with the image of the infinite and great
- 33.6% of respondents compare nature with the image of spiritual, living, high
- 22.6% – see her in poetic images
- 4.6% associate nature as negative, and destructive

Thus, the analyzed data show that the majority of future primary school teachers have an appropriate attitude towards the environment and a positive attitude towards nature.

The next question was aimed at the feelings that future primary school teachers have about the environmental condition of the area where they live. We got the following results:

- 24.5% – hopelessness
- 20.5% – anxiety
- 15.3% – danger
- 11.1% – dissatisfaction
- 8.8% – uncertainty
- 4.3% – hope
- 2.1% – calming
- 4.0% – no special feelings
- 3.1% – satisfaction
- 3.1% – respect

1.9% – confidence
1.9% – security
1.4% – fear

Therefore, such results highlight negative feelings in the emotional and volitional sphere of future elementary school teachers, they testify to the concern and indifference of their locality to the ecological state. Emotionality in the perception of the surrounding nature by future primary school teachers most often indicated such emotions as joy (21.4%) and pleasure (22.5%). And insignificantly – for emotions of excitement (8.8%), beauty (9.4%), harmony (9.1%), irritation (6.8%), curiosity (4.4%), sadness (6.3 %), boundless sadness (4.3%), indifference (2.7%), shame (4.3%). So, 65% of future primary school teachers showed emotions of beauty, beauty, harmony, which is the basis of environmental awareness and 35.1% of future primary school teachers have negative emotions. Taking into account the chosen specialty of the future primary school teacher, these indicators testify to the positive attitude of students toward nature, and only a third of respondents chose indifference, sadness, and irritation, which indicates an attitude towards nature. So, the research suggests that nature is included in the point of view of their interests, needs, and goals in the category of the most valuable orientations among the majority of respondents.

So, based on the analysis of the typological features of the ecological consciousness of future primary school teachers, it can be concluded that this phenomenon exists in close interaction with all forms of social consciousness, and has an independent scientific status, which consists in the interaction of society and nature. To ensure the effectiveness of the formation of environmental consciousness of future primary school teachers, it is necessary that upbringing and environmental education are aimed at transforming the value characteristics, skills, knowledge, principles, ideals, and attitudes toward the nature of the whole society into the internal worldview plan of the individual.

We, to form the ecological awareness of future primary school teachers, have allocated environmental educational activities, practical training, educational work with students, environmental psychological training, and the creation of ecological pedagogical projects.

During the experimental period, different teaching methods, forms, and different work tools were used. Environmental-pedagogical projects, which contributed to the formation of

environmental awareness of future primary school specialists, played a significant role in solving clearly defined problems. While preparing the material for the project, the students studied psychological and pedagogical literature, a significant volume of scientific environmental literature, applied material from practice, and participated in student conferences, scientific discussions, and round tables.

During the formation of ecological consciousness, it was assumed that students of higher education would be familiarized with the content of ecological consciousness and its structure. Ecological awareness is represented from two positions. The first position is based on the acquired experience of ecological existence, a person's awareness of a mental sense of personal responsibility. The second position is the phenomenon of ecological consciousness in the system "society – nature".

The students discussed the three-component structure of environmental awareness, its varieties, the main approaches in preparing future primary school teachers for the formation of environmental awareness, the principles that ensure the development of the environmental awareness of primary school teachers, the components of environmental awareness (technological, managerial, communicative).

During the experimental work, great importance was attached to the application of project activities for forming environmental awareness among primary school teachers.

When studying professional disciplines, work with information was given a creative ecological character: students of education had the opportunity to define an ecological-pedagogical problem in the content of the work, draw up an activity plan, develop their own methods of solving ecological-pedagogical tasks, put forward a hypothesis based on evaluative judgments, write conclusions to creative work and make generalizations; to analyze the work of other students and self-analysis of one's own activity.

Great attention was paid to: the content of ecological material, clarity, the possibility of considering the studied concept in various aspects, the application of situational and problematic tasks, the formation of intellectual skills in students, conducting reflective training of students, where they creatively approached the solution of ecological and pedagogical tasks, group reflections (video reflections – analysis of

video recordings of lessons and events of environmental orientation.

After conducting such in-depth work on education seekers on the ecological and pedagogical problem, we surveyed students.

As evidenced by the results of the survey of students of higher education, insufficient attention is paid to the formation of environmental awareness during university studies.

So, to the question: "What prevents the successful formation of environmental awareness among future primary school teachers?" education seekers answered differently: insufficient attention on the part of teachers to the formation of environmental awareness among future primary school teachers (31%); detachment of people from nature (48%); rapid scientific and technical progress (20%); a negative example from adults for children in matters of attitude to the environment (54%); insufficient number of hours in the educational process for studying environmental disciplines (12%); insufficient attention of the state to solving environmental problems (9%); 17% of respondents could not answer.

In the course of the experiment with future primary school teachers, it was found that they have insufficient knowledge for the formation of environmental awareness, do not know how to carry out environmental education activities for younger schoolchildren (49%); would like to receive more information about the environmental problems of their area (28%); environmental disasters of a global scale (46%); problems of demographic explosion (13%); on issues of environmental law – 6%; environmental problems of other countries – (33%) and others. 24% of higher education students do not feel the need for additional environmental knowledge and are consciously ready for the formation of environmental awareness in primary school students.

We believe that the formation of environmental awareness among future primary school teachers, and their environmental activity is one of the health-preserving activities of all mankind, as it contributes to the formation of environmental awareness, health-preserving skills, and abilities in primary school students. Under such conditions, it is possible:

- caring attitude towards nature,

- formation of moral and spiritual health, social health, psychological health, and physical health of a person;
- formation of cultural behavior skills,
- interpersonal communication, etc.

Special attention should be paid to the formation of ecological awareness among future primary school teachers and the formation of the environmental culture of schoolchildren in primary school when a person is formed as a future citizen. Therefore, institutions of higher education face the task of forming environmental awareness among future primary school teachers, and their appropriate preparation for carrying out such activities with children.

A literature review is an important task for the researcher, so we made extensive use of information available through published articles or the Internet. Given the volume of literature available, the literature review was subject to substantial bias because only a few studies were included, as the studies thus identified may well be representative of all relevant studies. It was felt that the best way to ensure an objective and unbiased review of the literature was to conduct a review that followed strict guidelines to minimize bias in the selection and interpretation of the reported studies, and generalization of results. Knowing about some of the key published studies helped us. However, we checked that they were all identified using an electronic database search. If not, a careful review of the search strategy identified the reason for this, and the search may have been modified accordingly. Reference lists of all relevant studies identified from the electronic database search that were missed by this search but cited in relevant papers were reviewed.

We will give specific examples of how primary school teachers can raise the environmental awareness of their students. Learning by doing promotes a more frugal attitude to objects, students understand that raw materials are needed for their production of all objects, and this harms the environment. After our conversations about the importance of the environment, the students began to use water and paper more rationally, try to take care of their clothes, save electricity at home and school, and make sure that the front door is closed.

Scientific research and educational work, ecological and local history, educational and cognitive, educational and informational, and environmental protection activities were carried out to develop environmental awareness among

students.

Educational and cognitive activities took place through environmental games, trainings, and participation of students in environmental Olympiads, seminars, and debates.

Scientific and research work covered the implementation of environmental projects, monitoring, experiments, organization of observations, work at the school site, and landscaping of the arboretum.

Educational and informational activities consisted of the release of newsletters, leaflets, appeals to citizens, the presentation of the environmental campaign brigade, and the collection of photo materials.

Environmental and local history and nature protection activities are participation in the environmental actions such as "Plant a tree", "Clean environment", "Save the beauty of the village".

For environmental education, students were involved in work on the school grounds and flower gardens, teachers conducted environmental brainstorming sessions and socializing hours.

Conclusions

The significance of the formation of environmental consciousness of each individual on a global scale has been proven, and the approach of scientists to the disclosure of the content of ecological consciousness, its structure, and its varieties has been investigated.

The position of consideration of ecological consciousness is proposed, which is presented from two positions, and the three-component structure of ecological consciousness is shown. The main approaches in preparing future primary school teachers for the formation of environmental consciousness are highlighted; principles that ensure the development of environmental awareness of primary school teachers; and components of environmental awareness (technological, managerial, communicative).

The necessity of using project activities for the formation of environmental awareness among primary school teachers is shown.

During the theoretical analysis, we found

insufficient attention to such elements of environmental consciousness as interests, needs, attitudes, motives, beliefs, etc., which contribute to the environmental protection activities of students and the orientation of the ecological worldview.

To verify the formation of the components of environmental awareness among students of higher education at higher educational institutions, an experimental study of the formation of environmental awareness among primary school teachers was conducted and the need for the formation of environmental culture among schoolchildren was proven precisely in primary school, when a person develops his personality as a future citizen, which proves the relevance of the selected research topic.

The implications of the research results make it possible to state that primary school teachers can use the results to improve their teaching practice because environmental consciousness forms a worldview in the individual aimed at ensuring environmental protection and is a worthy platform for environmental education, which is a collection of various environmental knowledge, environmental thinking, ecological ethics, ecological culture.

First of all, primary school teachers can use the results to improve their teaching practice, putting into practice such functions of a teacher that are necessary for his work, these are: diagnostic; orientational and prognostic; constructive and design; organizational; informative and explanatory; communicative and stimulating; analytical and evaluative; research-creative.

Secondly, take into account the fact that the development of ecological awareness takes place through the following activities: deepening scientific knowledge in natural disciplines that ensure a responsible attitude to the environment and life; learning independent ecological thinking, finding innovative solutions to problems; promotion of ecological education for awareness of the idea of harmonious interaction between man and nature; involving not only students, but also parents, public organizations, and local authorities in environmental protection activities; formation of a sense of responsibility for the state of the environment. We will provide specific recommendations on the formation of environmental awareness for future primary school teachers. To give the

process of students' familiarization with nature a clear ecological orientation, educational activities should be improved in the following areas:

- 1) eliminate the anthropocentric approach to studying the material;
- 2) highlight such tasks as the development of personal responsibility for the state of preservation of the natural balance of the environment, development of ecologically competent behavior in nature, assimilation of ethical norms about members of society and objects of nature, etc.;
- 3) to provide students with the formation of elementary, but scientifically reliable ecological ideas and concepts, the disclosure of laws existing in nature;
- 4) for students to understand the need to preserve natural balance, they should be brought to the awareness of the general regularity – "Everything in nature is interconnected."

For this purpose, the teacher can apply verbal-symbolic modeling, combine dynamic modeling and verbal-symbolic, offer schoolchildren to solve environmental problems, and familiarize them with the rules of ecologically competent behavior in nature not in the form of moralizing, but by giving them the right to choose a variant of behavior, enable to motivate him, to create such pedagogical situations that will have a significant educational impact, will contribute to the formation of the substructure of a responsible attitude of students to nature.

Further research will be aimed at clarifying the principles that ensure the development of environmental awareness among primary school teachers.

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DOI: <https://doi.org/10.34069/AI/2024.74.02.15>

How to Cite:

Knysh, I., Palshkova, I., Balalaieva, O., Kobernyk, H., & Tiahur, V. (2024). Augmented reality in higher school as a tool for implementation of STEM education. *Amazonia Investiga*, 13(74), 180-192. <https://doi.org/10.34069/AI/2024.74.02.15>

Augmented reality in higher school as a tool for implementation of STEM education

Доповнена реальність у вищій школі як засіб реалізації STEM-освіти

Received: January 9, 2024

Accepted: February 28, 2024

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Abstract

The article provides a meaningful definition of the concepts of STEM technology, STEM education, STEM approach, and STEM training; the meaning and main ways of using elements of augmented and virtual reality for higher education as a means of implementing STEM education are revealed. The purpose of the article is to show the importance and necessity of using elements of augmented reality in higher education as a means of implementing STEM education. As a result, an experimental study was conducted to clarify the state of development and the use of modern innovative technologies in education, clarifying the question – of to what extent modern technologies can effectively organize distance learning, and STEM education in higher education when using elements of augmented reality, which are provided to messengers preference of educators, which

Анотація

У статті подано змістовне визначення понять STEM технології, STEM-освіта, STEM-підхід та STEM навчання; розкрито значення та основні способи використання елементів доповненої та віртуальної реальності для вищої школи як засобу реалізації STEM-освіти. Мета статті – показати важливість і необхідність використання елементів доповненої реальності у вищій освіті як засобу впровадження STEM-освіти. У результаті проведено експериментальне дослідження з метою з'ясування стану розвитку та використання сучасних інноваційних технологій в освіті, з'ясування питання – наскільки сучасні технології можуть дозволити ефективно організувати дистанційне навчання, STEM-навчання у вищій школі при використанні елементів доповненої реальності, яким месенджером надають перевагу освітяни, які

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platforms are used by teachers in working with students of higher education during quarantine, etc. The conclusions summarize the most effective modern technologies for preparing and conducting practical online classes in higher education as a means of implementing STEM education and highlight the most important condition for creating a STEM environment in higher education.

Keywords: elements of augmented reality, higher school, STEM education, students of higher education, modern innovative technologies in education.

Introduction

The growing demand for competent specialists in high-tech industries who can creatively approach complex professional scientific activities and the innovative latest processes of socio-economic development of society contributed to the development and formation of the pedagogical innovation of the 21st century – the educational direction of STEM education, the implementation of which began in 2009 in the USA on at the state level from the "Educate to Innovate" program. Throughout the world, the ideas of the STEM approach in the field of education are supported by many educational systems in different countries (Polikhun et al., 2019).

In the field of education, one of the main factors of innovative activity, one of the priorities of the renewal of education is the strengthening of the role in the training of STEM-education specialists, which is an integral part of the state policy of any country to increase the development of human capital, the level of competitiveness of specialists who can implement qualitatively state innovations through continuous work in the field of education, own professional development and the national economy, which meets the needs of society and the demands of the economy (Drokina, 2023).

The use of modern technologies is one of the main principles of the development of STEM education. Augmented and virtual reality technology, artificial intelligence, virtual assistants, 3D printers, holograms, etc., are the technologies of the future, which now cover the educational sector, and are increasingly becoming the subject of scientific research. In the last century, these technologies were used in special scientific laboratories and were considered science fiction, but today they

платформи використовують викладачі у роботі із здобувачами вищої освіти під час карантину, тощо. У висновках узагальнено найдієвіші сучасні технології підготовки та проведення практичних онлайн-занять у вищій школі як засобу реалізації STEM-освіти та виокремлено найважливішу умову створення STEM-середовища у вищій школі.

Ключові слова: елементи доповненої реальності, вища школа, STEM-освіта, здобувачі вищої освіти, сучасні інноваційні технології в освіті.

gradually fill all spheres of human life (Honcharova, 2021). Nowadays, virtual reality devices have become more common and available, and the task of pedagogy and science has become the search for ways to effectively use this technology. Therefore, the use of elements of augmented reality in higher education as a means of implementing STEM education is relevant, timely, and necessary, which is what our research is aimed at.

The advantages of STEM education are:

1. Integrated training. STEM combines a project-based and interdisciplinary approach that is currently recognized as the best by teachers around the world.
2. Application of acquired knowledge in real life. STEM demonstrates how children can use the information they receive in life. Students will study not just abstract data, they will study a concrete project, and then they will create their own project of a certain product.
3. Development of critical thinking. Schoolchildren should learn to navigate independently even in difficult situations and solve problems without outside help, based on the experience gained, analogies, and generalizations.
4. Confidence in one's own capabilities. The practical implementation of an idea provides moral satisfaction and increases the child's self-esteem.
5. Work in a team. Schoolchildren work together, express their ideas and proposals, discuss, justify their positions, and come to certain conclusions together
6. Increasing interest in technical disciplines. Students will see that being an engineer or a mathematician is not boring at all, but rather fun and interesting.

7. Innovativeness. This is a special approach that allows you to study and apply technologies and sciences at the same time.
8. The direct path from education to career. Shortly, the demand for specialists in such specialties as chemical engineers, computer systems analysts, robotics engineers, nuclear medicine engineers, architects of underwater structures, etc. is expected to increase.
9. Preparation for rapid technical development. One of the main tasks of modern education is to create conditions for the comprehensive development of schoolchildren, taking into account the capabilities of everyone, then STEM education is an ideal option.

STEM education is aimed at maintaining a constant interest and encouraging students to pursue a career and their own research in a certain field. In the article, we highlighted the main aspects of this problem: a meaningful definition of STEM technology, STEM education, STEM approach, and STEM learning; the importance of using elements of augmented and virtual reality in higher education as a means of implementing STEM education; the main ways of using augmented reality in higher education as a means of implementing STEM education; modern technologies for preparing and conducting practical online classes in higher education as a means of implementing STEM education; the most important condition for creating a STEM environment in higher education; the use of elements of augmented reality in higher education as a means of implementing basic competencies in the formation of a STEM specialist.

Literature review

With the transition to new indicators of the quality of maritime education, by which competencies are recognized, the problems of strengthening the practical orientation of professional education, organizing productive independent work, and using modern digital technologies in the educational process. In the system of higher education, the search for new directed professional practice-oriented forms of education has begun, the purpose of which is to effectively ensure the formation of professional competencies of future maritime specialists on principles of electronic, blended learning, continuous education, use of simulation technologies, simulators of augmented, mixed and virtual reality, etc.

The essence, structure, and significance of the competence approach in the system of modern

maritime education, and the peculiarities of the formation of professional competencies in future shipmasters are highlighted in the works of many scientists.

Modern works of scientists are aimed at using the latest technologies in the field of education. Thus, with the aim of quality training of future teachers of STEM disciplines, M. Mintii (2023) improved the content of the professional training of specialists and theoretically substantiated the identified pedagogical conditions of preparation for the application of augmented reality technologies in the professional activity of future teachers of STEM disciplines. A. Drokina (2023) will prove that immersive technologies are a powerful tool for the implementation of STEM education, in particular augmented reality technologies, which make the educational process interactive and exciting, and the use of augmented reality technologies contributes to the intensive search for knowledge in students of education and the formation of cognitive interest in learning and provides the possibility of an effective means of introducing STEM education by future specialists, already during practice, involving them in scientific and technical creativity, stimulating their curiosity.

Dulce-Salcedo, O. V., Maldonado, D., & Sanchez, F. (2022). analyzes the relationship between being exposed to female STEM teachers during secondary education and female graduates' enrollment in tertiary STEM programs.

Buitrago, L. M., Laverde, G. M., Amaya, L. Y., & Hernández, S. I. (2022). emphasize on the results of the reflection shows that: a. in addition to computational thinking, STEM strategies allow the development of 21st-century skills, b. students with disabilities respond in an assertive and motivated way, c. Peer work enriches own and collective learning, d. the greater the number of teachers linked, the more coverage the project reaches.

Bascopé, M., & Reiss, K. (2021) analyze STEM projects conducted in eight schools with children from 4 to 10 years old in southern Chile. The main purpose of the study was to describe and analyze how these projects can affect students' and educators' attitudes and create community capacities to tackle local socioecological challenges.

Macías, W., Rodríguez, K., Arosemena-Burbano, F., & Zhangallimbay, D. (2023) show that the purpose of this study was to

evaluate whether the variables that reside in the consumer's mind, such as brand awareness, associations, and evaluation of choice determinants, are significant in explaining the intention to enroll and recommend a higher education institution.

Laurens-Arredondo, L.A. (2022) evaluates the use of m-learning in university students for STEM learning, in times of pandemic, through the use of a mobile application, which was used by students to determine kinematic variables.

The research of N. V. Horbachenko (2021) showed the need for virtual reality in education to increase its level through immersion and integration with academic disciplines. S. Semerikov, S. Lytvynova & M. Mintii (2020) also analyzed the experience of using augmented reality technology in the educational space; conducted an overview of augmented and virtual reality tools, and showed the expediency of sharing the Unity environment, the Visual Studio programming environment, for visual design, augmented (Vuforia or other) and virtual (Google VR or other) reality platforms related to STEM disciplines. Valuable is the research of S. Lytvynova (2022), who in the field of education identified the key directions of VR research, described the main components characterizing virtual reality (immersion, involvement, interaction) that are characteristic of this technology, in particular: features of conducting practical and laboratory work, which in it is impossible to carry out traditional learning conditions, the development of multisensory learning, the development of the spatial imagination of students of higher education, the improvement of the quality of STEM education. O. Pinchuk & L. Luparenko (2022) revealed ways of practical application of augmented and virtual reality technologies in production, corporate training, and business. In particular, the scientists showed the features of the application of augmented reality technology in the educational process: the application of Khan's generalized model of electronic education; based on augmented reality technology – educational digital content; augmented reality technologies and game activity; with the support of augmented reality technology – a review of educational mobile applications.

So, summing up the use of information and communication technologies in the modern educational process, we can say that an important trend is the use of virtual reality technologies.

Modern works of scientists are aimed at using the

latest technologies in the field of education. Thus, the content of the professional training of specialists has been improved and the pedagogical conditions of training for the application of augmented reality technologies in the professional activity of future teachers of STEM disciplines have been theoretically substantiated; the possibilities of applying augmented reality applications during distance learning in the educational process are described, the possibilities of virtual reality applications are highlighted to form the necessary skills for a career in STEM professions.

As a result of the analysis of practical experience, in the preparation of future teachers for the use of Augmented Reality in higher education as a means of implementing STEM education several contradictions between:

- the need for higher education institutions for teachers who are ready to use Augmented Reality in higher education, and the insufficient level of development of the theoretical and methodological aspects of the application of these innovations;
- the need to intensify the process of using Augmented Reality in higher education and the lack of theoretically grounded pedagogical conditions for its implementation;
- the need for methodical support of the process of using Augmented Reality in higher education and the unsatisfactory state of program content and organizational-methodological support in the practice of higher education institutions;
- the presence of the potential means of using Augmented Reality in higher education and the insufficient level of provision of pedagogical conditions.

The relevance and significance of the problem, the lack of its theoretical and methodical treatment, the need to find practical mechanisms for the use of Augmented Reality in higher education, and the possibility of resolving these contradictions determined the choice of the topic of our article.

The purpose of the article is to show the importance and necessity of using elements of augmented reality in higher education as a means of implementing STEM education.

Methodology

The systematic method was singled out by the general scientific method, which we applied for

a comprehensive study of the features of the use of augmented reality elements in higher education as a means of implementing STEM education.

Theoretical methods were used: comparative-historical – to evaluate the historical-social prerequisites for the formation of a system of using elements of augmented reality in higher education as a means of implementing STEM education; structural – to identify the factors of qualitative changes in the use of elements of augmented reality as a means of implementing STEM education in the conditions of graduate education; classification and systematization of data – to analyze the structure and content of elements of augmented reality in higher education as a means of implementing STEM education; empirical – conducting research and experimental work; analysis of the results of educational activities of higher education applicants and teaching activities; surveys, questionnaires of respondents; expert assessment; observing the activities of teachers and students regarding the use of elements of augmented reality in higher education as a means of implementing STEM education; statistical – processing of experimental data obtained for the purpose of quantitative and qualitative analysis of experimental research results.

We conducted a study in 2022-2023 to find out: the state of development and use of modern innovative technologies in education, to what extent modern technologies can effectively organize distance learning, in particular STEM-learning in higher education using elements of augmented reality, which messengers educators prefer, which platforms are used by teachers in working with students of higher education during quarantine, etc.

Respondents were scientists, teachers of higher education institutions, administrators of educational institutions, and methodologists.

The survey of respondents was carried out by online filling in Google forms, anonymously.

The total volume of the sample is 62 subjects. When forming the sample, the criteria of meaningfulness, representativeness, and equivalence were taken into account. The sample was formed by random selection using the technical procedure for calculating the selection step.

The implementation of the pedagogical experiment was carried out in three stages:

preparatory, main, and final.

At the preparatory stage, the purpose and tasks of the research were determined, the experimental plan was developed, methods of measurement and processing of results were selected, control and experimental groups were selected, and their homogeneity was checked.

At the main stage, an experiment was conducted. At the final stage, the results of the experiment were analyzed, their reliability was confirmed, and conclusions were drawn about the pedagogical effect of the experiment.

The reliability and validity of the obtained results, and the objectivity of their assessment were ensured by the methodological soundness of the initial positions and the qualitative mechanism for evaluating the quality under study, the use of a complex of complementary research methods, and the involvement of a group of respondents from a higher educational institution in the analysis of its results.

To assess the homogeneity of experimental and control data, statistical processing was performed using MS Excel and SPSS (Statistical Package for Social Science).

Research relies heavily on the accuracy and reliability of the data. In research work, the quality of data collection and analysis not only adds weight to the research but also contributes to the formation of sound conclusions, which is the key to academic success.

The following digital data collection tools were useful in the study:

- Google Forms - a simple tool for creating surveys that allows you to collect data from respondents, create different types of questions, and collect answers in spreadsheets.
- SurveyMonkey - a modern survey tool that offers a wide range of customization options and analytical tools for analyzing the collected data.
- JSTOR, Google Scholar, and other academic search engines provide access to scholarly articles, books, and other academic resources that may be useful for literature review and theoretical data collection.
- Zotero or Mendeley - bibliography management programs that help organize research materials, store references, and format bibliographies and citations according to different citation styles.

- Microsoft Excel or Google Sheets - spreadsheets are useful for organizing and analyzing collected data when working with quantitative data.
- SPSS, R, or Python for more advanced data analysis, statistical analysis, and processing of volumes of data.

The results of the experimental study confirmed the applicability, optimality, and effectiveness of the proposed pedagogical conditions for the formation of an environmental culture of an ecologist in the process of professional training.

Results and discussion

A meaningful definition of STEM technology, STEM education, STEM approach, and STEM learning.

STEM education is defined as the educational activity of the subjects of the pedagogical process aimed at improving or forming relevant competencies in higher education seekers. The concept of "STEM technology" is interpreted as modern technological and instrumental-technical means that ensure the mastery of higher education students with scientific research, primary engineering-technological skills, and knowledge, as well as the formation of the values of STEM education in them (Valko, 2020). The origin of the abbreviation STEM from Science, Mathematics, Engineering, Technology (science, engineering, technology, mathematics). New versions of this concept based on STEM have also appeared, the most common of which are: STEAM (technology, science, art, engineering, mathematics), STREAM (robotics, technology, science, engineering, mathematics, art) (Drokina, 2023).

In STEM education, the approach is based on the construction of individual didactic elements, and educational disciplines on an interdisciplinary basis (according to certain topics – integrated learning, not individual disciplines) with the use of the latest innovative educational technologies: social, cognitive and knowledge transfer (Stryzhak et al., 2017).

Immersive technologies are effective means of implementing modern STEM education (eng. immersive – to immerse) – various types of mixing of augmented, virtual, and real reality or technology of partial or full immersion in the virtual world. Immersive technologies are also called augmented reality technologies. They provide the effect of partial or full presence in an alternative space and change the experience in

completely different areas intended for the user. These technologies combine Augmented Reality (AR) and Virtual Reality (VR) or partial or full immersion in the virtual world.

The importance of using elements of augmented and virtual reality in higher education as a means of implementing STEM education.

The use of elements of augmented reality in higher education as a means of implementing STEM education allows combining various types of digital data (video, text, graphics) with objects of the real environment displayed on the screen of gadgets, which provides opportunities for creating an effective innovative educational space. Speaking about the importance and considering the essence of MixedReality, it can be argued that it is a way of embedding non-existent virtual objects into our usual environment, a complex combination of augmented reality and virtual (Oleksiuk & Oleksiuk, 2021). Nowadays, immersive technologies are not systematically implemented in educational practice, but they are only at the stage of selection, design, the approbation of the user environment, and the development of methods for using such an environment (Lytyynova, 2023).

The main ways of using augmented reality in higher education as a means of implementing STEM education.

Let's highlight the main methods of using augmented reality for training students of higher education:

- material visualization;
- interactive activities;
- maximum productivity and efficiency;
- teamwork;
- method of cooperation;
- transparent and fair monitoring of results (Aleksov & Didyk, 2023).

We believe that this classification is the most productive in higher education. It is she who reveals the possibilities of implementing AR in the educational process of higher education students.

The diverse spectrum of AR technologies that exist today requires the future specialist not only to practice their skills well but also to master the methods of their application well in their professional activities.

In any form of STEM education (project, class, quest, hackathon, etc.), the use of augmented reality technologies contributes to the successful implementation of new professional roles by a modern specialist. With this approach, the mentor's role is completely changed to a mentor, facilitator, innovator, and tutor, and higher education students turn into innovators and researchers. A teacher who observes the progress of scientific research introduces innovations into the educational intellectual activity of pupils, inspires and supports them through pedagogical interaction, identifies educational requests, stimulates them to conclusions, helps eliminate shortcomings, and understands their cause.

During STEM classes, students implement a wide variety of ideas, generating them, based on the available materials and the set goal – plan their activities. The features of this approach optimize the educational process as much as possible, allowing the teacher to successfully solve educational tasks of a professional orientation.

STEM projects, which involve integrated research activities of students of higher education: contribute to the critical evaluation of the obtained results, the search for ways to solve problems, the formation of a scientific worldview in students, and the provision of a favorable psychological-pedagogical atmosphere for collective discussions. Students of higher education learn to interact in a team, actively express their opinions, and are not afraid to present their results. The creation of a STEM project involves innovation and multi-subjects since students of higher education comprehensively apply knowledge of engineering, mathematics, etc., using digital technologies (Drokina, 2023).

Modern technologies for preparing and conducting practical online classes in higher education as a means of implementing STEM education.

Let's consider the most important modern technologies for conducting and preparing practical online classes.

Automated, remote access laboratory workshops using network technologies: synthesis of virtual reality, multimedia technologies, and presentations. The value of laboratory practicums is the ability to simulate the work of stand-alone unique equipment of real operating factories, the ability to organize the practical part of the educational process online, to get rid of the

insufficient material base of educational institutions, as problems of individual villages, regions, problems of institutions where there are no large manufacturing enterprises (Plakhotnik et al., 2023).

Smart Virtual Classroom – technology enables the teacher to display drawings, text, presentations, and graphics, create a joint educational product, use the electronic notebook of a student of higher education, monitor knowledge, etc. on an interactive whiteboard.

Game-based learning technology – provides continuous learning that uses the principles of game organization, simulates a real situation, and provides an opportunity to establish a connection between real life and the theoretical material of classes.

Organizing classes in the virtual classroom and creating a program requires the use of modern means of the educational process (Shetelya et al., 2023).

Let's consider some of them.

Web Whiteboard – a white web board that facilitates the creation of graphic content in a team, the organization of "brainstorming", provides an opportunity for several participants to draw diagrams at the same time, and can connect remote participants.

Trello is an online manager that is convenient and greatly simplifies the organization of joint work in a group; provides an opportunity to monitor compliance with the calendar schedule, create tasks by project, comment, attach files, highlight priority tasks with the desired color, create projects and add as many participants as you like.

Breakout rooms are virtual rooms for the organization of simultaneous studies in small groups of higher education seekers. The resource uses modern information and communication technologies for joint work with text and video material.

For education, Google services include an ad-free and free set of tools for teachers and students to effectively and successfully interact, learn, and teach.

Google Google Docs – internet services – text editors that provide an opportunity to make marks on the downloaded image, build a diagram, and quickly draw a block diagram

without leaving the browser. Based on these tables, charts are created that interact with other Google services and are stored in the Google Cloud.

Google services are separate web applications that are interconnected by a repository of all information and a single account, but a browser and an Internet connection are required to access the information.

Google Sites is a simple site builder, available for games to test knowledge, publishing test materials, provides informational material for laboratory work, classes, etc.

Google Forms is an online service that provides various quizzes and surveys, feedback, creation of tests, and questionnaires. The user configures the questionnaire with the required fields, sends a link to it to the participants of the educational process, and receives, based on the answers received, access to statistics. The forms are designed with images and videos to your own taste. A Google table is automatically created when creating a form, in which the results of filling out the form are stored and accumulated. The table serves as a convenient storage and processing of the collected data.

Google Disk is necessary for creating backup copies of your files in the cloud storage and accessing them both from a computer and mobile devices.

Google Mars is an important service for geographers.

Google Alerts is a service for notification and detection of content changes.

Google Body is a visualization of an anatomical 3D model of the human body.

Among the educational community of higher education institutions, Google services are also in demand:

Google Calendar – an online calendar;
Gmail – free e-mail;
Google Docs – online office;
Google Sites – free hosting that uses wiki technology;
YouTube – video hosting;
Google Translate is a translator.

All the Google services mentioned above provide tools for students of higher education and teachers of an educational institution, which are

necessary for joint work and effective communication. Scientific and research virtual sites ensure the creation of a STEM environment in a higher education institution, network interaction of subjects, and mutual learning (Polikhun et al., 2019).

In the educational process of higher school, today, modern technological devices iPhone, iPad, etc. are increasingly used, which provide remote work with online resources through the use of applications Epson, Android, Projection, etc., using wireless technology. These devices make it possible to conveniently and easily receive all the advantages of using modern technologies in the organization of the educational process: seminars, video conferences, presentations, remote classes, control of learning results, etc. Computer-mediated interaction is an advantage. It became popular when the following social networks appeared: Facebook, MySpace, media sites YouTube, Flickr, commercial sites eBay. These Internet projects are well-known and have the following common characteristics: service-oriented design, open APIs, and the possibility of remote hosting of media files and data.

In higher education, devices with the support of virtual and augmented reality (VR/AR) are increasingly popular, which assist in simulating comfortable conditions for acquiring knowledge, while creating with the effect of involvement an innovative environment that the student of higher education perceives through the senses (mobile VR/AR-enabled and software applications, virtual helmets, etc.).

The most important condition for creating a STEM environment in higher education.

A hardware module with software is the most important condition for creating a STEM environment. It consists of:

- software for automating the activities of various services (personnel accounting, accounting of subjects of the information environment, library automation, performance monitoring, etc.);
- general purpose software (spreadsheets, graphic and text editors, etc.);
- information resources of the educational institution (multimedia educational developments, educational and methodical data banks, website, unified databases, document storage, etc.);
- software and methodological support (electronic guides, developmental and

educational computer programs, multimedia encyclopedias, etc.) (Polikhun et al., 2019).

The use of elements of augmented reality in higher education as a means of implementing basic competencies in the formation of a STEM specialist.

The main signs of the formation of digital competence are the ability to manage information, protect data, content, and digital identities; program, access, use, evaluate, filter, create, and distribute digital content; to effectively work with artificial intelligence, devices, programs, and robots.

With a projection on the educational STEM environment, we highlight the main characteristics of a specialist's competence: update and distribution of digital content; critical thinking; combination of methods of activity, classification; and creativity in use.

Working with digital technologies and their content requires a higher education student to have a safe, ethical, responsible approach to the use of innovative tools; and a critical and reflective, open, inquisitive, and perspective attitude towards their development. Therefore, the main competencies in the formation of a STEM specialist are goals; business; creativity; communication; promotional activity; IT (ability); development of interests; self-controlling orientation; awareness of needs; epistemological, informational, knowledge orientation; critical thinking; distribution of digital content, its updating; creativity in use, combination of methods of activity.

The implementation of the STEM education model process in the educational process of a higher school using elements of augmented reality will allow students to develop such STEM competencies as the ability to:

- pose a problem;
- regarding the solution of certain problems, understand the possibility of other points of view;
- to formulate and determine the ways of solving the research task;
- apply knowledge in different situations;
- to develop interdisciplinary projects in the field of STEM education;
- originally solve the problem;
- to monitor and forecast needs that can be realized using STEM;
- apply thinking skills at a high level.

- teach using project method technology, case studies, etc. (Rakhmanina et al., 2022).

Key aspects of the STEM approach in higher education when using elements of augmented reality:

- integration into a single paradigm of the methodology and content of sciences, and modern technologies, in particular, engineering design, information, and mathematical tools;
- by certain topics, and not individual disciplines of the application of integrated education;
- designing programs and curricula on an interdisciplinary basis;
- application of social technologies and cognitive technologies, knowledge transfer;
- training on real technical and technological, socially significant, and economic problems;
- emphasis on the formation of complex engineering and scientific thinking.

The peculiarity and main components of the STEM educational environment. STEM education is based on the use of equipment and modern tools related to electrical engineering, computing, scientific research in the field of energy-saving technologies, energy, technical modeling, informatics, multimedia technologies, automation, robotics, telemechanics, intelligent systems, radio electronics, radio engineering, cosmonautics, aviation, aerospace engineering, etc. In the educational environment, innovations in STEM education relate to all its components – informational and technological, spatial and material, social and personal.

The main components of the STEM education environment are:

- elective courses, integrated training programs focused on the formation of competencies (educators and specialists from certain fields of knowledge must be involved in the creation of creative content, as well as representatives of business and industry);
- practice-oriented training within STEM disciplines and beyond them;
- interdisciplinary principles of education, which solve real practical tasks in conditions of shortage of academic knowledge;
- emphasis on team, project, and group work of students of higher education; dominant organizational forms are integrated classes, projects, quests, excursions, cases, thematic

- days, scientific exhibitions, competitions, hackathons, festivals of engineering projects, etc.;
- zones of activity in the audience: presentation zone, zones of development and interaction, research and creativity, etc.;
- modern teaching aids, containing educational robots-constructors (LEGO Mindstorms, LEGO, Cubelets, MakeBlock, LittleBits, etc.), which create learning in a game form, allow putting forward your own ideas, familiarize yourself with electronics, the basics of robotics, programming, mechanics, with using various sensors for navigation to create complex designs and implement them in practice, microprocessors and programming, digital measuring complexes, network and remote tools of project management and cooperation, which ensure the principle of equal access to quality education for students of higher education and their special needs;
- interaction with parents;
- cooperation and attraction of resources between external participants and educational teams: academic research institutions, institutions of higher education, research laboratories, centers, museums, business structures, enterprises, public organizations, etc.;
- systematic monitoring of the results of educational activities (Polikhun et al., 2019).

Experimental research aimed at clarifying the state of development and use of modern innovative technologies in education.

We conducted a study in 2022-2023 to find out: the state of development and use of modern innovative technologies in education, to what extent modern technologies can effectively organize distance learning, in particular STEM-learning in higher education using elements of augmented reality, which messengers educators prefer, which platforms are used by teachers in working with students of higher education during quarantine, etc.

Respondents were scientists, teachers of higher education institutions, administrators of educational institutions, and methodologists.

The survey of respondents was carried out by online filling in Google forms, anonymously.

The questionnaire questions were as follows.

1. "Do modern technologies in higher education, when using elements of augmented reality, make it possible to effectively organize STEM training and distance learning?" The respondents gave the following answers:
 - "Yes" – 55.8%;
 - "Partly" – 40.5%;
 - "No" – 2.5%;
 - "Difficult to answer" – 1.2%.
2. "Which platforms in quarantine do you prefer when communicating online with students of higher education?" Respondents' answers to questionnaire questions showed that most specialists use it in their work
 - Zoom (65%);
 - Google Meet (64%);
 - Google Classroom (63.5%);
 - Skype (10%);
 - Cisco Webex (1.3%).

Therefore, specialists use Google Meet and Zoom services the most for conducting online meetings. Each of these services has its own disadvantages and advantages, so specialists choose one or the other, depending on goals, wishes, financial capabilities, preferences.

3. "Which messengers do you prefer in professional activities?". The answers to this question were interesting:
 - Viber – 93%;
 - Telegram – 58%;
 - Messenger – 39.5%;
 - WhatsApp – used by 30% of respondents.

An example of conducting various remote activities, using elements of augmented reality in higher education among the STEM community is the permanent festival "STEM Education – Higher School" organized by institutions of higher education.

Each institution of higher education has the opportunity to share the experience of introducing elements of STEM education in the educational space and to present their projects, developments, and ideas.

We believe that, despite the obstacles in the use of modern technologies and elements of augmented reality in higher education as a means of implementing STEM education (a large amount of time spent on mastering new material,

the lack of an appropriate method of using elements of augmented reality in higher education as a means of implementing STEM education, lack of technical support, etc.), educators manage to implement quality education.

Analysis of the challenges of implementing STEM education with augmented reality

With the development of STEM education and the strengthening of the practical component based on the use of digital technologies, the development of STEM centers and laboratories, and the improvement of the qualifications of teachers, the problem of continuous updating and development of methods of using the latest technologies and teaching aids, in particular digital ones such as augmented reality, remains relevant.

Augmented reality promotes creativity, critical thinking, data management, and analysis. The use of immersive technologies in a STEM-oriented environment contributes to the improvement of the quality of education, and the use of forms and methods implemented on the principles of active, purposeful learning - the assimilation of educational material and a greater understanding of the content of education.

Recommendations for teachers who want to implement the implementation of STEM education with augmented reality in their activities:

- development of scientific and methodical foundations for the implementation of STEM education;
- promoting the development of STEM education: analysis of the effectiveness of the process and the dynamics of development, ways to increase the efficiency of the implementation of innovations, identifying problems and forecasting future trends in the development of STEM education;
- organizing and conducting educational events aimed at popularizing STEM education, and career guidance work among young people;
- dissemination of experience and achievements in the field of STEM education through publications, and presentations during educational events of various levels;
- initiation, fundraising, and coordination of innovative educational projects;
- increasing the level of professional skills of

scientific and pedagogical workers and presentation of pedagogical work experience, in particular, within the framework of a STEM school.

Specific examples of how elements of STEM education with augmented reality have been used to enhance student learning.

The educational process using STEM is a new education system. Students of education receive an individual task, compile a list of sources of information, obtain them, filter them for reliability, compare numbers and opinions, select the necessary ones, and start constructing new knowledge. Having received the result, they present it to society (the teacher), having earned a multi-vector assessment in the form of an index of their own personal achievements. According to this STEM methodology, the focus is on a practical task or problem of a research nature, which is significantly different from traditional tasks. Research tasks are formulated in such a way that students do not see an obvious answer, but find it on their own and justify it through trial and error. The task is formulated in the direction of: "investigate", "it's true that if..., then", "analyze"... There is a gradual increase in the independent activity of the students of education: from research works based on the program material, experimentation with topics that go beyond the boundaries of the program to conducting scientific research.

Conclusions

The concepts of STEM technology, STEM education, STEM approach, and STEM training are defined. The importance of using elements of augmented and virtual reality in higher education as a means of implementing STEM education is shown and the main methods of its use are prescribed. Modern technologies for preparing and conducting practical online classes in higher education as a means of implementing STEM education are proposed.

The key aspects of the STEM approach in higher education when using elements of augmented reality, features, and main components of the STEM educational environment are named.

We conducted an experimental study to find out: the state of development and use of modern innovative technologies in education, to what extent modern technologies can effectively organize distance learning, in

particular STEM-learning in higher education when using elements of augmented reality, which messengers are preferred by educators, which platforms are used by teachers in working with students of higher education during quarantine, etc.

Experimental research aimed at clarifying the state of development and use of modern innovative technologies in education has been developed.

Recommendations have been developed for teachers who want to implement augmented reality in their work.

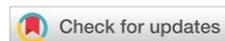
Therefore, the use of elements of augmented reality in higher education as a means of implementing STEM education is an effective tool of the educational space, which contains a huge potential for solving the tasks of the educational process. The perspective of the new educational space of the higher school is the mass introduction of augmented reality technologies in education, as well as the development of methodical and didactic materials for their effective use.

The issue of the organization of distance learning, which is relevant nowadays, needs further research.

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DOI: <https://doi.org/10.34069/AI/2024.74.02.16>

How to Cite:

Husieva, V., Kryvoruchko, L., Pylyp, V., Makarova, O., & Shynkarenko, I. (2024). The offender and the theory of legal personality: International and ukrainian contexts. *Amazonia Investiga*, 13(74), 193-200. <https://doi.org/10.34069/AI/2024.74.02.16>

The offender and the theory of legal personality: International and ukrainian contexts

Правосуб'єктність правопорушника та злочинця: міжнародний та український контексти

Received: November 20, 2023

Accepted: January 13, 2024

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Abstract

The ability of a person to represent and protect his interests, and bear legal responsibility for committing administrative offenses and crimes, constitutes such a category as the legal personality. The article's purpose was to compare the legal personality of an offender and criminally punishable acts by the legislation of Ukraine and international legal acts.

For this purpose, the following tasks have been set: 1) the concept and components of such a category as "legal entity" were defined; 2) the peculiarities of the concept of administrative legal personality are clarified, the limits of the administrative legal personality of a person who has committed an administrative offense are determined; 3) the limits legal personality person who has committed a criminal offense are characterized.

The value of individual sources of the United Nations and the European Court of Human

Анотація

Здатність особи представляти і захищати свої інтереси, нести юридичну відповідальність за вчинення адміністративних і кримінальних правопорушень становить таку категорію, як правосуб'єктність особи. Метою статті було порівняти правосуб'єктність правопорушника, який вчинив адміністративно каране правопорушення, та особи, яка вчинила кримінально каране діяння законодавством України та міжнародно-правовими актами. Досягнення поставленої мети стало можливим завдяки виконанню таких завдань: 1) визначено поняття та складові такої категорії як «юридична особа»; 2) з'ясовано особливості поняття адміністративної правосуб'єктності, визначено межі адміністративної правосуб'єктності особи, яка вчинила адміністративне правопорушення; 3) охарактеризовано межі правосуб'єктності

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Rights for solving the specified tasks is clarified. Provisions are given that indicate that certain norms of Ukraine's national legislation do not correspond to the provisions of international law. This needs to be settled, because, for example, the right to a fair trial should be equal for everyone.

The legal personality within the limits of administrative and criminal proceedings carried out by the legislation of Ukraine does not differ. However, in the case of bringing a person to justice, it is necessary to evaluate different components of legal personality.

Keywords: legal personality, crime, forensic psychiatrist examination, court proceedings in absentia.

Introduction

The terminological construction "Legal Personality" is derived from the category "Subject of Law". "Subject of Law" is a concept that originated in ancient Rome. The category "Legal Personality" is widely used in the theory of law and in-branch legal sciences.

Everyone has the right to recognition everywhere as a person before the law (United Nations, 1948). A similar definition is contained the Art. 16 of the International Covenant on Civil and Political Rights (United Nations, 1966). These norms establish the concept of the legal personality of a person.

The Basic Law of Ukraine stipulates that exclusively the laws of Ukraine determine the legal personality of citizens (Law of Ukraine No. 254k/96-VR, 1996). The legal personality of the offender is determined by the norms of the Code of Ukraine on Administrative Offenses (Law of Ukraine No. 8073-X, 1984), and the legal personality of the criminal is by the Criminal Procedural Code of Ukraine (Law of Ukraine No. 4651-VI, 2012).

Such a category as legal personality means that a person, enterprise, state, international organization, and other forms of population organization can be participants in legal relations. In the modern world, there are many different debatable questions about the definition of the legal personality of a person, the disabled, persons who have changed sex, as well as about the definition of the legal personality of animals and rivers, artificial intelligence.

The problem of the legal personality of the offender and the criminal has drawn our

особи, яка вчинила кримінальне правопорушення.

Автори використовували методи аналізу, синтезу, логіко-догматичний методи тощо. Визначено, що у загальному аспекті обсяг правосуб'єктності в межах адміністративного та кримінального судочинства, що здійснюється законодавством України, не має суттєвих відмінностей, однак у разі притягнення особи до відповідальності необхідно враховувати вагому кількість факторів.

Ключові слова: правосуб'єктність, злочин, судово-психіатрична експертиза, заочне судове провадження.

attention. This is important because Ukraine has been in a state of military conflict for more than two years. When choosing the measure of punishment for persons who committed war crimes, it will be important to be guided by the provisions of international law especially since the International Criminal Court and the European Court of Human Rights will consider individual cases. In most of the criminal cases considered by the courts of Ukraine, criminal proceedings are conducted "in absentia" of the criminal. Their rights must be respected.

That is why the theory of the criminal's legal personality, the specifics of its observance in the investigative and judicial practice of Ukraine, its compliance with the theory of international legal personality, and the possibility of bringing a person to legal responsibility for such criminal cases this is all a subject for separate thorough scientific studies.

Literature review

In the science of international law, the international legal personality of a person studied has been researched by M. Baimuratov (2004), N. Kucheruk (2013), and others. Comprehensive studies were conducted by J. Sánchez (2022), O. Tarasov (2023), K. Boczek (2023), O. Pasechnyk (2023), D. DeGrazia, (2023). F. Renz (2023), P. Księżak and S. Wojtczak (2023). The works of these scientists became the theoretical basis for our scientific research. Scientists tried to determine which subjects should be prosecuted for violating the provisions of international law. They also investigated the peculiarities of the status of individuals, minority groups, non-governmental organizations,

international organizations, and animals in the international legal order. At one time, these works witnessed the emergence of an international legal order, which is increasingly perceived in terms of regularities and probabilities. Scientists are still analyzing the provisions of international legal acts. However, some aspects of this problem remain insufficiently studied.

O. Kaplina (2022), A. Shulika (2023), H. Hlobenko (2023), Ye. Pelikhos (2021) studied the problems of absentee criminal proceedings in Ukraine. They pointed to debatable issues. The authors actualized the need to solve them but did not suggest how it could be done.

Methodology

The article aimed to compare the legal personality of an offender who committed an administratively punishable delict and a person who committed a crime.

Achieving this goal is possible by solving the following tasks:

- 1) To define the concept and components of such a category as "legal personality".
- 2) To clarify the concept of administrative legal personality, determine the limits of the administrative legal personality of a person who committed an administrative offense.
- 3) To determine how the provisions of criminal procedure legislation can characterize the limits of the legal personality of a criminal.

This study is comparative-legal. The provisions of the Constitution of Ukraine, the Code of Ukraine on Administrative Offenses, the Criminal Code of Ukraine, the Universal Declaration of Human Rights, and the International Covenant on Civil and Political Rights are used for comparison. By the provisions of these normative legal acts, the components of the category "legal personality of the offender" were analyzed. Also, when conducting a comparative study, the positions of scientific works of foreign and Ukrainian scientists were analyzed.

The authors used methods of analyzing, and synthesis, which made it possible to determine the normative and legal provisions governing the legal personality of the offender. The dogmatic, comparative legal, logical, and generalization methods, as well as the legal analysis method, were also used to formulate the research conclusions.

Empirical research is presented by the results of the study of 150 judgments of the national courts of Ukraine. It was issued in 2022 and 2023. The category of cases is criminal, accused of collaborationism and treason. Methods of analysis and generalization were used to collect data.

Results and discussion

I. The Offender and the Theory of Legal Personality: Ukrainian Context

There are two types of legal personality in the theory of Ukraine's legal science.

- The first is general legal personality. General legal personality is the presence of the subject of typical rights, obligations, and the possibility of their use and execution, regardless of external factors. The scope of general legal personality is the same for both natural persons and legal entities.
- Special legal personality is the subject of specific rights, duties, and opportunities. It is used and fulfilled depending on external factors. The scope of special legal personality is not the same or constant, it depends on the will of the subject, its type, characteristics, etc.

Some scientists also distinguish three types of legal personality: 1) general; 2) sectoral; 3) special. General legal personality is considered a prerequisite for the legal relations emergences between persons in general, and sectoral - as the possibility emergences of these legal relations, but already in a specific field of law. Branch legal personality is a part of general legal personality, it includes civil, administrative, labor, procedural, and others.

II. The offender's administrative legal personality

The offender's administrative legal personality consists of two elements: 1) administrative legal capacity, and 2) administrative capacity (Law of Ukraine No. 8073-X, 1984). Administrative responsibility is borne by an offender in a state of conviction and has reached the age of sixteen at the time of its commission.

The Code of Ukraine on Administrative Offenses does not specify the procedure for appointing a psychiatric examination for a person who has committed an offense. But the expert is appointed by the body (official) in whose

proceedings there is a case if need for special knowledge (Law of Ukraine No. 8073-X, 1984). To establish the administrative capacity of a person, a forensic psychiatric examination may be ordered.

The term for conducting an outpatient forensic psychiatric examination is up to 30 working days. This period may be extended with the notification of the body (person) who appointed the examination (engaged the expert) and at whose request) the expert was involved. An administrative penalty may be imposed within three months from the date of the commission of the offense in cases pending before the court, and within two months in cases pending before the court of other bodies. Therefore, carrying out such an examination will lead to missing the terms of prosecution. In addition, the Code of Administrative Offenses does not specify the procedure for appointing a psychiatric examination if the administrative case is not under the jurisdiction of the court and when the person (offender) refuses to undergo it.

Moreover, persons who haven't reached the age of majority are endowed with a different scope of legal personality. At the age of 16 to 18, other measures are applied for offenders.

Some exceptions make it impossible to bring a person to criminality. For example, it is a person who has a chronic mental illness (Corner, Penhale, & Antony, 2023), a temporary disorder of mental activity (Husieva et al., 2021), dementia, or other medical conditions. Based on the above, it can be said that the scope of legal personality of all persons - citizens of Ukraine are not the same, because a person with mental disorders is not endowed with administrative delict capacity, and the scope of legal personality of some persons may change in general, depending on the type of offense that they committed.

III. The criminal's legal personality

Each of the criminal proceedings participants is endowed with a legal personality. For example, procedural legal capacity is the ability to demand judicial protection, to have procedural rights and obligations, and to be a person participating in the proceedings.

The criminal procedural law of Ukraine pays considerable attention to the requirements that a person must meet to become the subject of criminal procedural relations. It is appropriate to talk about the existence of procedural rights and

obligations, legal interests, guarantees of rights, legal interests, and legal responsibilities of criminals.

The conditions for legal personality of a suspect (accused) are the following circumstances:

- 1) The person reaches the age of criminal responsibility.
- 2) Sanity.
- 3) Notification to a person of suspicion or detention on suspicion of committing a crime.

IV. The Criminal's legal personality in absentia criminal proceedings: practice of Ukraine

From 2022 to January 2024, 3,141 verdicts were passed in cases of crimes against the national security foundations. Of these, 716 were passed in absentia criminal proceedings (i.e. in the absence of the accused).

In such criminal proceedings, pretrial bodies investigations must use all available means to the suspect knows about the criminal proceedings initiated against him. That is, a person should know about:

- that criminal proceedings have been initiated;
- what she is suspected of and to be able to exercise her right to defense and have her position in court.

Compliance with these conditions will ensure the implementation of the adversarial proceedings.

A special pre-trial investigation can be conducted only in relation to a person who has acquired the status of a suspect. Such notice must be personally delivered to the person. If her whereabouts are unknown, a message about this should be published in the mass media and on the official website of the Prosecutor General Office. The Supreme Court recognizes that informing by publishing relevant information in mass media, the Internet, or by e-mail may be considered sufficient. We believe that these measures cannot always be considered informative. Being in the occupied territory, a person may not have access to the Internet and may not even know that criminal proceedings have been initiated against him. This is not the only violation of the adversarial proceedings principle.

For the proper implementation of the defense suspect's right, the attorney must receive copies

of the documents to be handed over to the suspect. However, it is unclear how he should hand them over if the location of the suspect is unknown. In such cases, the lawyer cannot agree with the suspect on the appropriate legal position, and secondly, if necessary, he cannot timely inform about the specifics of the case in court.

The outlined aspects have an extremely negative impact on the provision of effective legal assistance to the suspect. This indicates the limitation of its legal personality.

V. The Offender and the Theory of Legal Personality: International Context

According to the law, people are composed of statically structured bodies and identities (Naffine, 2012). A change in status or gender should also change the legal personality of a person. That it is, it leads to a new static way of existence. Thus the legal personality of a person can theoretically change several times during his life (Grabham, 2010).

In the modern world, legal personality is defined differently according to civil law (Dong, & Zhang, 2023), corporate law, and criminal law (Osmanollaj, 2023).

International legal personality is considered through the prism of a three-dimensional approach - normative, personal, and communicative.

The normative approach is the social actor's ability to be the bearer of legal status, to have rights, and to bear obligations (legal normative capacity). The personal approach is the social actor's ability to be a subject of law, a bearer of the personal legal physical form, or a sovereign person (legal personality). The communicative approach is the social actor's ability to participate in legal communication, as a party to a legal relationship (legal communication ability) (Boczek, 2023).

The concept of international legal capacity is equated with international legal personality. However, each category of subject of international law has a different legal capacity and is determined by a set of potential rights and obligations. In this sense, it is important to distinguish between legal capacity and legal personality.

Each category of subjects of international law has a different legal personality and reflects their

specific features. In this sense, if international legal capacity indicates the legal framework of a person's possible behavior, then legal personality as a qualitative characteristic reflects not the size of these frameworks, but their presence. International legal capacity means the ability, or the possibility, to enter into legal relations within the limits of those rights and obligations that a person is endowed with.

A vivid illustration of this difference is the provision of clause 1 of Art. 4 of the Rome Statute of the International Criminal Court. According to it "the court has international legal personality. It shall also have such legal capacity as may be necessary for the exercise of its functions and the achievement of its objectives" (Asamblea General UN, 1998). In the given provision, a clear distinction is made between the concept of legal personality as a qualitative characteristic that has no volume and legal capacity as a quantitative characteristic that is different in its content.

For a subject of international law, not only the ability to possess rights and obligations is important, but also to realize his international legal status, which, in addition to rights and obligations, includes the subject's freedoms, his legal interests, etc.

International legal personality characterizes the legal status of its bearer. At the same time, it is the basis of such status and a prerequisite for the subjects of international law participation in international legal relations. It is in the legal status of the subject of international law that the character and scope of international legal personality are reflected.

The equal subjects of international law can have (and often do) different legal status. This has been established as a precedent in modern international law. In the advisory opinion of the International Court of the United Nations, it was recorded that "subjects of the law of one or another legal system are not necessarily identical, since it is about their nature or the scope of their rights" (Asamblea general UN, 1998).

International legal personality acts as a prerequisite for participation in international legal relations. Based on the general theory of law, the subjects of specific international legal relations exercise certain international rights and perform the corresponding duties that constitute the legal content of such legal relations.

Thus, Article 34 of the Charter of the International Court of Justice of the United Nations stipulates: "Only states can be parties to cases pending in court" (United Nations, 1945).

Also, for example, part 4 of Article 55 of the Constitution of Ukraine states that "Everyone has the right, after using all national legal remedies, to apply for the protection of his rights and freedoms to the relevant international judicial institutions or international organizations, which he is a member or is Ukraine" (Law of Ukraine No. 254k/96-VR, 1996). That is, the state must be a party to a certain agreement and must recognize the competence of the committee established by the relevant agreement. This proves that the boundaries of the legal personality of a person and the state are different, and therefore not every citizen can apply independently for the protection of his rights.

VI. The International principles of administration justice «in absentia»

International standards of fair justice are defined by the Convention for the Protection of Human Rights and Fundamental Freedoms, the International Covenant on Civil and Political Rights, and other normative legal acts. All of them declare the need for the accused to be present at the trial. However, some international documents do not define it as mandatory.

Such exceptions are provided for in Article 21 of the European Convention on the International Validity of Criminal Procedures (Council of Europe, 1970), Recommendation No. 6 R (87) 18 of the Committee of Ministers of the Council of Europe to member states "Regarding the simplification of criminal justice" (The Committee of Ministers of the Council of Europe, 1987).

The precedent practice of the European Court of Human Rights provides that the absence of the accused in the court session is possible if:

- a) He has been duly notified of the judicial proceedings to be held against him;
- b) He is guaranteed the realization of his right to protection;
- c) The accused deliberately refused to participate in the trial;
- d) The accused has the right to a retrial of this case.

Conclusions

Criminals in cases against the national security foundations usually have Ukrainian citizenship. If they appeal the decisions made in absentia, this may increase the number of complaints to the European Court of Human Rights against the national courts of Ukraine. We believe that the person should be declared an internationally wanted person and only then his case should be brought to trial. This approach is justified. For example, in Ukraine, judgments of courts of foreign countries passed in absentia, are not subject to execution. Exceptions are only those cases when the sentenced person was given a copy of the verdict and was allowed to appeal it. Citizens of Ukraine should have the same rights under the national legislation of Ukraine.

The current study has shown that the legal personality of the offender is a complex and multifaceted concept that is subject to various limitations. The study's findings have important implications for legal practice and legal theory. In legal practice, the study's findings could be used to develop more effective defense strategies for defendants. In legal theory, the study's findings could be used to refine the understanding of the offender's legal personality.

Current trends suggest that the theoretical and legal doctrine of legal personality must continue to develop to adapt to the changing reality of international law.

We recommended that future research explore in greater depth the theoretical and legal doctrine of legal personality development.

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DOI: <https://doi.org/10.34069/AI/2024.74.02.17>

How to Cite:

Melnyk, S., Ravlinko, Z., Shuprudko, N., Pushak, H., & Havrylyshyn, O. (2024). Security aspects of digital transformation and intellectualization of business. *Amazonia Investiga*, 13(74), 201-213. <https://doi.org/10.34069/AI/2024.74.02.17>

Security aspects of digital transformation and intellectualization of business

Aspectos de seguridad de la transformación digital y la intelectualización de los negocios

Received: December 14, 2023

Accepted: January 28, 2024

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Abstract

The main purpose of the article is to determine the key aspects of security during digital transformation and intellectualization of business in the conditions of a changing external environment. As a result of the literature review, the team of authors of the article sets themselves a new scientific task, to form an innovative approach to assessing security aspects during digital transformation and intellectualization of business in modern development conditions. The research methodology involves the use of the expert analysis method, the Delphi method, the even comparison method, and the modeling method. Thanks to this, the result was a list of the most significant security aspects affecting the process of digitalization and intellectualization of business in the region. An approach to assessing these aspects has been formed. The innovativeness of the results obtained is considered through the prism of the proposed model for achieving the most important aspects

Resumen

El objetivo principal del artículo es determinar los aspectos clave de la seguridad durante la transformación digital y la intelectualización de las empresas en las condiciones de un entorno externo cambiante. Como resultado de la revisión de la literatura, el equipo de autores del artículo se propone una nueva tarea científica: formar un enfoque innovador para evaluar los aspectos de seguridad durante la transformación digital y la intelectualización de las empresas en las condiciones de desarrollo modernas. La metodología de investigación implica el uso del método de análisis de expertos, el método Delphi, el método de comparación uniforme y el método de modelado. Gracias a esto, se obtuvo un listado de los aspectos de seguridad más significativos que afectan el proceso de digitalización e intelectualización de los negocios en la región. Se ha formado un enfoque para evaluar estos aspectos. El carácter innovador de los resultados obtenidos se considera a través del prisma del modelo

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of security for effective digitalization and intellectualization of business in Ukraine. The study is limited by taking into account the specifics of the business environment only in Ukraine. Prospects for further research suggest expanding the range of modeling; if only the IDEF0 method was used in the article, then in the future the possibilities of using IDEF3 should be considered.

Keywords: business, security, digital transformation, business environment, intellectualization.

Introduction

Digital transformation within the framework of the functioning of each individual enterprise has become relevant relatively recently, but today it is already the main condition for maintaining competitive advantages and creating the necessary digital foundation for development in the context of an increasing share of the digital economy. COVID-19 became an indicator that determined significant benefits for businesses that were able to operate online. The post-pandemic period has not diminished, but increased, attention to a holistic vision of the prospects for introducing digital technologies with a rethinking and restructuring of all business processes. The difference in the development of the national economy, manifested in the readiness of the digital infrastructure for business activity in matters of digital transformation, determines different initial positions with the benefits of enterprises operating in economically developed countries. Ukraine lags behind its EU neighbors in economic development, and military actions have provoked a significant number of refugees, which has caused personnel losses that are slowing down the digital transformation of Ukrainian enterprises. A thorough study of the best practices of digital transformation of enterprises in the EU countries in comparison with the actual circumstances of such processes in Ukraine creates the necessary information basis for predicting changes in the struggle for competitive positions in the domestic and foreign markets, in particular in terms of eliminating threats and better using new opportunities arising through displacement of significant numbers of highly skilled and motivated refugee workers.

The passivity of Ukrainian enterprises regarding digital transformation and intellectualization on an individual basis is fraught with the loss of competitive positions due to the inability to meet

propuesto para lograr los aspectos más importantes de seguridad para una digitalización e intelectualización efectiva de las empresas en Ucrania. El estudio se limita a tener en cuenta las características específicas del entorno empresarial únicamente en Ucrania. Las perspectivas de futuras investigaciones sugieren ampliar la gama de modelos; Si en el artículo solo se utilizó el método IDEF0, en el futuro se deberían considerar las posibilidades de utilizar IDEF3.

Palabras clave: negocios, seguridad, transformación digital, entorno empresarial, intelectualización.

consumer needs at a higher technological level, and within the national economy - a deepening of the technical and technological gap with an increased orientation towards raw materials and labor exports and a decrease in purchases. Consequently, the issue of digital transformation and intellectualization of enterprises is especially acute due to the growing uncertainty of the external environment, which requires, in order to maintain competitiveness, the transformation of activities through the introduction of modern information technologies and digital management tools, ensuring digital shifts. If in economically developed countries this is a matter of strategic and tactical perspective of operation, illustrated by the ability to maintain the active activity of enterprises during restrictions during the COVID-19 period, then for Ukraine it is a matter of its own survival, restoration of macroeconomic balance and laying the resource foundation for post-war recovery and the ability to technologically follow for the leading countries in economic development.

The main purpose of the article is to determine the key aspects of security during digital transformation and intellectualization of business in the conditions of a changing external environment.

Literature review

The transition to digital platforms and the intellectualization of business, especially in a fluctuating external environment, presents multifaceted challenges and opportunities, as explored in a range of scholarly works.

Thus, in the study by Javaria et al. (2020) focuses on identifying and managing the risks consumers face as e-commerce evolves. In the context of your topic, this resource provides insights on the

security aspects associated with digital transformation in e-commerce and points to strategies that can help mitigate these risks. Coverage of methods for identifying and countering potential threats is important to maintaining consumer safety in a changing environment. While Javaria et al. (2020) discuss identifying and managing risks in e-commerce, they primarily focus on the consumer side of security. Our article appears to adopt a broader organizational perspective, emphasizing the security aspects affecting the overall business process during digital transformation, rather than just consumer interaction. Our innovative assessment model offers a holistic view that encompasses the entire business environment.

Alazzam et al. (2020) offer insights into the legal intricacies of electronic commerce, highlighting the obstacles and solutions within Jordanian and comparative legislatures, crucial for understanding the legal framework surrounding digital business transactions. This is complemented by Zybareva et al. (2022) investigation into the management of business projects, emphasizing the role of international competitiveness in global sustainability conditions. Their perspective is crucial in understanding how businesses can adapt and thrive in an increasingly interconnected world.

In a study by Kopytko et al. (2023) the authors propose a methodology for optimizing financial resources in order to increase the level of economic security of enterprises in a dynamic external environment. In the context of our study, this clearly understands the importance of financial stability and economic security in the context of digital transformation and business intelligence, as well as for developing strategies to optimize resources. Kopytko et al. (2023) propose methods for optimizing financial resources to enhance economic security, focusing specifically on financial strategies. Our methodology, which includes expert analysis, the Delphi method, and even comparison, allows for a more comprehensive approach to assessing security in the context of digital transformation, beyond just economic security.

The development of e-commerce platforms, as discussed by Alazzam et al. (2023), brings to light the importance of information models in modern socio-economic systems. Their research underscores the need for legal compliance and global digitalization, providing a framework for the successful integration of e-commerce in business operations. Similarly, Lagodiienko et al. (2022) examine the management of foreign

economic activities in sustainable conditions, offering insights into how enterprises can navigate the international market amidst sustainability challenges.

The work of Fischer et al. (2020) illuminates the archetypes of digital transformation strategies using business process management to define meta-goals. This article can serve as a source of information about different approaches to digital transformation and their impact on business processes. This will provide a better understanding of how strategic planning and management can facilitate successful adaptation to changes in the external environment.

At the same time, Zhou et al. (2021) analyzes the impact of enterprise intellectualization on its leadership potential. In the context of your topic, this resource is important for understanding how the integration of intelligent systems and processes can enhance business competitiveness and leadership in a changing environment. The importance of an innovative approach to leadership and strategic development is highlighted. Zybareva et al. (2021) bring attention to the economic and legal aspects of network readiness of enterprises in Ukraine, offering a perspective on how businesses can improve through digital and network enhancements. This is particularly relevant in understanding the legal ramifications and economic strategies needed for digital transition. Studies like that of Zybareva et al. (2022) and Lagodiienko et al. (2022) address global sustainability and international market navigation, but they might not integrate these factors with digital transformation security. Our innovative model could be seen as integrating these concerns by providing a security assessment that considers digital transformation as a factor contributing to international competitiveness and sustainability.

Kim et al. (2021) explores the essence, characteristics and consequences of modern digital transformation. It can provide your research with a deeper understanding of where the digital era is heading and the challenges and opportunities it poses for businesses. Analyzing the future direction of digital technologies and their impact on business models, management and competitiveness is key to adapting to changing environmental conditions.

The study by Trokhymets (2020) examines the development of the national economy in the context of information processes and digitalization. The author analyzes how digital technologies and information systems influence

economic structures and processes at different levels: global, national and regional. In the context of our topic, this source can provide valuable insight into the impact of digital transformation on the economy, which in turn highlights the importance of security aspects in the process of integrating emerging technologies. A focus on national economic development helps understand macroeconomic trends and the challenges businesses face as they adapt to digital innovation, highlighting the need to ensure digital security at all levels. In conclusion, Sylkin et al. (2021) effectively highlight the critical need for businesses to adapt their economic security management in response to the rapid digital transformation and intellectualization of business practices sparked by the global pandemic. This work serves as a valuable resource for those looking to understand the security imperatives in the digital age, providing both theoretical insights and practical guidance for navigating the complex landscape of modern business operations.

Shtangret., Korogod., Bilous., Hoi, & Ratushniak (2021) focus on the management of economic security in the high-tech sector, emphasizing the necessity of modernizing security practices to cope with the dynamic threats emerging from rapid technological advancements. Their study highlights the urgency of integrating sophisticated security management tools and techniques to protect critical infrastructures and sensitive data against cyber threats exacerbated by increased digital dependency. Dubyna et al. (2023) extend this discussion to the trading

sector, analyzing how digitalization serves as both a tool and a challenge for maintaining financial and economic security under external shocks, such as global health crises or economic instability. Their research underlines the dual role of digital technologies that offer innovative solutions for robust security mechanisms while simultaneously presenting new vulnerabilities that must be managed carefully. The findings suggest that proactive management of digital resources and continuous adaptation of security strategies are essential to safeguard trading enterprises from the volatile external environment. Both studies stress the importance of a methodological approach to security in the digital era. Sylkin et al. (2020) contribute to this body of knowledge by developing a model for assessing financial security levels that businesses can use to quantify and manage their security postures effectively. Their methodology allows organizations to systematically evaluate their financial vulnerabilities and prepare more comprehensive defense mechanisms against potential threats. This model is particularly relevant in contexts where businesses are seeking to balance growth and security in an increasingly interconnected and digitalized market landscape.

Collectively, these studies provide a multi-dimensional understanding of the challenges and strategies in the digital transformation and intellectualization of businesses, offering valuable insights into the legal, economic, and strategic aspects in a rapidly changing external environment. But along with this there are a number of gaps in the literature (Table 1).

Table 1.
Key gaps in the literature on the topic of the article

Gaps	Characteristics
The proposed approach	Lack of a modern methodical approach to security modeling
Consideration of security	In the literature when considering the digitalization of business, there is no issue of ensuring security
The issue of intellectualization	The intellectualization of business is rarely the focus of the literature

Source: (formed by authors)

As a result of the literature review, the team of authors of the article sets themselves a new scientific task, to form an innovative approach to assessing security aspects during digital transformation and intellectualization of business in modern development conditions.

Methodology

Expert analysis and the Delphi method formed the cornerstone of your approach, providing a

robust framework for identifying critical security aspects. By engaging a panel of experts and employing a systematic, iterative process of surveys, the study harnessed collective intelligence and expert insights. This methodology is particularly effective in reaching a consensus on complex issues where individual understanding may be limited or highly variable. It ensured that the security aspects identified were not only comprehensive but also reflective of current industry and academic perspectives.

To prioritize and compare these identified security aspects, the pairwise comparison method was adopted. This method is particularly useful for its simplicity and effectiveness in breaking down complex decisions into a series of simpler comparisons. It enabled a systematic evaluation of each security aspect against the others, ensuring that the most critical aspects were highlighted based on consistent and logical comparisons. This approach is instrumental in distilling a range of potential security concerns down to the most pivotal ones.

30 experts from the leading areas of business security were involved in order for them to help establish 5 key aspects of the security of digitalization and intellectualization of business in Ukraine. Since there are many experts themselves, they were forced to use the Delphi method to organize them. Next, the final list agreed through mathematical modeling programs is highlighted, the key results are highlighted. Following the identification of these critical aspects through the Delphi method, the study employed the pairwise comparison method to

prioritize and systematically evaluate these aspects against each other. This method simplified the complex decision-making process by breaking it down into smaller, more manageable comparisons. Each security aspect was compared with every other to establish its relative importance or urgency.

Finally, the IDEF0 method was leveraged for modeling the effective implementation of these critical security aspects in Ukrainian businesses. IDEF0 is a functional modeling methodology used for the analysis, development, reengineering, and integration of information systems, business processes, and software engineering. This method provided a structured framework for conceptualizing how the identified security aspects could be effectively integrated into business processes. By using IDEF0, your study not only identified key security aspects but also mapped out a clear, actionable path for businesses to enhance their security in the face of digital transformation and intellectualization (Fig.1).

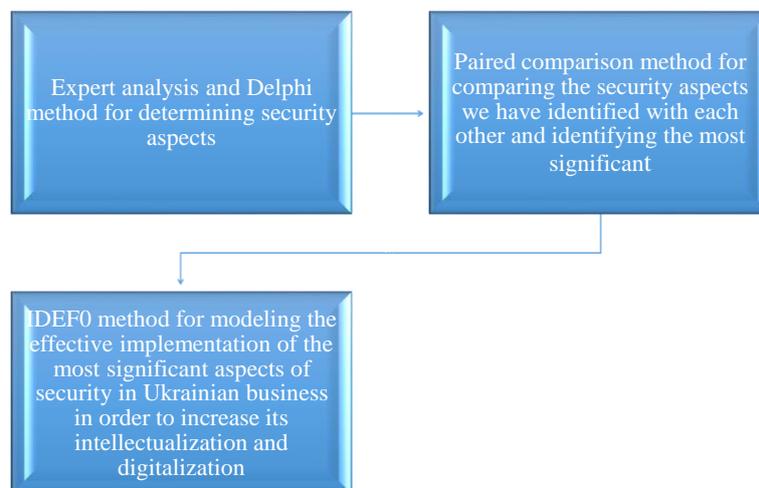


Figure 1. The main methods used in the article. Source: (formed by authors)

The application of IDEF0 began with the identification and decomposition of primary business functions into simpler, manageable sub-functions. This breakdown facilitated a detailed examination of where and how security vulnerabilities could arise as businesses digitalized and intellectualized their operations. Each sub-function was then assessed to determine specific security needs, ensuring that all potential threats were accounted for systematically. Building on this foundation, the study used the IDEF0 diagrams to map out the interactions between these functions and their

respective security requirements, effectively creating a visual and logical representation of workflows and data flows.

Together, these methodologies provided a comprehensive, multi-faceted approach to understanding and addressing the security challenges inherent in the digital and intellectual evolution of businesses in an ever-changing external environment.

Results and discussion

In the EU countries, three levels of digital maturity of enterprises can be identified: the first, where investment is made in individual digital technologies, the application of which does not have a significant impact on the overall activity, but is an embodiment of the desire to follow competitors in the position that provided certain competitive advantages; the second – the gained experience allows forming a portfolio of digital solutions, within which the necessary investment volumes, risks, expected effect, and the degree of impact on the overall financial results of the activity are assessed; the third – a developed strategy serves as the basis for systematic updating of the list of relevant digital technologies, which ensures strengthening of competitive positions due to leadership and maximum readiness to operate in the conditions of the digital economy.

The necessity to pay due attention to the digital transformation of enterprises in Ukraine is conditioned by the business's realization of the global nature of this issue, which requires resolution. By 2022, i.e., in a period when military actions were not the main threat to the functioning of Ukrainian enterprises, 90% of enterprises passive to the implementation of digital technologies felt an increase in competition from those that had made real steps in the digitization of business processes. In terms of digital transformation of enterprises by scale of activity, the most complex situation was in large industrial enterprises, 95% of which were passive to the widespread introduction of digital technologies, continuing to rely on technological processes created sometimes 30 years ago for the production of technologically simple, material- and energy-intensive products for domestic consumers. At the same time, the management of 71% of these large enterprises noted an

intensification of competition with a high probability of losing competitive positions in the short term.

Information from the survey of management of Ukrainian enterprises is almost fully confirmed by analytical data from the State Statistics Service of Ukraine. Such research has been conducted since 2018 and actually contains diverse information due to the constant clarification of the research object, but despite this, it provides a general idea of the intensity of use of digital technologies before and during military actions. According to these official statistical data, the share of enterprises that had access to the Internet virtually did not change (2018 – 88.0%, 2019 – 86.4%, 2021 – 86.6%, 2022 – 85.1%) and was insufficiently high, as in the conditions of the digital economy without information exchange, there is practically no possibility to conduct business, and here more than 10% of operating enterprises were deprived of such an opportunity. Equally interesting are the details of access to the Internet, as significantly fewer enterprises had fixed access, i.e., in 2018 – 62.1%, 2019 – 60.9%, and in 2021 – 61.8%. Another quality indicator – Internet speed – shows that in 2021, 18.2% of enterprises used connections with speeds less than 30 Mbps and another 21.8% – from 30 Mbps to 100 Mbps. Collectively, such data indicate limitations in Internet access and low quality of using this data transmission tool, as well as insufficient development of digital infrastructure, which has already been emphasized above.

One of the traditional and most actively used tools of digital marketing remains the website. According to analytical data, the share of Ukrainian enterprises using such a tool was critically low: 2018 – 35.7%, 2019 – 35.2%, and 2021 – 35.3%." However, anything related to security must be referred to as "security.

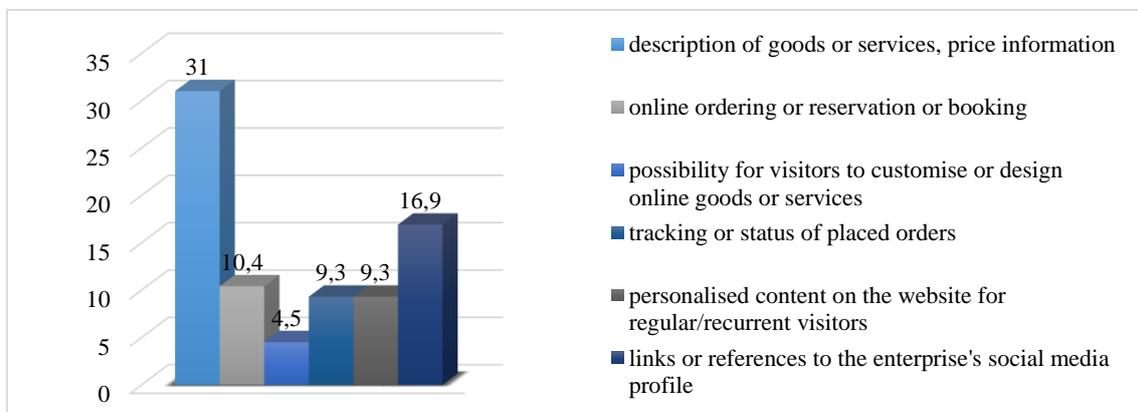


Figure 2. Functional capabilities of the website of enterprises in Ukraine in 2022. (formed by authors)

An even more complex situation arose in 2021 regarding: the use of chat services for customer communication, which was relevant for only 9.1% of enterprises; the purchase of cloud computing services was applied by 10.2% of enterprises; additional hiring of IT professionals was conducted by 22.3% of enterprises; and the production of products using robotics occurred in just 2.9% of enterprises. Collectively, these data indicate both a critically low level of digital technology usage and the technological backwardness of Ukrainian enterprises compared to competitors from economically developed countries, depriving them of competitive advantages both in the domestic market and limiting their effectiveness in global markets.

One of the specific characteristics of digital transformation in enterprises is the need for continuous technological updating, which is possible in the case of improving the digital competencies of employees. Analytical data provide a general idea of the intensity of knowledge improvement by ICT specialists and other employees involved in enterprises: 3.7% and 4.1% in 2018; 3.8% and 4.3% in 2019; 4.5% and 4.4% in 2020. We will further emphasize the importance of intellectualization, and these data serve as an informational basis that this issue will be very acute, as previously necessary attention was not paid to improving the professional and digital competencies of employees.

Security aspects of implementing digital transformation consist not only in the ability to establish a corresponding list of challenges, risks, and threats that will be relevant for a particular enterprise, but also in considering the fact of the duration, and actually the continuity of changes, which largely concern management and personnel. This involves two important points: firstly, the need to prevent and eliminate internal corporate resistance; secondly, stimulating the acquisition of new professional and digital skills. The first point is related to the typical behavior of each individual, i.e., the desire to maintain consistency in the way of life and work activity, as any change provokes the need for adaptation and adjustments, which is accompanied by disturbance, additional psychological and physical loads, etc. The reluctance to change, especially in the absence of understanding of the process and possible consequences, causes resistance, which can be manifested in the form of a passive attitude towards the execution of tasks and participation in digital transformation, or even deliberate actions with a distinctly hostile character. Such aspects are real, considering that in the program of digital transformation of the

enterprise, typical measures include automation and robotization, which provoke a reduction in the necessary workforce, and thus pose a threat of job loss for individual employees, and may lead to disturbances in the moral-psychological climate in the collective with an increase in the number of conflict situations, a decrease in discipline, an increase in cases of resignations due to the inability to continue active work activity, and a decrease in labor productivity. Countering such a negative course of events, which threatens both the failure to achieve the goals of digital transformation and significant losses due to incurred costs for implementing the program, requires the activation of security activities, particularly based on conducting explanatory work, which should involve informing every executor of the enterprise's digital transformation of the justification of the necessity of changes, his tasks, strategic guidelines in general, and the advantages that he will personally receive. The key emphasis should be on the fact that such changes are made based on the possibility of joint achievement of the interests of owners, management, and employees. Successful practice in reducing resistance involves engaging all employees, regardless of their level of participation in the enterprise's digital transformation process, in transparent communication, exchange of opinions, consideration of positions, and providing the opportunity to show initiative that corresponds to the content of the planned measures.

We have 5 key aspects of the security of digitalization and intellectualization of business in Ukraine:

A1. Data protection. Ensuring data confidentiality, integrity and availability is critical. This includes protection against unauthorized access, data loss, as well as ensuring data backup and recovery after possible incidents.

A2. Cybersecurity. Protection against cyber threats such as viruses, malware, phishing, and other types of cyber attacks. It is important to have modern antivirus solutions, firewalls, and intrusion detection and prevention systems.

A3. Compliance with regulatory requirements. It is important to consider local and international legislation related to digital activities, including requirements for the protection of personal data.

A4. Physical security. Ensuring physical protection of the infrastructure used for digitalization (servers, network equipment, etc.).

This includes access control, CCTV systems, anti-terrorism measures, etc.

A5. Education and training of personnel. Raising awareness and training of employees in the field of cybersecurity and proper handling of data. This helps prevent accidental or unintentional information leaks.

To perform a detailed Analytic Hierarchy Process (AHP) analysis and create a reachability and dependency matrix for the five key aspects of digitalization and intellectualization of business security in Ukraine, we need to follow several steps:

1. Create Pairwise Comparison Matrices. Based on expert opinions, two matrices will be created. Each aspect will be compared with every other aspect, and their relative importance will be assigned values.
2. Calculate Weights and Consistency Indicators. For each matrix, we'll calculate the weights (or priorities) of each aspect and the consistency ratio to ensure the judgments are reliable.
3. Create Reachability Matrix. This matrix will identify which aspects can reach or influence other aspects.
4. Create Dependency Matrix. This matrix will show how dependent each aspect is on the others.

Lets creat Pairwise Comparison Matrices (Table 2).

Table 2.
Pairwise Comparison Matrix

	A1	A2	A3	A4	A5
A1	1	2	3	4	5
A2	1/2	1	2	3	4
A3	1/3	1/2	1	2	3
A4	1/4	1/3	1/2	1	2
A5	1/5	1/4	1/3	1/2	1

Source: (formed by authors)

Each element in the pairwise comparison matrix is divided by the sum of its column. This normalization process turns the original matrix into a matrix where each column sums up to 1. The average of each row of the normalized matrix is calculated. These averages represent the weights or priorities of each aspect.

Multiply the original matrix by the weights vector. Divide each element of this product by

the corresponding element in the weights vector. Calculate the average of these quotients to find the maximum eigenvalue (λ_{max}).

Let's calculate these values using our matrix. We will illustrate the calculations for normalizing the matrix, calculating the weights, and then finding the maximum eigenvalue, CI, and CR. Normalized matrix is in Table 3.

Table 3.
Pairwise Comparison Matrix

	A1	A2	A3	A4	A5
A1	0.43	0.49	0.43	0.38	0.33
A2	0.21	0.24	0.29	0.28	0.26
A3	0.14	0.12	0.14	0.19	0.2
A4	0.109	0.08	0.07	0.096	0.13
A5	0.088	0.06	0.049	0.04	0.067

Source: (formed by authors)

The weights are calculated as the average of each row in the normalized matrix.

- A1. Data Protection: 0.416
- A2. Cybersecurity: 0.262
- A3. Regulatory Compliance: 0.161
- A4. Physical Security: 0.099

A5. Personnel Education & Training: 0.062.
Calculated as the average of the quotients of the weighted sum vector by the weights vector. λ_{max} : 5.0683.

CI: 0.0171.
CR: 0.0153.

So, its mean that A2 is most value security aspect for digitalization and intellectualization of business in Ukraine. Lest buld IDEF0 model to

improve it. To begin with, the node tree of the model blocks (Fig. 2).

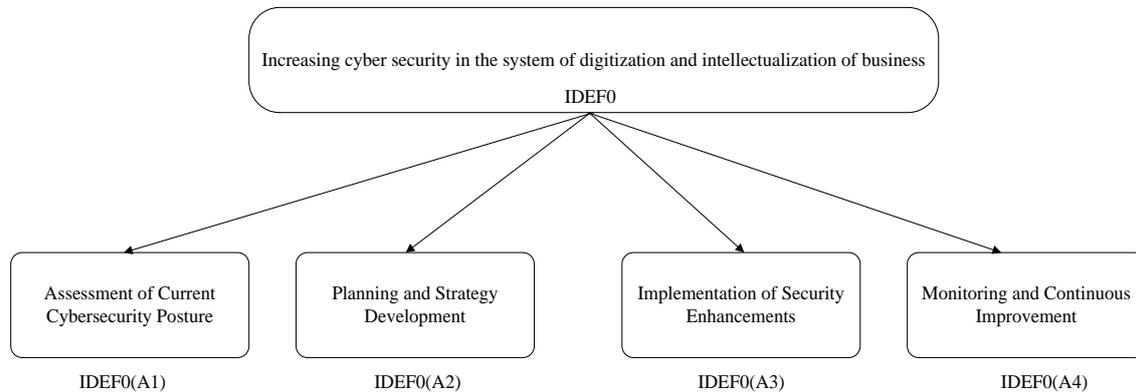


Figure 3. The node tree of the model blocks.
Source: (formed by authors)

To develop an effective IDEF0 model for enhancing cybersecurity, we can break down the process into four main stages:

A1. Assessment of Current Cybersecurity Posture. Evaluate the current state of cybersecurity measures in the organization. This includes assessing existing security policies, network infrastructure, software, hardware, and employee awareness levels.

Inputs: Current cybersecurity policies, network architecture diagrams, software and hardware inventory, employee survey data.

Outputs: Comprehensive assessment report detailing vulnerabilities, strengths, and areas for improvement.

A2. Planning and Strategy Development. Based on the assessment, develop a strategic plan to address identified cybersecurity weaknesses. This includes updating or creating new security policies, identifying necessary technological upgrades, and planning training programs for employees.

Inputs: Assessment report, industry best practices, budgetary constraints.

Outputs: Cybersecurity improvement plan, updated security policies, training schedule, technology upgrade list.

A3. Implementation of Security Enhancements. Execute the cybersecurity improvement plan. Implement new security technologies, update systems, and conduct employee training sessions. Ensure that all changes are in compliance with local and international cybersecurity regulations.

Inputs: Cybersecurity improvement plan, updated security technologies, training materials.

Outputs: Enhanced cybersecurity infrastructure, trained workforce, compliance documentation.

A4. Monitoring and Continuous Improvement. Regularly monitor the cybersecurity measures to ensure their effectiveness. This includes continuous threat assessment, periodic reviews of security policies, and incorporating feedback from employees. Stay updated with the latest cybersecurity trends and threats.

Inputs: Security monitoring tools, employee feedback, industry updates.

Outputs: Monitoring reports, updated security policies, feedback implementation plan (Fig.3).

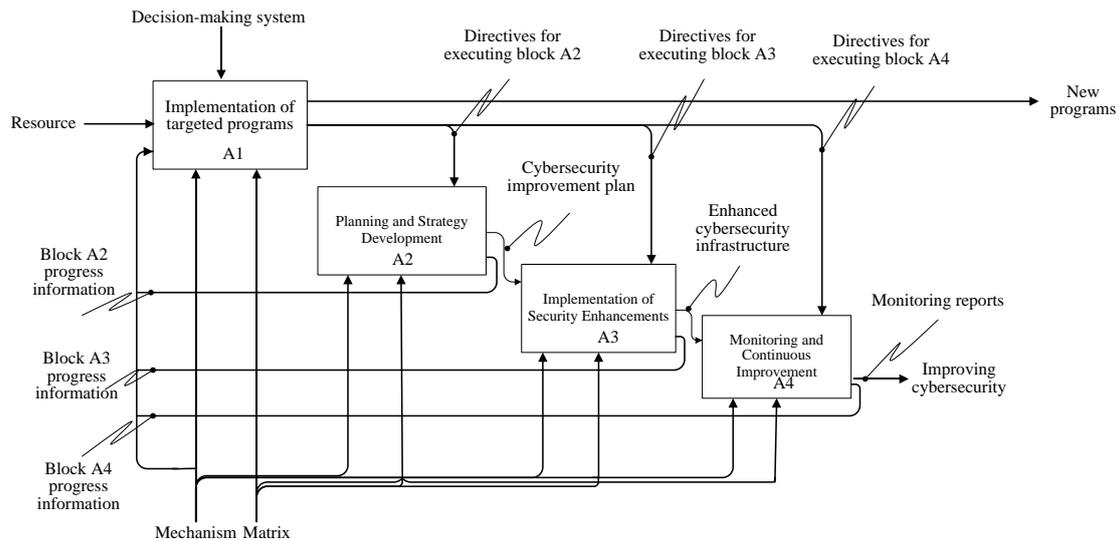


Figure 4. The main IDEF0 model to increasing cyber security in the system of digitization and intellectualization of business.

Source: (formed by authors)

Each of these stages should be detailed in the IDEF0 model with clear connections, indicating how the output of one stage becomes the input of the next. This systematic approach ensures a comprehensive strategy for enhancing cybersecurity in the context of business digitalization and intellectualization in Ukraine.

Discussing the results obtained, it should be noted that a critical analysis of the conditions and actual activity of the digital transformation of enterprises in Ukraine, in particular based on the significant impact of military operations and the prospects for post-war economic recovery, clearly demonstrated the following points:

- the processes of digital transformation are objective, they are occurring and will continue to occur regardless of the activity of individual business entities under the pressure of the changes that are taking place in the global economy as a whole;
- maintaining competitiveness requires searching for financial resources for technical and technological renewal and searching for the optimal option for using digital technologies;
- the process of digital transformation is indefinite, which provokes systematic changes with a violation of constancy in functioning, and therefore the need for activities and temporary stabilization of the situation;
- the problem of the effectiveness of digital transformation is determined by the motivation and intellectual level of management and employees, which, in the

context of the loss of human resources due to a significant number of refugees in the EU countries and internally displaced persons, requires due attention to issues of intellectualization;

- each enterprise forms and implements its own digital transformation program, which must be balanced, take into account the current state of the enterprise, changes in the national economy and the expansion of the boundaries of the digital economy in the global economic space.

Expanding business access to digital technologies has become the basis for the emergence of new business models, when previously existing forms of business organization are forced to be modernized in order to maintain competitive advantages and adapt to the conditions of increasing the share of the digital economy within the traditional one. Such processes exist in every national economy, but occur with varying intensity due to digital transformation at the macro level, which is determined by the level of development of digital infrastructure. In Ukraine, as a country lagging behind the EU countries in economic development, an increase in the share of the digital economy, on the one hand, increases threats to enterprises that maintain established business models and are passive in the introduction of digital technologies, but on the other hand, creates new opportunities for improving competitiveness through the formation of competitive advantages, which resonates with consumers. Conventional digitization cannot ensure the preservation of

competitive positions, nor can fragmented investment in digital technologies. The priority is to rethink holistic guidelines, where digital technologies act only as tools, the effectiveness of which depends on the intellectual level of the performers, that is, management and employees. The starting point should be an understanding of the goals that must be achieved based on the digital transformation of the economy, the selection of digital technologies that ensure the achievement of such goals, the creation of a map for the implementation of transformations in the key of changing business processes and the transition to a new business model, while not leaving without attention issues of financing innovations, the possible emergence of threats and the expected effect, that is, a strategy for the digital transformation of the enterprise must be developed. The priorities of such a strategy should be: creativity in contact with consumers, non-linearity of the management hierarchical structure, individuality in the production of products with a reduction in the chains of intermediaries, high speed of changes in business processes together form the basis for implementing digital transformation at the level of individual enterprises. Security aspects are important, which lie in the fact that digital transformation in an enterprise represents a certain radical technological revolution, when loss of control threatens the cessation of activity. That is, in fact, there are two extremes: passivity - leads to the loss of competitive positions with subsequent liquidation; digital transformation in the absence of strategic vision and control over the process also does not guarantee an exclusively positive result. Consequently, such radical changes, driven by an increase in the share of the digital economy, require a targeted and balanced approach. Military actions burden such a process, but also create additional advantages for those enterprises that are moving towards the goal, ahead of competitors.

For example, Schwarcz (2023) delves into the evolving nature of commercial law in the digital age. Schwarcz's insights into the flexibility and adaptability required in commercial law offer a parallel to our study's focus on the dynamic nature of digital transformation and the need for innovative security approaches.

A study by Sylkin et al. (2018) focuses on assessing the financial security of engineering enterprises, considering it a critical condition for the application of crisis management. It emphasizes the practical aspect of identifying and addressing financial risks to prevent business crises. Our research, on the other hand, has a

broader focus as it covers digital transformation and business intelligence, with an emphasis on security aspects in a dynamic external environment. Our approach involves developing an innovative methodology for assessing security that differs from a direct focus on financial stability at work.

Ferrari (2022) investigates non-technological factors in family businesses, highlighting the importance of considering various elements, including security aspects, in the digitization of business processes. This perspective complements our research by underscoring the multifaceted nature of digital transformation. Bazyliuk et al. (2021) propose a methodical approach to evaluate the efficiency of transforming business processes in engineering enterprises. Their focus on security during transformation processes parallels our study's aim of ensuring safe digital transformation.

Also, Fajsi et al. (2022) link project management maturity with business excellence, suggesting that structured management approaches can significantly impact the successful transformation of businesses, a concept that is relevant to our research on digital transformation. Nam et al. (2019) offer a perspective on business analytics adoption, viewing it through an innovation diffusion lens. This complements our research by providing insights into the adoption process of new technologies and strategies in business, a key component of digital transformation.

Baiyere et al. (2020) explore digital transformation from the perspective of new business process management logics, focusing on the strategic and organizational changes it entails. This work takes a deep dive into how companies can rethink their processes and structures to effectively adapt to digital challenges. In contrast to our study, which focuses on security assessment in the context of digital transformation and intelligentization, Baiyere et al. focus more on change management and process optimization.

Shtangret et al. (2021) discuss the practical aspects of anticipative management in ensuring economic security. Their findings add depth to our understanding of proactive strategies in managing security aspects during business transformations.

Petruk and Shashlo (2022) view digital transformation as a source of both opportunities and threats to business models and enterprise

management systems. Their work includes analyzing the impact of digitalization on organizational structure and strategic planning. While this research highlights the importance of adapting to digital innovation, your work goes further by providing a specific methodology for assessing the security aspects of digital transformation, allowing for a deeper dive into addressing specific security challenges.

In conclusion, these comparative studies collectively underscore the importance of innovative, flexible, and comprehensive approaches to managing security aspects in the rapidly evolving landscape of digital business transformation. They highlight the need for continuous adaptation and reassessment of strategies to effectively navigate the challenges posed by digitalization and intellectualization in various business contexts.

Conclusions

The significant outcome of this study is the identification of key security aspects that influence the digitalization and intellectualization of businesses in the region. More importantly, the research formulated a unique approach for assessing these aspects, contributing to the field's body of knowledge. The innovativeness of the study is highlighted through the proposed model for achieving optimal security in digitalization and intellectualization efforts, specifically within the Ukrainian business context. However, it's important to note the study's limitation in focusing predominantly on the business environment in Ukraine. This specificity may affect the generalizability of the findings to other regions or countries. Looking ahead, the researchers propose expanding the scope of modeling in future studies. While the IDEF0 method was primarily used in this research, exploring the potential of the IDEF3 method could offer more comprehensive insights and applications. In conclusion, this article represents a significant step in understanding and developing strategies for security in the digital transformation of business. It opens avenues for further research, particularly in exploring more diverse modeling methods and extending the study to different geographical contexts.

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DOI: <https://doi.org/10.34069/AI/2024.74.02.18>

How to Cite:

Tumalavičius, V., Prykhodkina, N., Vovk, M., Mytych, S., & Kustovska, O. (2024). Legal impacts of digitization on intellectual property. *Amazonia Investiga*, 13(74), 214-226. <https://doi.org/10.34069/AI/2024.74.02.18>

Legal impacts of digitization on intellectual property

Aspectos jurídicos de la protección de la propiedad intelectual en la era digital

Received: January 4, 2024

Accepted: February 23, 2024

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Abstract

The digital age has revolutionized the way intellectual property is created, shared, and protected. This article explores the legal aspects of IP protection in the digital age, focusing on the challenges and opportunities posed by digital technologies. The objective of this study is to analyze the evolving landscape of IP protection in the digital age, examining the impact of digitalization on traditional IP laws and regulations. This study employs a qualitative research methodology, conducting a comprehensive review of existing literature, laws, and regulations related to IP protection in the digital age. Content analysis and synthesis are used to illustrate key concepts and trends. The results of the study highlight the need for updated and harmonized IP laws to address the challenges posed by digital technologies. The study also identifies the importance of technological solutions, such as blockchain and digital rights management, in enhancing IP protection in the digital age. In conclusion, the study emphasizes the importance of adapting IP laws and regulations to

Resumen

La era digital ha revolucionado la forma de crear, compartir y proteger la propiedad intelectual. Este artículo explora los aspectos jurídicos de la protección de la PI en la era digital, centrándose en los retos y oportunidades que plantean las tecnologías digitales. El objetivo de este estudio es analizar la evolución del panorama de la protección de la propiedad intelectual en la era digital, examinando el impacto de la digitalización en las leyes y reglamentos tradicionales de propiedad intelectual. Este estudio emplea una metodología de investigación cualitativa, realizando una revisión exhaustiva de la literatura existente, las leyes y los reglamentos relacionados con la protección de la PI en la era digital. Se utilizan el análisis de contenido y la síntesis para ilustrar conceptos y tendencias clave. Los resultados del estudio ponen de relieve la necesidad de actualizar y armonizar las leyes de PI para hacer frente a los retos que plantean las tecnologías digitales. El estudio también identifica la importancia de las soluciones tecnológicas, como blockchain y la gestión de derechos digitales, para

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the digital age to ensure effective protection of IP rights. It also underscores the need for collaboration between governments, industries, and technology companies to develop innovative solutions for IP protection in the digital era.

Keywords: evolution, intellectual property rights, digital age, legal frameworks, technological advancements, artificial intelligence.

Introduction

In the rapidly evolving digital age, the protection of intellectual property has become a paramount concern. As technological advancements continue to reshape the way information is created, disseminated, and consumed, the legal aspects surrounding intellectual property rights have assumed unprecedented significance. This necessitates a comprehensive examination of the challenges and opportunities that arise in safeguarding intellectual property in the digital realm.

The digital age has ushered in an era of unparalleled connectivity and information accessibility (Sofilkanych et al., 2023). However, this interconnectedness has also given rise to a myriad of challenges for protecting intellectual property. With the ease of digital reproduction and distribution, issues such as copyright infringement, piracy, and unauthorized use have proliferated. The relevance of understanding and addressing the legal aspects of intellectual property protection in the digital age is thus imperative to foster innovation, encourage creativity, and ensure a fair and sustainable knowledge economy.

Many studies have delved into the legal dynamics of intellectual property protection in the digital era. These studies highlight the complexities posed by emerging technologies, the inadequacy of traditional legal frameworks, and the need for adaptive strategies (Pelegrinová & Lačný, 2016). Besides, modern research collectively provide insights into various facets of intellectual property protection, technological innovation, global economic perspectives and some legal procedures (Nadobko, 2020; Voronkova et al., 2019). However, without applying these works, there is still a lack of comprehensive works that would systematize the experience of various countries in the protection of intellectual property.

mejorar la protección de la PI en la era digital. En conclusión, el estudio subraya la importancia de adaptar las leyes y reglamentos de PI a la era digital para garantizar una protección eficaz de los derechos de PI. También subraya la necesidad de colaboración entre gobiernos, industrias y empresas tecnológicas para desarrollar soluciones innovadoras para la protección de la PI en la era digital.

Palabras clave: evolución, derechos de propiedad intelectual, era digital, marcos jurídicos, avances tecnológicos, inteligencia artificial.

The research problem at the core of this study revolves around the inadequacies of current legal frameworks in addressing the multifaceted challenges posed by the digital age to intellectual property protection. The dynamic nature of technological advancements often outpaces legislative responses, leaving intellectual property vulnerable to various forms of infringement. This research aims to scrutinize these gaps and propose nuanced solutions that align with the evolving nature of the digital landscape.

The primary aim of this research is to critically examine the legal aspects of intellectual property protection in the digital age and propose effective strategies for mitigating the challenges posed by technological advancements. By assessing the current legal frameworks, understanding the implications of emerging technologies, and drawing on insights from relevant studies, this research aims to contribute to the enhancement of intellectual property protection mechanisms in the digital era.

To achieve the stated aim, the following research tasks will be undertaken:

1. to review of existing legal framework
2. to analyze the influence of emerging technologies, such as artificial intelligence, blockchain, and digital distribution platforms, on intellectual property protection.
3. to explore and analyze specific cases of intellectual property infringement in the digital space to identify patterns, challenges, and potential solutions.

By undertaking these research tasks, this study aspires to contribute valuable insights to the ongoing discourse on intellectual property protection, facilitating the development of legal frameworks that are not only robust but also

capable of adapting to the dynamic digital system.

Literature review

Intellectual property (IP) refers to creations of the mind, encompassing a broad range of intangible assets such as inventions, literary and artistic works, designs, symbols, names, and trade secrets. These creations are the result of human intellect and creativity, and they hold value for individuals, businesses, and society at large. Intellectual property serves as a means to incentivize innovation, foster creativity, and promote economic growth by granting creators and innovators exclusive rights to their intangible assets.

The protection of intellectual property is a concept that involves legal and regulatory frameworks designed to safeguard the rights of creators and inventors. The fundamental purpose is to provide a set of exclusive rights that allow the originators of intellectual property to control how their creations are used, shared, and commercialized (Mansfield, 2000). These exclusive rights typically come with certain limitations and durations, aiming to strike a balance between the interests of the creators and the broader public (Brown et al., 2016). Therefore, modern authors have focused on various aspects of intellectual property protection. For instance, Cho and Kim (2017) examined the issue of relationship between intellectual property rights (IPR) protection and technological innovation. Focusing on the business context, the research investigated how robust IPR regimes influenced the incentives for firms to engage in research and development activities. The authors discussed the role of IPR protection as a motivator for technological innovation and its impact on the overall competitiveness of businesses. Cimoli, Dosi, Maskus, Okediji, Reichman and Stiglitz (2014) provided a comprehensive overview of the role of intellectual property rights in modern countries. Examining the broader economic implications, the research synthesized findings on how IPR regimes affected innovation, technology transfer, and economic development in developing nations. The authors presented conclusions and insights drawn from various studies, offering a nuanced understanding of the challenges and opportunities associated with intellectual property rights in the context of global development. Besides, Janković (2017) explored diverse legal aspects related to intellectual property laws. Focused on procedural aspects within the European Union legal

framework, the research provided an in-depth analysis of the legal intricacies surrounding IPR. The author addressed issues such as enforcement, dispute resolution, and the evolving nature of intellectual property law within the EU. Mula and Lobina (2012) provided insights into legal challenges and protections specific to web pages.

Given the rapidly changing nature of the online environment, the study's analysis could be enriched by considering evolving digital technologies, user-generated content, and global legal perspectives on web page protection. Kumar (2012) investigated the intersection of digital rights management (DRM) and intellectual property protection. Focused on the digital realm, the research explored how DRM technologies contributed to the protection of intellectual property in the context of digital content. Mula and Lobina (2012) provided insights into legal challenges and protections specific to web pages. Given the rapidly changing nature of the online environment, the study's analysis could be enriched by considering evolving digital technologies, user-generated content, and global legal perspectives on web page protection. Yi and Naghavi's (2017) research delved into the intersection of intellectual property rights (IPR), foreign direct investment (FDI), and technological development. This study contributes to the ongoing debate on how IPR influences innovation and economic growth. Moreover, Calista, Sudirman and Djaja (2023) analyzed the legal protection of digital painting. This work uses normative legal analysis using legal data. According to these results, copyright is an exclusive right formed from non-property and economic rights. This study demonstrates that copyright issues exist today, especially in the digital age. Legal regulation of intellectual property protection in EU countries was defined by Yavorska & Boyarska (2020). The results of this study demonstrate both challenges and solutions for this system. Litvishchenko's (2020) study explored the legal dimensions of protecting television formats as intellectual property. This niche focus indicated a recognition of the evolving nature of content creation and the need for legal frameworks to keep pace. The study's brevity suggested it may serve as a foundational exploration or commentary. However, a deeper analysis of specific legal mechanisms, case studies, or comparative perspectives could enhance the study's depth and applicability. However, the study described effective mechanisms for the protection of intellectual property in EU countries. In conclusion, the reviewed studies collectively

provide insights into various facets of intellectual property protection, spanning digital art, technological innovation, global economic perspectives, legal procedures, and digital rights management. Each study contributes important perspectives to the broader discourse on intellectual property in its diverse applications and contexts. However, in view of the development of new and new threats to intellectual property in the digital age, this problem remains relevant and not fully investigated. In this context, it is worth comparing the experience of different countries on the protection of IP.

Methodology

This research seeks to address this need by analyzing the legal aspects of IP protection in the digital age. By assessing the effectiveness of current legal frameworks, understanding the implications of emerging technologies, and drawing on insights from relevant studies, this research aims to propose effective strategies for mitigating the challenges posed by technological advancements. Ultimately, this research aims to contribute to the enhancement of intellectual property protection mechanisms in the digital era, ensuring that creators, innovators, and businesses can continue to thrive in an increasingly digital world.

To provide the proposed research several scientific methods were used. The synthesis method was used to analyze and summarize information on the legal aspects of intellectual property protection in the digital age. This method involves studying various sources of information, such as scholarly articles, books, legislation, case law, and other sources, to identify key aspects of the topic. Furthermore, by synthesizing the data obtained, the article can conduct a comparative analysis of legal norms and practices of intellectual property protection in different countries. This will help identify common trends and differences in regulating intellectual property protection in the digital age. Finally, through the synthesis of the data obtained, the article can formulate conclusions and recommendations for further development of legislation and practice in intellectual property protection in the digital age.

The main method was content analysis of scientific data. For this study, it was utilized multiple databases of scientific journals, including Scopus, Google Scholar, and Web of Science, to gather bibliographic data. Keywords such as "innovations", "digital technologies",

"law", "intellectual property", "legal challenges", "opportunities of legal regulation" were used for the search. The process of coding information from the content analysis involved the selection of sources based on relevance and relevance to the topic. After that, the units of analysis were determined, that is, a certain concept, sentence or paragraph that was repeated in detail in other works. Based on this, a detailed content analysis was carried out. Each database offers unique features and coverage, enhancing the comprehensiveness of the research. For this study, we relied on the Scopus database as our primary source for collecting bibliographic data. Scopus is a comprehensive abstract and citation database that covers peer-reviewed scientific content. It contains an extensive collection of more than 80 million records, making it one of the largest curated bibliographic databases available today. This database includes intelligent tools for monitoring, analyzing, and visualizing research output across various domains, such as science, technology, medicine, social science, and arts and humanities. It was used the function used Scopus's "Analyze Search Results" feature to analyze the data we collected. This feature allowed us to conduct a detailed analysis based on several criteria, including the distribution of documents by year, document sources, authors, institutes, subject areas, and document types. By utilizing this functionality, it became able to extract valuable insights from the dataset.

Google Scholar is a freely accessible search engine that indexes scholarly articles across various disciplines. It provides a broad scope of content, including peer-reviewed papers, theses, books, conference papers, and patents. Google Scholar's advanced search capabilities allowed us to refine our search queries and retrieve relevant articles on intellectual property rights. Web of Science is a curated database that indexes high-quality scholarly journals across different subject areas. It offers robust citation analysis tools, enabling us to track citations, identify influential works, and discover related research. Web of Science's comprehensive coverage and advanced search functionalities complemented our data collection process.

It has been employed similar methodologies across these databases, including using specific search queries related to intellectual property rights, analyzing search results to extract relevant data, and utilizing database-specific features to conduct in-depth analyses. By combining data from multiple databases, we were able to

enhance the reliability and validity of our findings.

This methodology, although effective, has certain limitations. It is worth taking into account the subjectivity of the judgments of scientists in the selected works.

Results and discussion

Amidst the ongoing global shift towards the digital era, there is a notable dearth of comprehensive understanding regarding the evolving landscape of intellectual property rights (IPR) in this context. The Information Age has enabled unparalleled access to information and creative works, yet it has also engendered intricate challenges pertaining to IPR protection and enforcement. Recent statistics indicate that in 2020 alone, the internet hosted over 500 billion copyrighted webpages, underscoring the pressing need for a study that methodically examines the shifts in IPR frameworks, the burgeoning issues of digital copyright infringement, and the ramifications of these developments on diverse stakeholders.

The evolution of intellectual property rights (IPR) in the United States and the UK has been driven by technological advancements and changing economic landscapes. In the USA, copyright protection has expanded to include digital media, reflecting the growing importance of digital content. Patent applications related to technology and software innovations have increased significantly, highlighting the role of patents in safeguarding technological advancements (Adams, 2023). Trademark registrations have also surged due to the increasing globalization of markets and the rise of e-commerce, emphasizing the importance of brand protection. Similarly, in the UK, there has been a notable increase in patent applications related to AI and machine learning technologies, leading to the streamlining of patent examination processes (Bowie, 2005). These developments underscore the need to adapt intellectual property rights to accommodate emerging technologies and changing business environments.

Trademark protection has also evolved in response to digitalization. While the UK was a member of the European Union, businesses could secure trademark protection across EU member states with a single application. However, post-Brexit, the UK has introduced its own trademark system while respecting existing EU trademarks,

ensuring continuity of trademark rights for UK-based businesses. Additionally, the UK has implemented domain name dispute resolution mechanisms to address trademark-related issues online. The evolution of intellectual property rights in the UK is closely tied to the challenges and opportunities of the digital age. The statistics and legislative changes discussed here illustrate the country's commitment to adapting its legal framework to safeguard intellectual property in an increasingly digital and globalized environment (Adams, 2023). As technologies advance, intellectual property laws will likely undergo further revisions to address emerging issues and strike a balance between innovation and protection.

In Japan, known for its innovation and technological progress, the evolution of IPR has been remarkable. Japan consistently ranks among the world's top countries for patent applications and grants. In 2019, Japan's patent office received over 340,000 applications, demonstrating the nation's dedication to safeguarding intellectual property. One significant development in Japan's IPR evolution is the extension of patent protection in response to technological advancements. Initially focused on traditional industries like manufacturing and chemicals, patents now cover a broader range of fields due to the rise of digital technology and electronics. Japan has granted patents for innovations in artificial intelligence, biotechnology, and software, highlighting its commitment to protecting intellectual property in emerging sectors.

The evolution of intellectual property frameworks in Sub-Saharan Africa has been notable, with countries in the region progressively establishing and enhancing these frameworks over the past decade. South Africa, for instance, has been at the forefront of adopting modern IP legislation, aligning its policies with international standards. A significant aspect of this evolution is the increasing emphasis on protecting traditional knowledge and cultural expressions (Adams, 2023). Kenya, among other countries, has acknowledged the significance of safeguarding traditional knowledge and folklore.

The following table provides an overview of patent applications, industry leadership, IP framework development and protection of traditional knowledge and cultural expressions in Japan, the UK, South Africa and the US (See Table 1).

Table 1.
Intellectual property landscape in Japan, the United Kingdom, South Africa, and the United States.

Indicator	Japan	United Kingdom	South Africa	United States
Leadership in	Technological innovations	Digital innovations	Legislative stability	Technological innovations
Development of IP framework	Broad	Adapted	Strengthened	Strengthened
Protection of traditional knowledge	Minimal	Unknown	Active protection	Minimal
Enhanced protection of cultural expressions	Minimal	Unknown	Protection exists	Minimal

Source: Bowie (2005), Adams (2023).

Over the preceding three years, the European Union (EU) has undertaken a series of legislative measures aimed at fortifying copyright and associated rights within the framework of the Digital Single Market. One pivotal development was the adoption of Directive (EU) 2019/789 by the European Parliament on April 17, 2019 (European Parliament & Council, 2019a). This directive lays down regulations governing the use of certain online transmission organizations and the retransmission of television and radio programs. Simultaneously, it addresses the incorporation of Council Directive 93/83/EU (2019), which streamlines cross-border transmission of radio broadcasting via satellite networks (Yavorska & Boyarska, 2020).

Another significant stride was the approval of Directive (EU) 2019/790 by the Parliament and the Council on the same date. This directive is instrumental in delineating copyright and additional rights within the Single Digital Market (European Parliament & Council, 2019b). Furthermore, it introduces amendments to Regulations 96/9/EC and 2001/29/EC (2019), serving to complement and augment existing directives that oversee pertinent matters in the digital landscape (Yavorska & Boyarska, 2020).

The regulatory landscape expanded with the inception of Regulation (EU) 2019/517 by the European Parliament and the Council on March 19, 2019. This regulation focuses on establishing and administering the EU top-level domain name (European Parliament & Council, 2019c). Notably, it modifies and annuls Regulation (EC) No. 733/2002 and repeals Commission Regulation (EC) No. 874/2004 (2019). By doing so, it delineates critical parameters for EU top-level domain names, contributing to the overarching legal framework. Additionally, Regulation (EC) No. 2017/1128, sanctioned by the EU Parliament and Council on June 14, 2017, pertains to the cross-border availability of interactive content services in the internal market

(European Parliament & Council, 2017). This regulation is instrumental in governing the legitimate access to portable e-content by users, ensuring accessibility at any given time and in any country within the boundaries of the European Union. The evolving needs of the digital market, unfolding within the expansive European Union, underscore the necessity for continuous legislative adaptation. The digital market is not only characterized by the free movement of people and services but also by the unimpeded flow of information and the Internet (Yavorska & Boyarska, 2020). This underscores the dynamic nature of EU legislation, responding to the evolving landscape of the digital realm and its multifaceted challenges.

Germany, a stalwart in technological and industrial innovation, possesses a sophisticated framework for the protection of intellectual property (IP). Germany boasts a robust patent system governed by the German Patent and Trademark Office (DPMA) and aligns with the European Patent Convention (EPC). The country's commitment to innovation is evident through the recognition of software as patentable subject matter, a stance that aligns with the European Patent Office (EPO) guidelines. Notably, Germany plays a pivotal role in the establishment of the Unified Patent Court (UPC), a system designed to enhance patent enforcement across participating EU countries. The German Copyright Act (Urheberrechtsgesetz) forms the backbone of copyright protection in the country. It safeguards the rights of authors and creators, covering a spectrum of creative works. Germany, acknowledging the digital age, has adapted its copyright laws to address challenges such as online piracy and the protection of digital content. In addition, Germany participates in the EU Trademark system, allowing businesses to register trademarks with the European Union Intellectual Property Office (EUIPO). Nationally, the German National Institute of Industrial Property (INPI) oversees trademarks.

Germany's approach to trademarks reflects its commitment to fostering a competitive business environment while ensuring fair competition. Besides, design protection in Germany is administered by the German Patent and Trademark Office. The country emphasizes the safeguarding of designs, particularly in the vibrant sectors of fashion and industrial design. Germany's approach aligns with the EU Directive on the Legal Protection of Designs, ensuring harmonization within the European context.

Hence, Germany stands as a paradigm of effective intellectual property protection within the EU. Its legislative frameworks, encompassing patents, copyright, trademarks, and design rights, demonstrate a commitment to fostering innovation and creativity while navigating the challenges posed by the digital age. As Germany continues to play a central role in shaping the European IP landscape, ongoing adaptation and international collaboration remain essential to address emerging complexities in the field.

On the other hand, France boasts a sophisticated and comprehensive legal framework for the protection of intellectual property (IP), aligning with both European Union directives and international standards. The country's commitment to fostering innovation and creativity is evident in its robust laws governing patents, trademarks, copyrights, and geographical indications. Patents in France are administered by the French National Industrial Property Institute, which plays a pivotal role in examining and granting patents. The institute provides a platform for patent registration; ensuring inventors' rights are protected.

France, being a participant in the Unified Patent Court, contributes to a unified system for patent litigation across EU countries. The UPC enhances legal certainty and consistency in patent disputes. Governed by the French Intellectual Property Code, copyright law

protects the rights of authors and creators. The Code encompasses a broad range of creative works, including literary, artistic, and software creations.

Poland has taken significant steps to enhance intellectual property protection by establishing specialized IP courts. These courts play a crucial role in efficiently handling IP-related disputes, contributing to a more streamlined legal process. Poland's commitment to creating a specialized judiciary reflects its dedication to the effective enforcement of intellectual property rights. Moreover, Poland has made substantial efforts to harmonize its intellectual property laws with EU directives (Sapiński & Szydłowski, 2022). This commitment ensures that Poland's legal framework aligns with European standards, promoting consistency in IP protection across the EU. The harmonization process reflects Poland's dedication to fostering a unified and effective intellectual property regime (Pelegrinová & Lačný, 2016). Although not an EU member, Switzerland collaborates closely with the European Patent Organization and the EUIPO. The Swiss Federal Institute of Intellectual Property oversees patents, trademarks, and designs, contributing to a comprehensive and harmonized intellectual property landscape (GGBA, (n.d.)). Switzerland's legal framework aligns with international standards, ensuring a robust protection system. Recognized as a hub for pharmaceutical innovation, Switzerland places a strong emphasis on the protection of pharmaceutical patents (GGBA, (n.d.)). The country's intellectual property laws strike a balance between incentivizing innovation in the pharmaceutical sector and addressing public health considerations. Rigorous patent protection measures contribute to fostering a conducive environment for research and development. This table highlights each country's approach to intellectual property protection and innovation, showcasing their efforts to support and protect creativity, innovation, and traditional knowledge (See Table 2)



Table 2.
Approach to intellectual property protection and innovation

	Germany	France	Poland	Switzerland
Patents	Germany boasts a robust patent system managed by the German Patent and Trademark Office (DPMA). It actively contributes to technological protection and innovation.	France places emphasis on technological protection, recognizing the importance of patents in fostering innovation.	Poland actively supports innovation through specialized IP courts that efficiently handle patent-related disputes.	Switzerland, a hub for pharmaceutical innovation, places a strong emphasis on protecting pharmaceutical patents. The legal framework balances innovation incentives with public health considerations.
Copyright	Germany's copyright framework, governed by the <i>Urheberrechtsgesetz</i> , provides comprehensive protection for authors. The legal landscape addresses challenges posed by the digital environment, emphasizing the rights of content creators.	France has strong copyright protection, recognizing moral rights. The legal framework ensures the integrity and reputation of creators.	Poland actively harmonizes its copyright laws with EU directives, adapting to the digital landscape and addressing challenges in online content distribution.	Switzerland addresses challenges in the digital landscape, adapting copyright laws to protect the rights of content creators and foster creativity.
Trademarks	Germany adheres to the EU Trademark system, allowing businesses to register trademarks with the European Union Intellectual Property Office (EUIPO). The country emphasizes brand protection within the European framework.	France places a strong emphasis on protecting trademarks through both national and EU systems. Rigorous trademark protection is essential for preserving brand integrity.	Poland, through specialized IP courts, enhances enforcement of trademark rights, contributing to a streamlined legal process.	Switzerland collaborates closely with international organizations, contributing to a comprehensive and harmonized intellectual property landscape, including trademark protection.
Geographical Indications (GIs)	Protected and regulated according to the European system. Examples are regional varieties of wine, cheese, etc.	France is renowned for stringent protection of Geographical Indications (GIs). Examples include Champagne, Roquefort cheese, and Bordeaux wine. Protects the authenticity and quality of regional products.	Poland takes an active role in international discussions and forums focused on the protection of traditional knowledge and Geographical Indications (GIs). This proactive engagement demonstrates Poland's commitment to contributing to global conversations surrounding the preservation of traditional practices, cultural heritage, and the distinctive qualities of products	Switzerland, though not an EU member, has its system to recognize and protect Geographical Indications (GIs). The comprehensive framework covers diverse products like agricultural produce, food items, and traditional crafts with unique qualities tied to specific regions. Following PDO and PGI schemes similar to the EU, Switzerland ensures products from specific areas maintain distinct qualities linked to



			Germany is recognized for creating an innovation-friendly environment, with various mechanisms supporting research and development.	France actively supports innovation through various mechanisms, including tax incentives, contributing to a culture of research and development.	Poland actively supports innovation through initiatives such as tax incentives, fostering a culture of research and development.	Switzerland actively fosters innovation, particularly in the pharmaceutical sector, providing a conducive environment for research and development.
Innovation Support						

Source: Romanyuk (2017), Pasechnyk (2022).

However, practical experience shows that the digital space presents a myriad of challenges for protecting intellectual property, encompassing issues such as digital piracy, counterfeiting, plagiarism, and cybersecurity threats. Many modern authors emphasize this (Bowie, 2005). Unauthorized distribution of copyrighted content, the sale of counterfeit goods, and the unauthorized use of creative works are pervasive problems. Additionally, increasing cybersecurity threats jeopardize the integrity of digital IP. To address these challenges, potential solutions include enhanced digital rights management technologies, stricter legal enforcement, and public awareness campaigns to mitigate digital piracy. Strengthening e-commerce platform monitoring, implementing blockchain for supply chain transparency, and fostering a culture of respect for IP rights can combat counterfeiting and trademark infringement. Solutions for plagiarism involve content recognition technologies, a legal

framework supporting content creators, and initiatives promoting awareness. Protecting against cybersecurity threats to IP necessitates robust cybersecurity measures, encryption technologies, and regular audits of digital infrastructure. A comprehensive strategy involves global cooperation among governments, law enforcement, and industry stakeholders. Legal reforms to update and harmonize IP laws, integrating advanced technologies for proactive monitoring, and promoting awareness are crucial components. Blockchain technology offers transparent and tamper-proof records of IP rights, while collaboration between IP owners and technology companies is essential for innovative solutions. Strategic litigation against major infringers can set precedents and deter others, contributing to a more secure and respectful digital environment for intellectual property. The Table 3 outlines the main challenges and potential solutions that should be implemented.

Table 3.
The main challenges and potential solutions of protection IP

Aspects of IP Protection	Challenges	Potential Solutions
Digital Piracy	Unauthorized distribution of copyrighted content	Enhanced digital rights management (DRM) technologies - Stricter legal enforcement - Public awareness campaigns
Counterfeiting and Trademark Infringement	Illicit reproduction and sale of counterfeit goods	Strengthen e-commerce platform monitoring - Implement blockchain for supply chain transparency - International cooperation
Plagiarism and Content Theft	Unauthorized use and reproduction of creative works	Content recognition technologies - Legal recourse for content creators - Educational campaigns
Cybersecurity Threats to IP	Increasing cybersecurity threats	Robust cybersecurity measures - Encryption technologies - Regular audits of digital infrastructure
Global Cooperation	Cross-border challenges in enforcement	Strengthen international collaboration and information sharing - Harmonize legal frameworks for international IP protection
Legal Reforms	Outdated or inconsistent IP laws	Update and harmonize intellectual property laws - Clarify jurisdiction in cases of international infringement

Technology Integration	Emerging challenges in digital landscapes	Embrace advanced technologies (AI, ML) for proactive monitoring - Implement automated takedown systems for infringing content
Education and Awareness	Lack of understanding about IP importance	Promote awareness campaigns - Foster a culture of respect for intellectual property
Blockchain for IP Protection	Lack of transparent and tamper-proof records	Leverage blockchain technology for transparent IP records - Enhance traceability of ownership
Collaboration with Tech Industry	Technology facilitating infringement challenges	Encourage collaboration between IP owners and tech companies - Develop innovative solutions and best practices for protection
Strategic Litigation	Insufficient deterrents for major infringers	Pursue strategic legal actions against major infringers - Set legal precedents to deter others

Source: Malinovska (2018), Svitlak (2023).

Therefore, the multifaceted nature of intellectual property protection in the digital age requires a strategic and holistic approach. Legislative reforms, technological integration, global collaboration, and awareness initiatives are crucial components of an effective strategy to safeguard intellectual property rights in the ever-evolving digital landscape.

In the context of the legal aspects of intellectual property protection in the digital age, the research undertaken has yielded significant insights. The results indicate that the evolving landscape of digital technology has posed intricate challenges to the traditional framework of intellectual property rights. The findings align with Janković's (2017) exploration of diverse legal aspects related to intellectual property rights, emphasizing the need for procedural considerations in the EU law context. Furthermore, Pelegrinová and Lačný (2016) shed light on the economic dimensions of intellectual property protection, highlighting its critical role in fostering economic development. The obtained results resonate with Vindele and Cane's (2022) exploration, emphasizing the evolving role of intellectual property rights in the technological age. However, in this dynamic discourse, Cimoli, Dosi, Maskus, Okediji, Reichman and Stiglitz (2014) conclusions on the role of intellectual property rights in developing countries present a contrasting perspective, pointing towards the need for nuanced considerations in diverse global contexts. The results show that the multifaceted nature of intellectual property rights requires a comprehensive understanding of legal intricacies, economic implications, and technological advancements.

The obtained results indicate that legal frameworks must adapt to the evolving digital landscape, balancing the interests of creators and the broader public. In comparing these findings with existing literature, Janković's insights align with the need for procedural advancements in EU

law, contributing to a nuanced legal framework. Pelegrinová and Lačný's (2016) emphasis on economic aspects resonates with the growing recognition of intellectual property's crucial role in driving economic prosperity. Vindele and Cane's (2022) exploration of intellectual property rights in the technological age aligns with the broader discourse on the dynamic relationship between innovation and legal protection. However, Cimoli, Dosi, Maskus, Okediji and Reichman (2014) conclusions provide a divergent viewpoint, suggesting that the implications of intellectual property rights vary significantly in developing countries. Instead, this study demonstrated that modern countries are actively trying to develop their legal framework in accordance with the challenges of digitalization. This is especially noticeable from the analysis of the legislative framework. Also, this study demonstrated that the general legislative frameworks of the EU countries are adopted by the member countries and are actively adapted and developed in different national base.

However, it is crucial to extend the discussion to include Pick's (2022) work to provide a more comprehensive understanding. The results demonstrate that the legal protection of Geographical Indications (GIs) is a vital component in the broader discourse on intellectual property. Pick's (2022) exploration of the legal framework for GIs in France provides an enriching perspective. The obtained results indicate that the legal protection of GIs is intricately linked to the overall intellectual property landscape, reflecting the need for specialized considerations in protecting regional and traditional products. Comparing these findings with the existing literature, Pick's (2022) work aligns with the growing recognition of the unique challenges and opportunities associated with GIs. The emphasis on GIs in France, as presented by Pick (2022), corresponds with the broader global discourse on the protection of regional identities and traditional knowledge. Integrating this perspective into our discussion

enriches our understanding of the legal intricacies surrounding intellectual property, showcasing the need for specialized legal frameworks to safeguard geographical indications.

In conclusion, incorporating Pick's insights into the discussion enhances the comprehensiveness of this exploration. The legal protection of GIs in France serves as a valuable case study, illustrating the nuanced considerations required for specific categories within the broader spectrum of intellectual property. This further reinforces the notion that a one-size-fits-all approach is inadequate in addressing the diverse challenges posed by the digital age. The experiences of various countries, as explored in Janković (2017), Pelegrinová, Lačný (2016) and Pick (2022) work collectively underscore the importance of a nuanced and adaptive legal framework to effectively protect intellectual property in a rapidly evolving digital landscape. The obtained results underscore the importance of continuous analysis and adaptation of legal frameworks to address emerging challenges. They indicate the need for a balanced approach that considers technological advancements, economic implications, and global diversity. In conclusion, while supporting our theory, Janković (2017) contributes valuable perspectives, Adams's (2023) work highlights the necessity for context-specific considerations in the evolving discourse on intellectual property rights. This comprehensive analysis reinforces the notion that intellectual property protection in the digital age demands a nuanced, globally aware, and adaptive legal framework. Therefore, this work has a significant and significant contribution to the study of the experience of countries in the context of the protection of intellectual property in the digital age. Emphasis on various aspects, such as legal tricks, economic dimensions, and the impact of technology on intellectual property, gives this study a wide scope and depth. Therefore, this study makes a significant contribution to solving intellectual property issues, considering them in an international context.

Conclusions

The evolution of intellectual property rights in the digital age is a complex and dynamic process, with various countries adapting their legal frameworks to accommodate technological advancements and changing economic landscapes. In the United States, for example, copyright, patenting, and trademark registration have all seen significant growth, reflecting the

importance of IPR in fostering innovation and creativity. Similarly, the UK and Japan have witnessed notable developments in patent and trademark protection, highlighting the global nature of IPR evolution. Moreover, in Sub-Saharan Africa, there is a growing emphasis on protecting traditional knowledge and cultural expressions, indicating a broader recognition of the importance of intellectual property in diverse cultural contexts. Overall, these trends underscore the need for ongoing legal and policy adjustments to address emerging challenges and ensure a balance between protection and accessibility in the digital era.

The European Union has implemented several legislative measures to strengthen copyright and associated rights in the Digital Single Market. Germany's intellectual property protection framework is sophisticated, with robust patent, copyright, trademark, and design protection systems. The country plays a central role in the Unified Patent Court and emphasizes the protection of digital content in its copyright laws. France also has a comprehensive legal framework for IP protection, aligning with EU directives and international standards. The country's laws governing patents, trademarks, copyrights, and geographical indications reflect its commitment to fostering innovation and creativity. Poland has made significant efforts to enhance IP protection, including establishing specialized IP courts and harmonizing its laws with EU directives. Switzerland, although not an EU member, collaborates closely with EU organizations and has a robust IP protection system, particularly in pharmaceutical patents. These countries' approaches to IP protection demonstrate a commitment to fostering innovation while addressing the challenges of the digital age.

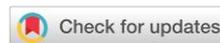
The digital space presents significant challenges for protecting intellectual property, including digital piracy, counterfeiting, plagiarism, and cybersecurity threats. Unauthorized distribution of copyrighted content, sale of counterfeit goods, and unauthorized use of creative works are widespread issues. Cybersecurity threats also pose risks to digital IP integrity. Potential solutions include enhancing digital rights management technologies, enforcing stricter legal measures, and raising public awareness to combat digital piracy. Monitoring e-commerce platforms, implementing blockchain for transparency, and fostering respect for IP rights can address counterfeiting and trademark infringement. Solutions for plagiarism include content recognition technologies and legal

frameworks supporting content creators. Protecting against cybersecurity threats requires robust measures, encryption technologies, and regular infrastructure audits. A comprehensive strategy involves global cooperation, legal reforms, integration of advanced technologies, and promoting awareness. Blockchain technology can provide transparent records of IP rights, and collaboration between IP owners and technology companies is crucial. Strategic litigation against major infringers can set precedents and deter others, contributing to a more secure digital environment for intellectual property. So, this work has a significant contribution to the study of the experience of countries in the context of the protection of intellectual property in the digital age. Hence, this research makes an important contribution to solving intellectual property issues, considering them in an international context. Although the used methodology provides a systematic approach to the analysis of the problem of intellectual property protection, it is worth paying attention to certain limitations. First, the methodology includes content analysis of digital sources, while it may ignore non-traditional sources such as industry reports or expert opinions. At the same time, it is worth noting that the study took into account the experience of EU crises, while ignoring the experience of other countries. Important directions for further research are the analysis of concrete cases of violations of intellectual property rights based on practical legal consideration.

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DOI: <https://doi.org/10.34069/AI/2024.74.02.19>

How to Cite:

Pryzvanska, R., Borysova, O., Mozgova, G., & Fedorenko, A. (2024). Clinical cases and recommendations for post-traumatic rehabilitation based on EI. *Amazonia Investiga*, 13(74), 227-238. <https://doi.org/10.34069/AI/2024.74.02.19>

Clinical cases and recommendations for post-traumatic rehabilitation based on EI

Casos clínicos y recomendaciones para la rehabilitación postraumática basadas en la IE

Received: January 8, 2024

Accepted: February 27, 2024

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Abstract

Psychological rehabilitation following traumatic events is essential for individuals to regain a sense of well-being and resilience. Emotional intelligence (EI) has emerged as a promising tool in trauma recovery, yet its specific role and effectiveness remain underexplored. This research aims to investigate the relevance of EI as a tool for psychological rehabilitation after traumatic events. Through the analysis of clinical cases, this study seeks to elucidate the impact of EI interventions on promoting resilience and facilitating recovery among trauma survivors. Clinical cases, presented in literature, of individuals who have experienced traumatic events were analyzed to assess the role of EI in their psychological rehabilitation. The results reveal that EI interventions significantly contribute to psychological rehabilitation after traumatic events. The integration of EI strategies into trauma recovery programs facilitated resilience-building and enhanced overall well-being among trauma survivors. Hence, the research underscores the relevance of EI as a tool for psychological rehabilitation after traumatic

Resumen

La rehabilitación psicológica tras sucesos traumáticos es esencial para personas recuperen una sensación de bienestar y resiliencia. La inteligencia emocional (IE) ha surgido como una herramienta prometedora en recuperación del trauma, sin embargo, su papel específico y eficacia siguen siendo poco explorados. El objetivo de este estudio es investigar la relevancia de la IE como herramienta para rehabilitación psicológica tras sucesos traumáticos. A través del análisis de casos clínicos, este estudio pretende dilucidar el impacto de las intervenciones de IE en la promoción de la resiliencia y la facilitación de la recuperación entre los supervivientes de traumas. Se analizaron casos clínicos, presentados en la literatura, de individuos que han experimentado eventos traumáticos para evaluar el papel de IE en su rehabilitación psicológica. Por lo tanto, la investigación subraya la relevancia de IE como herramienta para rehabilitación psicológica tras sucesos traumáticos. Las conclusiones destacan la eficacia de intervenciones de IE para promover la resiliencia y facilitar la recuperación entre los supervivientes de traumas. Mediante la

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events. The conclusions highlight the effectiveness of EI interventions in promoting resilience and facilitating recovery among trauma survivors. By incorporating EI strategies into trauma recovery programs, mental health professionals can enhance the effectiveness of interventions and support individuals in their journey toward healing and recovery.

Keywords: trauma rehabilitation, emotional intelligence interventions, case illustrations, resilience enhancement, psychological healing, traumatic events, psychological rehabilitation.

Introduction

In the wake of traumatic events, individuals often grapple with a myriad of emotional upheavals, from acute distress to long-lasting psychological scars. In recent years, the concept of emotional intelligence (EI) has emerged as a pivotal tool in the field of psychological rehabilitation, offering a nuanced understanding of how individuals perceive, express, and manage emotions. This burgeoning interest stems from the recognition that traditional therapeutic approaches, while valuable, may sometimes fall short in addressing the complex emotional needs of trauma survivors (Gransberry, 2021). Trauma, whether resulting from natural disasters, interpersonal violence, or other life-altering experiences, can significantly disrupt an individual's emotional equilibrium. Conventional models of psychological intervention typically focus on symptom alleviation and cognitive restructuring.

Nowadays it is important to improve emotional intelligence. Emotional intelligence (EI) is the ability to understand, realize and manage one's own emotions, one's motivation, thoughts and behavior, to regulate one's emotional state, as well as the ability to manage the emotional states of other people, notice their actual needs, empathize and develop their strengths.

While traditional methods seek to alleviate symptoms, they do not address the emotional and psychological roots of the problem. Cognitive-behavioral therapy, for example, focuses on modifying distorted thoughts without addressing the underlying emotional components. As a result, these traditional methods often offer limited and isolated solutions to post-traumatic syndromes. Exposure therapy, on the other hand, while it can be helpful, carries the risk of rekindling the trauma. Therefore, the development of emotional intelligence becomes a fundamental tool to prevent the recurrence of

incorporación de estrategias de IE en programas de recuperación del trauma, los profesionales de salud mental pueden mejorar la eficacia de intervenciones y apoyar a los individuos su camino hacia la curación y la recuperación.

Palabras clave: rehabilitación del trauma, intervenciones de inteligencia emocional, ilustraciones de casos, mejora de la resiliencia, curación psicológica, eventos traumáticos, reabilitação psicológica.

the problem and promote a comprehensive recovery.

A burgeoning body of research has explored the role of EI in facilitating psychological rehabilitation following traumatic events (Miloradova, 2023). Studies have investigated various facets of EI, including emotional awareness, empathy, and emotion regulation, and their influence on coping strategies and resilience. Moreover, empirical evidence suggests that individuals possessing emotional intelligence tend to exhibit better adaptive functioning and reduced vulnerability to psychopathology in the aftermath of trauma (Kao & Chen, 2016; Malik, 2021; Radziievska et al., 2022). Such findings underscore the potential utility of integrating EI-based interventions into existing therapeutic frameworks to enhance post-traumatic recovery outcomes.

Despite the growing recognition of emotional intelligence as a valuable resource in trauma recovery, significant gaps remain in understanding its precise mechanisms of action and optimal implementation within clinical settings. Moreover, contextual factors such as cultural differences and socio-economic disparities may influence the efficacy of EI-based interventions, highlighting the need for nuanced approaches that account for diverse individual backgrounds and experiences.

The primary aim of this study is to explore the utility of emotional intelligence as a tool of psychological rehabilitation following traumatic events, drawing upon clinical cases and empirical research to elucidate its potential benefits and challenges. To complete the object, the following research questions will be undertaken:

1. Reviewing existing literature on emotional intelligence and trauma recovery to identify

- key theoretical frameworks and empirical findings.
2. Analyzing clinical cases illustrating the application of EI-based interventions in diverse trauma contexts, with a focus on treatment outcomes and therapeutic processes.
 3. Identifying barriers to the effective integration of emotional intelligence into trauma rehabilitation protocols and proposing recommendations for addressing these challenges.
 4. Synthesizing findings to inform evidence-based practices and guidelines for enhancing psychological rehabilitation efforts in the aftermath of trauma.

Through a comprehensive exploration of emotional intelligence within the background of trauma recovery, this study seeks to contribute to the growing body of knowledge aimed at improving the quality of care for trauma survivors and promoting their long-term well-being.

Literature review

A considerable body of scholarly work has delved into the intersection of emotional intelligence (EI) and trauma, exploring their intricate relationship and implications for psychological well-being. Current scholars have investigated several important issues of EI, ranging from its role in military leadership to its impact on trauma treatment outcomes and self-care practices among clinicians. Numerous scholars have underscored the importance of emotional intelligence in military settings, highlighting its role in enhancing leadership effectiveness and promoting resilience among service members (Chiorcea & Cioranu, 2021; Garcia Zea et al., 2023). These studies have demonstrated that individuals with higher levels of emotional intelligence exhibit greater adaptability in high-stress environments, fostering cohesive team dynamics and facilitating decision-making processes. Moreover, research has examined the link between past trauma and emotional intelligence, shedding light on how adverse experiences may shape one's emotional competencies (Oden et al., 2015). However, these studies constitute only the theoretical basis of the study, since they do not demonstrate concrete practical solutions and models of treatment of psychological diseases based on the development of emotional intelligence.

Older, conventional techniques aim to lessen symptoms without considering psychological and emotional factors. Specifically, cognitive-behavioral therapy influences the alteration of dysfunctional thought patterns without emphasizing emotional aspects. In addition, conventional approaches can only partially and singly alleviate post-traumatic disorders. However, there is a chance that exposure therapy will make the issue worse.

Findings from Gottfredson & Becker (2023) suggest that exposure to trauma can impact emotional regulation abilities and interpersonal functioning, potentially contributing to difficulties in navigating social relationships and coping with distressing emotions. In the realm of clinical practice, attention has been directed towards the role of emotional intelligence in facilitating effective trauma treatment outcomes (Crone et al., 2022). A comparative analysis of trauma interventions among homeless and housed veterans revealed nuanced differences in response to therapeutic approaches, underscoring the importance of considering individual differences in emotional functioning and environmental factors (Crone et al., 2022).

Furthermore, studies have explored the relationship between emotional intelligence and self-care practices among clinicians, particularly in the context of trauma exposure (Butler et al., 2017). Research findings have highlighted the significance of emotional self-awareness and self-regulation in mitigating burnout, secondary traumatic stress symptoms, and compassion fatigue among mental health professionals. However, the shortcoming of the study is the practical dimension, since the researcher did not demonstrate in practice the relationship between these methods and their significance for treatment. Additionally, literature has examined how emotional intelligence contributes to effective leadership and management practices, emphasizing its role in promoting collaboration, empathy, and conflict resolution skills (Gransberry, 2021). These studies suggest that leaders with higher emotional intelligence are better equipped to navigate complex organizational challenges and foster supportive work environments conducive to employee well-being. The study by Piotrowski, Martinská, Boe, Rawat and Deshpande (2020) reveals significant correlations between personality traits, self-esteem, emotional intelligence among military personnel. Specifically, certain personality traits were found to be associated with higher levels of self-esteem and EI indicating a potential link between individual dispositions and adaptive

functioning in cross-cultural environments. Tuck and Patlamazoglou (2019) investigate the complex relationship between traumatic stress, EI, and posttraumatic growth (PTG)—the positive psychological changes that individuals may experience following adversity. The study reveals a significant negative correlation between traumatic stress symptoms and emotional intelligence, indicating that individuals with higher EI levels experience lower levels of distress in response to trauma. Hence, the literature reviewed underscores the multifaceted nature of emotional intelligence and its relevance across diverse domains, from military contexts to clinical settings and organizational leadership. By elucidating the complex interplay between emotional intelligence and trauma, these studies offer important data into the potential applications of EI-based interventions in promoting psychological resilience and facilitating post-traumatic growth. It should be noted that these studies do not always take into account the practical aspect of treatment and do not describe regional traditions of these therapies. Thus, this research will be directed to the analysis of post-traumatic practices based on detailed analysis of clinical cases and practical solutions, which makes this work important for further studies.

Methodology

By employing a multi-method approach that integrates case illustrations from literature with systematic literature analysis, this study aims to provide a study of the role of emotional intelligence in psychological rehabilitation after traumatic events.

First step: literature analysis

Literature selection

A comprehensive search of academic databases conducted to identify relevant studies on emotional intelligence and trauma rehabilitation. Peer-reviewed articles, research papers, and meta-analyses published in the last decade included in the analysis.

Data extraction

Pertinent data regarding emotional intelligence theories, trauma interventions, treatment outcomes, and recommendations was extracted from the chosen literature. This data was methodically organized and synthesized to aid in comparison and analysis.

Data synthesis

During data synthesis, the gathered information was amalgamated to pinpoint common themes, trends, and gaps within the literature. Comparative analysis techniques were utilized to scrutinize similarities and differences across studies, thereby fostering a comprehension of the research background in the field.

Second step: case illustration from literature

Selection of cases

Utilizing a systematic literature review approach, relevant case illustrations from existing literature was identified. Cases were selected based on their relevance to the topic of emotional intelligence as a tool for psychological rehabilitation after traumatic events. Criteria for selection included diversity in trauma types, treatment modalities, and outcomes.

Data collection

Case illustrations were extracted from peer-reviewed journals, books, and other scholarly sources. Data related to the traumatic event, emotional intelligence interventions, therapeutic processes, and treatment outcomes were collected and analyzed.

Data analysis

Case data was qualitatively analyzed to identify general themes and patterns, regarding the role of emotional intelligence in psychological rehabilitation post-trauma. Thematic analysis was employed to organize and interpret the data.

Third step: integration of methods

Triangulation

Findings from the case illustrations and literature analysis were triangulated to validate and enrich the results. Consistency and convergence of evidence across different sources was sought to enhance the robustness of the findings.

Interpretation

The integrated findings were interpreted in light of existing theoretical frameworks and empirical evidence. Insights derived from the case illustrations were contextualized within the broader literature landscape, allowing for a nuanced understanding of the role of emotional intelligence in trauma rehabilitation.

Results and discussion

In the aftermath of traumatic events, individuals often grapple with profound emotional distress and psychological upheaval. Traditional therapeutic approaches, while effective to some extent, may not adequately address the complex emotional needs of trauma survivors. Emotional intelligence (EI), characterized by the capacity to perceive, comprehend, and manage emotions, has garnered increasing attention as a promising tool for psychological rehabilitation in such contexts (Holbery, 2011; Holbery, 2015). By fostering emotional awareness, empathy, and adaptive coping strategies, EI interventions offer a holistic approach to trauma recovery.

Emotional responses to traumatic events are highly nuanced and deeply intertwined with an individual's sociocultural background. While the immediate aftermath of trauma often elicits emotions such as anger, fear, sadness, and shame, the manifestation of these feelings can be complex and multifaceted.

Moreover, some individuals may struggle to recognize or acknowledge these emotions due to

various factors (Ishii et al., 2017). One significant barrier to identifying emotions is a lack of prior exposure to emotional expression within one's familial or community context. In cultures or families where emotional discussions are taboo or suppressed, individuals may find it challenging to label and process their feelings in the aftermath of trauma. Furthermore, some individuals may perceive emotional expression as dangerous, associating it with the trauma itself. They may fear that acknowledging their emotions will result in a loss of control, leading to a sense of "losing it" or descending into madness. This fear can be particularly potent for those who have experienced trauma in which emotions played a central role, reinforcing the belief that emotional expression is perilous.

Additionally, there are those who may deny experiencing any emotions related to their traumatic experiences altogether. Instead, they may describe their reactions as a sense of numbness or emotional detachment. This denial can stem from a variety of factors, including a desire to avoid confronting painful memories or a belief that acknowledging emotions would be too overwhelming (See Figure 1).



A 22-year-old woman was mandated to outpatient mental health and substance abuse treatment as an alternative to incarceration after being arrested for assault. During intake, she disclosed a seven-year history of alcohol abuse and one depressive episode at age 18. She also revealed a history of severe physical abuse by her mother's boyfriend between ages 4 and 15. Despite the severity of her experiences, she showed a pragmatic attitude toward her past trauma, expressing reluctance to engage in group therapy or discuss emotions openly. She exhibited disinterest in schooling, having dropped out in 10th grade, and expressed low expectations for her future. Throughout her initial weeks in treatment, she remained disconnected from group members, questioning the purpose of therapy, and denying any emotional impact from her abusive past. Observers noted her lack of empathy and flat affect during group discussions, indicating potential emotional detachment or suppression.

Figure 1. Illustration of case.

Source: Adapted from Center for Substance Abuse Treatment (U.S.) (2014)

In the case 1 emotional numbing is apparent through her restricted range of emotions during interpersonal interactions and patient's inability to connect any emotion to her history of abuse. Additionally, she harbors a belief in a

foreshortened future. Research such as the prospective longitudinal study by Jeppesen (2017) underscores the significance of recognizing and comprehending numbing as a response to traumatic stress (See Figure 2).

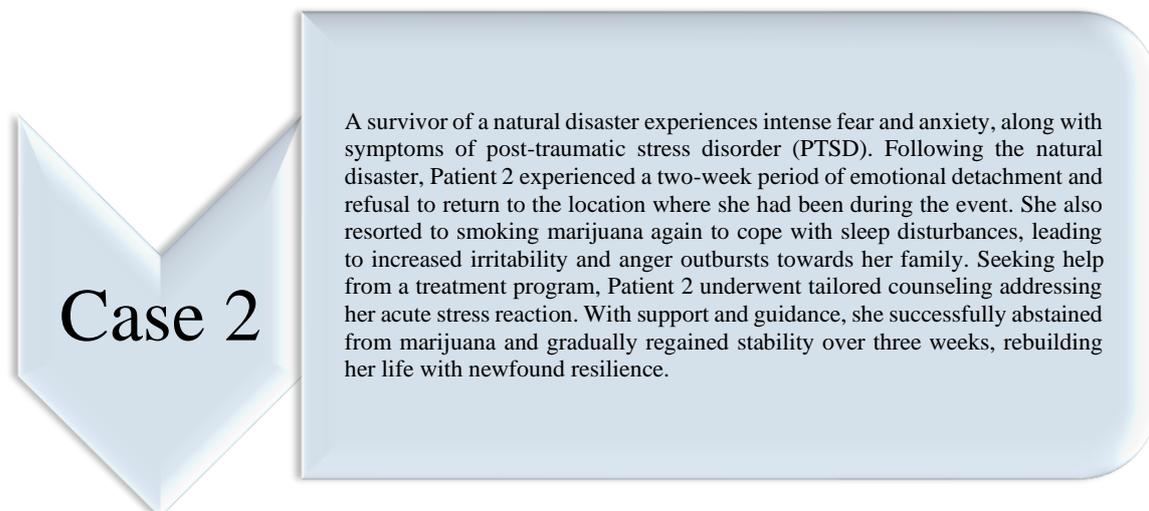


Figure 2. Illustration of case.

Source: Adapted from Center for Substance Abuse Treatment (U.S.) (2014)

The case of Patient 1 highlights the importance of developing emotional intelligence, particularly in the aftermath of traumatic events such as natural disasters. Emotional intelligence encompasses the ability to recognize, understand, and manage one's own emotions, as well as to navigate interpersonal relationships effectively. In this scenario, Patient 1 experienced intense fear, anxiety, and emotional detachment following a natural disaster, symptoms generally connected with post-traumatic stress disorder (PTSD). These emotional responses not only disrupted her daily life but also hindered her ability to cope with the aftermath of the event. However, through tailored counseling addressing her acute stress reaction, Patient 1 received support and guidance in developing emotional intelligence skills. By learning to recognize and manage her emotions, Patient 1 was able to abstain from maladaptive coping mechanisms, such as smoking marijuana, and gradually regain stability over time. Moreover, the rebuilding of Patient 1's life with newfound resilience underscores the transformative power of emotional intelligence in overcoming adversity. By cultivating emotional awareness, resilience, and adaptive coping strategies, individuals like Patient 1 can navigate the challenges of trauma recovery more effectively and rebuild their lives

with greater strength and stability. Overall, the case illustrates that developing emotional intelligence is crucial for individuals facing traumatic events, as it equips them with the necessary skills to cope, adapt, and thrive in the face of adversity. Through targeted interventions and support, individuals can harness the power of emotional intelligence to promote healing, resilience, and overall well-being in the aftermath of trauma. Through EI-focused therapy, the individual learns to identify and manage their emotions, gradually regaining a sense of control and resilience. By cultivating emotional regulation skills, the survivor develops coping strategies to navigate triggers and intrusive thoughts, paving the way for gradual recovery and emotional healing.

The importance EI for individuals who have participated in different wars cannot be overstated. In the aftermath of armed conflict, soldiers and veterans often face a myriad of physical, psychological, and emotional challenges (MacEwan & Gibson, 2023; Castilho Barilli, 2012). Emotional intelligence plays a critical role in helping them navigate these difficulties and promote their well-being in several ways (See Figure 3).

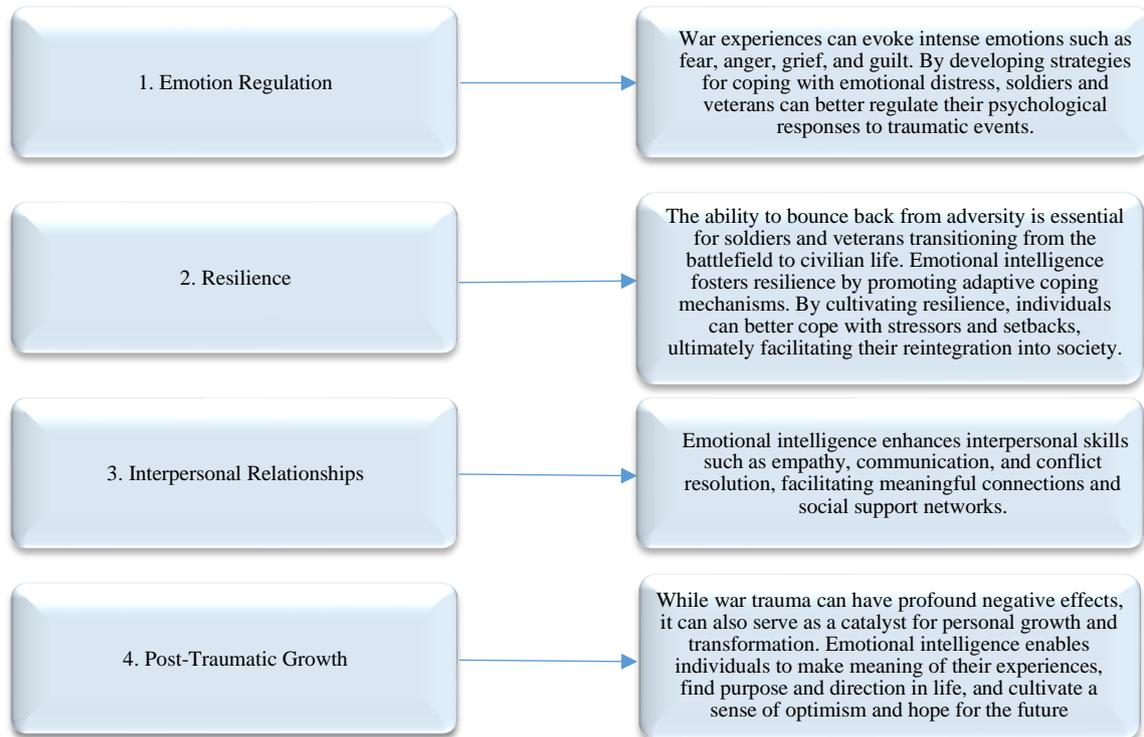


Figure 3. Ways of promoting the improvement of the condition of military personnel through the development of emotional intelligence.

Source: Author's development

Hence, emotional intelligence is of paramount importance for military people have participated in war, offering a valuable resource for navigating the complexities of post-conflict adjustment and promoting psychological resilience, social integration, and overall well-

being. By recognizing and cultivating emotional intelligence, soldiers and veterans can effectively cope with the challenges of war trauma and thrive in their transition to civilian life (See Figure 4-6).

Case 3

A 30-year-old combat veteran, returned from deployment with symptoms of post-traumatic stress disorder (PTSD), including intrusive memories, hypervigilance, and emotional numbing. Despite his physical injuries healing, the Patient 3 struggled with intense survivor guilt and feelings of worthlessness. Through therapy focused on emotional regulation and trauma processing, he learned to cope with his emotions and reconcile his wartime experiences. With ongoing support from his therapist and peers, he gradually regained a sense of purpose and meaning in civilian life, volunteering with veterans' organizations to support others struggling with similar challenges.

Figure 4. Illustration of case.

Source: Adapted from Center for Substance Abuse Treatment (U.S.) (2014)

Hence, EI enables individuals like Patient 3 to recognize and regulate their emotions effectively. Through therapy focused on emotional regulation, he learns to manage the intense emotions associated with his PTSD symptoms. By developing strategies to cope with intrusive memories and emotional numbing, he gains greater control over his psychological well-

being (Koh & O'Higgins, 2018). EI facilitates empathy and understanding towards oneself and others. As Patient 3 navigates his journey of recovery, empathy allows him to acknowledge and validate his own emotions and experiences without judgment. Additionally, empathy fosters a deeper understanding of the experiences of fellow veterans, enhancing his ability to connect

and support them in their own recovery processes. Moreover, EI equips individuals with adaptive coping mechanisms to navigate challenging situations effectively. By developing coping strategies tailored to his specific needs, Patient 3 learns to confront and process his traumatic memories constructively. Through therapy focused on trauma processing, he gains insight into his emotions and experiences, empowering him to adapt and thrive despite his

past traumas. In summary, this case underscores the importance of Emotional Intelligence in PTSD recovery among combat veterans (Koh & O'Higgins, 2018). By enhancing emotion recognition, empathy, coping skills, and interpersonal relationships, EI empowers individuals like Patient 3 to navigate the complexities of their traumatic experiences and embark on a journey towards healing, resilience, and post-traumatic growth.

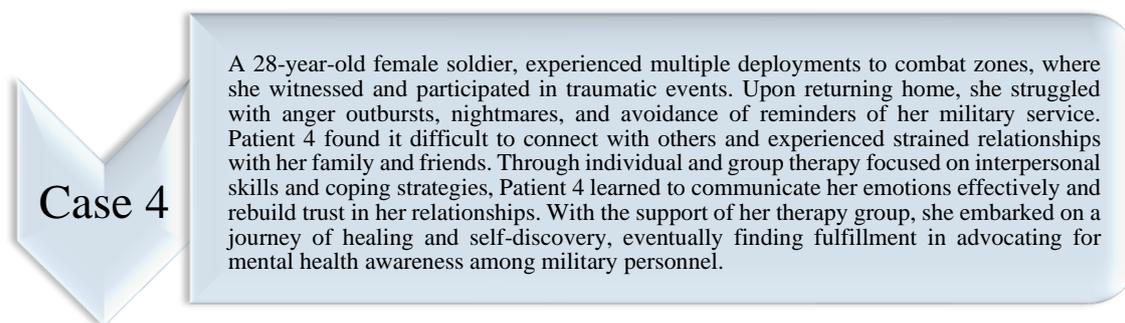


Figure 5. Illustration of case.

Source: Author's development

As shown in Case 4 EI played a crucial role in Patient's ability to recognize and regulate emotions effectively. Through therapy, she learned to identify and express her feelings of anger, fear, and sadness associated with her traumatic experiences. By developing emotional awareness and regulation skills, Patient 4 gained greater control over her emotional responses, reducing the intensity of her symptoms and improving her overall well-being. Moreover, EI facilitated her development of interpersonal skills and effective communication strategies. In therapy, she learned to communicate emotions and needs assertively, fostering healthier relationships with her family and friends (Vostrotin & Litovchenko, 2023). By expressing herself openly and honestly, she rebuilt trust and connection in her relationships, overcoming the barriers to intimacy and social support that she had previously experienced. In conclusion, EI played a pivotal role in Patient's 4 journey of healing and self-discovery. By enhancing her emotional awareness, interpersonal skills, empathy, and resilience, EI facilitated her recovery from PTSD and empowered her to rebuild her life with newfound strength and purpose. This case underscores the transformative impact of EI in promoting psychological well-being and resilience among individuals recovering from trauma.

Discussion

The case illustrations highlight the diverse ways in which EI interventions can support psychological rehabilitation after traumatic events. By addressing emotional needs, enhancing coping skills, and promoting adaptive functioning, EI emerges as a valuable tool in trauma recovery. Moreover, the holistic nature of EI interventions underscores the importance of addressing emotional well-being alongside cognitive and behavioral approaches. However, challenges such as cultural differences, individual variability, and access to resources must be considered in the implementation of EI-based interventions (Chiorcea & Cioranu, 2021; Kao & Chen, 2016). The research on emotional intelligence as a tool for psychological rehabilitation after traumatic events provides valuable insights into the efficacy of EI interventions in promoting resilience among survivors. Comparing these findings with those of other scholars sheds light on the broader landscape of research in this area. Gottfredson & Becker (2023) explored the issue of connection between past trauma and EI. Their findings suggest that individuals who have experienced different trauma may exhibit alterations in emotional intelligence, potentially affecting their ability to regulate emotions and navigate interpersonal relationships effectively. This aligns with the present research, which emphasizes the importance of EI in trauma

recovery and highlights the need for tailored interventions to address emotional challenges stemming from past trauma.

Garcia Zea et al. (2023) examined the issue of role of EI in the military place of work. Their study underscores the significance of EI in enhancing leadership effectiveness and overall well-being among military personnel. While their focus is on the workplace context, their findings resonate with the current research, which emphasizes the role of EI in promoting psychological resilience among military veterans coping with trauma-related challenges.

Jeppesen's (2017) research investigates the connection between emotional intelligence and military advisors. The study highlights the significance of EI skills, such as empathy and communication, in facilitating effective leadership and interpersonal interactions within military settings. This aligns with the present research, which underscores the relevance of EI in fostering positive outcomes among military personnel grappling with the psychological effects of trauma exposure. West et al. (2020) examine the effect of hyper-realistic trauma training on EI in military students. Their study suggests that immersive training experiences may enhance EI skills, particularly in the sense of medical trauma response. While their focus is on training interventions, their findings complement the current research by highlighting the potential of targeted interventions to bolster EI among military personnel facing trauma-related challenges.

MacEwan and Gibson (2023) explore EI in military officers within the Defence Medical Services. Their study underscores the relevance of EI in medical contexts, emphasizing its role in enhancing clinical effectiveness and patient care. While their focus is on healthcare professionals, their findings contribute to the broader understanding of EI's significance in military settings, aligning with the present research's emphasis on EI as a tool for psychological rehabilitation after traumatic events.

Although Sharma and Saxena's (2022) study highlights the importance of emotional intelligence in promoting work-life balance among nurses, their research focuses solely on job stress and does not delve into the specific challenges faced by individuals recovering from trauma. This research, on the other hand, examines the role of emotional intelligence as a tool for psychological rehabilitation after traumatic events, offering insights into its

efficacy in addressing trauma-related symptoms and promoting resilience among survivors. While Butler, Carello, and Maguin's (2017) study provides valuable insights into the predictors of burnout and secondary traumatic stress symptoms among individuals in clinical training, their research does not specifically explore the role of emotional intelligence in mitigating these outcomes. In contrast, our study emphasizes the significance of emotional intelligence in trauma recovery and highlights its potential to enhance coping mechanisms and promote well-being among individuals grappling with the psychological effects of trauma.

In summary, while each study offers important insights into the role of emotional intelligence within military and trauma contexts, collectively, they highlight the importance of EI in promoting resilience, leadership effectiveness, and clinical outcomes among military personnel facing trauma-related challenges. These findings underscore the multifaceted nature of EI and its relevance across various domains within the military and healthcare sectors. At the same time, it is worth delving into cultural and contextual factors that can affect the effectiveness of psychological rehabilitation, in particular after trauma. For this reason, cultural beliefs and values are important, particularly as they influence how individuals respond to psychological treatment. For example, in some cultures there is a stigma around mental illness that prevents them from seeking help. In addition, certain cultural values based on collectivism or individualism form a specific attitude to help. In collectivist cultures, where the main emphasis is on family support, family therapy is preferred. There are also language barriers that can create challenges for psychological treatment.

Hence, EI plays a crucial role in psychological rehabilitation after traumatic events, as evidenced by the insights gleaned from clinical cases. By integrating EI-focused approaches into trauma rehabilitation protocols, clinicians can enhance therapeutic outcomes and promote resilience among trauma survivors.

The novelty of this research lies in its exploration of EI as a pivotal tool for psychological rehabilitation following traumatic events. While previous studies have examined the role of EI in various contexts, such as workplace dynamics and healthcare settings, this research specifically focuses on its application in the aftermath of trauma. By analyzing clinical cases of individuals who have experienced special

traumatic events, the study offers unique insights into how EI interventions can aid in the recovery process and promote resilience among survivors.

Furthermore, this research contributes to the existing literature by providing concrete recommendations for incorporating EI strategies into trauma recovery programs. By synthesizing clinical cases and drawing on evidence-based practices, the study offers practical guidance for mental health professionals and trauma survivors alike, highlighting the importance of EI in fostering emotional regulation, interpersonal skills, and coping mechanisms post-trauma.

This research has a few limitations that should be taken into account despite its contributions. First off, the study's primary focus is on clinical cases, which would restrict how broadly the results can be applied. Clinical cases offer insightful perspectives into personal experiences, but they could not fully represent the range of experiences that trauma survivors have or take into consideration the various cultural and contextual elements that affect psychological recovery. Second, there's a chance that the study has intrinsic biases, including selection bias in the selection of clinical cases or researcher prejudice in the analysis of the data. The validity and dependability of the study's conclusions and suggestions may be impacted by these biases. It is also important to discuss the subjectivism that permeates scientific literature.

Additionally, the study's focus on EI as a therapeutic tool may overlook other factors that contribute to psychological rehabilitation after traumatic events. While EI plays a significant role, other interventions, such as cognitive-behavioral therapy or pharmacological treatments, may also be important in comprehensive trauma recovery programs. In conclusion, while this study provides significant view into the significance of EI in the psychological recovery process following traumatic events, it is imperative to recognize the constraints inherent to this research and the necessity for additional investigations to substantiate its findings and bridge existing gaps in knowledge.

Conclusions

Hence, the study highlights the key role of emotional intelligence (EI) in the psychological rehabilitation of post-traumatic events, as evidenced by clinical cases. EI interventions have played an important role in building resilience and helping survivors navigate the

complexities of post-traumatic recovery. By improving emotional awareness, regulation, interpersonal skills, and coping strategies, individuals are empowered to face and overcome the effects of trauma, emerging with newfound strength and purpose. Emotion-based therapy is an empirically supported method that highlights the need of comprehending and managing emotions in order to promote trauma recovery. This helps the patient feel better and lowers the chance of this psychiatric illness returning compared to more conventional approaches.

However, despite the confirmation of the effectiveness of the development of emotional intelligence, it is important to formulate final recommendations for improving psychological rehabilitation after an experienced trauma.

1. Individualized interventions. Specific populations, such as veterans or survivors of natural disasters, should receive interventions tailored to their unique challenges, effectively addressing issues such as guilt or bereavement.
2. Peer support and group therapy. Using group settings and peer support initiatives can promote understanding and social support, and EI principles increase empathy and communication in these groups.
3. Long-term support. Continued access to resources and support networks is essential for sustained progress and prevention of relapse, requiring long-term follow-up care and community-based resources.
4. Education and awareness. Increasing awareness among mental health professionals, policymakers, and the public of the importance of EI in trauma recovery can promote greater adoption of EI-based approaches and improve access to support services for survivors.

In essence, prioritizing EI in post-trauma care holds promise for strengthening post-trauma psychological rehabilitation and resilience, offering survivors a pathway to regain agency and well-being in their lives.

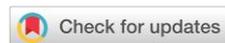
Despite its merits, this research has some drawbacks that need to be considered. The study's main emphasis is on clinical cases, which limits the applicability of the findings. Clinical cases provide individual experiences, but they are limited in their ability to capture the variety of experiences that trauma survivors endure and to account for the different cultural and contextual factors that influence psychological healing. These biases may affect the validity of

the study's recommendations. There remains a need for further exploration to ascertain the effectiveness of EI interventions in fostering sustained psychological well-being and adaptive functioning among trauma survivors within military environments.

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DOI: <https://doi.org/10.34069/AI/2024.74.02.20>

How to Cite:

Deichakivska, O. (2024). Predicative adjectives in the composition of expressions as tactics of positive and negative politeness strategies. *Amazonia Investiga*, 13(74), 239-247. <https://doi.org/10.34069/AI/2024.74.02.20>

Predicative adjectives in the composition of expressions as tactics of positive and negative politeness strategies

Предикативні прикметники у складі експресивів як тактики стратегій позитивної і негативної ввічливості

Received: January 11, 2024

Accepted: February 20, 2024

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Abstract

The present research focuses on analyzing the mechanisms of politeness and the role of adjectives in interpersonal relationships, considering them as important tools for expressing attitudes, emotions, and cultural values. Based on the research results, it has been established that politeness strategies and the use of adjectives vary significantly depending on cultural contexts, underscoring the need for a deeper understanding of linguistic norms and variations. Special attention has been paid to the role of adjectives, which serve not only as descriptive elements but also as means of expressing evaluations and emotions, thus, playing a significant role in intercultural interaction. The research conclusions underscore the importance of integrating intercultural understanding into the process of linguistic interaction. It has been revealed that successful intercultural communication requires not only language proficiency but also a deep understanding of cultural differences in politeness strategies. The research also points to the need for further exploration in this field, in particular, in developing practical recommendations for enhancing intercultural communication. In this context, knowledge and application of relevant linguistic strategies can contribute to better understanding and respect among representatives of different cultures.

Keywords: politeness strategies, intercultural communication, use of adjectives, language norms, cultural differences, speech interaction, sociolinguistics.

Анотація

Це дослідження зосереджено на аналізі механізмів ввічливості та ролі прикметників у міжособистісних стосунках, розглядаючи їх як важливі інструменти для вираження ставлення, емоцій та культурних цінностей. На основі результатів дослідження встановлено, що стратегії ввічливості та вживання прикметників значно відрізняються залежно від культурного контексту, що підкреслює необхідність глибшого розуміння мовних норм і варіацій. Особливу увагу приділено ролі прикметників, які виступають не лише описовими елементами, але й засобом вираження оцінок та емоцій, таким чином відіграючи значну роль у міжкультурній взаємодії. Висновки дослідження підкреслюють важливість інтеграції міжкультурного розуміння в процес мовної взаємодії. Було виявлено, що успішна міжкультурна комунікація вимагає не лише володіння мовою, а й глибокого розуміння культурних відмінностей у стратегіях ввічливості. Дослідження також вказує на необхідність подальших досліджень у цій галузі, зокрема, у розробці практичних рекомендацій щодо покращення міжкультурної комунікації. У цьому контексті знання та застосування відповідних лінгвістичних стратегій може сприяти кращому розумінню та повазі між представниками різних культур.

Ключові слова: стратегії ввічливості, міжкультурна комунікація, вживання прикметників, мовні норми, культурні відмінності, мовленнєва взаємодія, соціолінгвістика.

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Introduction

Within the contemporary linguistic landscape, special attention is given to studying linguistic mechanisms of interaction and communicative strategies, among which politeness tactics occupy a prominent place. These tactics, being an integral part of interpersonal communication, play a crucial role in the formation and maintenance of social bonds. In the context of this topic outlined, predicative adjectives as part of expressions serve as a means of implementing strategies of positive and negative politeness, allowing speakers to express attitudes, emotions, and intentions with a high degree of precision and variability.

The present academic paper aims to investigate how predicative adjectives function within the context of expressions as instruments of linguistic politeness and how they contribute to the implementation of positive and negative politeness strategies in various communicative situations. Significant attention is devoted to the analysis of linguistic expressions containing predicative adjectives in order to identify their expressive and evaluative functions within the dynamics of interpersonal communication. Special emphasis is placed on how speakers utilize these expressions to achieve communicative goals such as forming a positive social image, demonstrating respect, sympathy, as well as for implementing negative politeness tactics, including criticism, irony, or sarcasm.

In the analysis process, theoretical frameworks from sociolinguistics, pragmatics, and politeness theory will be applied to unfold a multidimensional perspective on predicative adjectives within expressions. This research aims to significantly advance our understanding of the universal and cultural aspects of linguistic politeness through a thorough analysis of examples from a variety of languages and cultures. Additionally, we hope to shed light on the potential use of predicative adjectives as an effective tool in politeness strategies.

Literature review

The richness of scientific materials from all over the world makes the task of selecting literature very difficult; consequently, we will briefly analyze the main studies that, in our opinion, are of the greatest interest within the chosen research topic.

For instance, Algiovan (2022) in her article focuses on the politeness strategies used by

teachers and students during virtual research supervision. This study emphasizes the importance of adapting politeness to the distance learning format, which is especially relevant in modern educational processes.

The scientific work of Abudayeh and Dubbati (2021), who in their study analyze politeness strategies in translating Donald Trump's offensive language into Arabic, is extremely interesting. This study reveals the difficulty of balancing the accuracy of the message with the need to adapt to cultural norms of politeness. The importance of cultural context in politeness strategies is further revealed in the publications of AlAfnan and MohdZuki (2023), where they investigate positive and negative politeness in the context of nonverbal communication, in particular, the behavior of drivers in Europe.

Brown's (2022) study offers a theoretical overview of the concepts of linguistic politeness, which serves as a foundation for understanding the practical aspects of using politeness strategies in different cultural and linguistic contexts. Deychakivska (2018) analyzes the pragmatic features of adjectives in the function of predicates in her study, which allows us to better understand how these linguistic units can influence the implementation of politeness strategies.

The next link in this chain is the research of Diyani and Putra (2023), which focuses on the politeness strategies used by teachers in preschool education, emphasizing the importance of linguistic adaptation to the age characteristics of the audience. It should also be noted that Erkinovna's research (2021) on negative politeness helps better understand the mechanisms of conflict prevention and reduction of direct criticism through politeness in interpersonal interaction.

Following up the review, Gaglia (2023) in her study draws attention to hybrid agreement in polite forms of address, demonstrating the variability of language tools depending on the context and interlocutor. This study complements the theoretical framework created by previous authors by expanding the understanding of the mechanisms of language adaptation in the process of communication.

An important contribution to the theory of politeness was made by Haverkate (1988), who proposed a typology of politeness strategies in

communicative interaction. His scientific work lays the foundations for much further research in this area, including the analysis of specific linguistic devices such as the use of adjectives. The study by Hollmann (2021) examines the “noun” essence of attributive adjectives and the “verb” essence of predicative adjectives based on phonological data. This analysis makes a significant contribution to the understanding of the structural and functional aspects of adjectives in language, which is essential for apprehending their role in expressing politeness.

Hutahaean et al. (2021) analyze the politeness strategies found in the show “Pesbukers”, pointing out the specifics of using language in entertainment programs. Their findings demonstrate how media content can serve as a source for learning language politeness. Isabella et al. (2022) explore how politeness can be learned through film by analyzing Brown and Levinson’s politeness strategies. This study emphasizes the importance of media resources in teaching socially acceptable forms of interaction. Kristyaningsih and Arifin (2022) extend the theme of using media content to analyze politeness by focusing on politeness strategies in the movie “Freedom Writers”. Their scientific work demonstrates how cinema can serve as a powerful tool for exploring language politeness. Kučerová and Szczezielniak (2021) study Polish politeness markers, considering them as a window into the world of assessing personal attributes. This study makes an important contribution to the comprehension of the linguistic specificity of politeness, allowing for a deeper understanding of how language reflects cultural norms and values.

Lenardič and De Maiti (2023) turned their attention to the grammatical and pragmatic aspects of Slovenian modality in socially unacceptable comments on Facebook, highlighting how modality influences the expression of politeness in online discourse. This study provides a valuable contribution to the understanding of language behavior on social media, expanding the horizons of language politeness. Mubarak and Rhaif (2022) analyze politeness strategies in the motivational storytelling of American graduation speeches. Their publication emphasizes the importance of politeness strategies in public speaking, demonstrating how speakers use language to establish a positive connection with the audience. Naghia and Mulatsih (2021) examine politeness strategies used by characters in the TV series “Brooklyn Nine-Nine”, providing examples of politeness in media content. This study illustrates

how politeness can be integrated into artistic narrative structure, reflecting interpersonal communication realities. Njuki and Ileri (2021) focus on strategies of positive and negative politeness used by members of the Kenyan National Assembly. Their research makes a significant contribution to understanding the cultural nuances of politeness in political discourse.

Nurmalasari et al. (2021) explore the use of nonverbal communication in implementing Brown and Levinson’s politeness strategies. This study underscores the importance of nonverbal cues in supporting polite communication, expanding understanding of politeness mechanisms. Pompeu (2021) analyzes politeness strategies in a scene from the series “The Crown”, demonstrating how highly contextual media products can reflect complex interactions of linguistic politeness and social hierarchies.

Rababah et al. (2021) investigate politeness strategies in hotel service in Jordan, particularly in giving directives. This study provides a unique perspective on using politeness in professional interactions, highlighting the cultural specificity of communication in the service industry. Santoso and Julianti (2022) study politeness strategies in the process of teaching English as a foreign language, emphasizing the importance of politeness in the pedagogical process. Their findings demonstrate how instructors can utilize linguistic strategies to create a positive learning environment. Selgas (2022) examines politeness strategies in students’ responses to online announcements by instructors, revealing the importance of adequate linguistic etiquette in digital academic communication. This research emphasizes the significance of politeness in electronic communication between educators and students.

Sikhite et al. (2021) focus on politeness strategies used by presidential candidates in Indonesia during the 2019 debates. The analysis shows how politeness can serve as a tool for shaping a positive image within political discourse and reducing conflict in communication. Surjowati (2021) investigates politeness strategies applied by students with a regional multicultural background, highlighting the diversity of approaches to politeness depending on cultural and regional origins. This research underscores the importance of cultural specificity in politeness strategies.

Suyono and Andriyanti (2021) analyze negative politeness strategies in the television show

“What Would You Do?”, demonstrating how complex moral and ethical dilemmas are reflected through politeness in media content. Terada et al. (2021) explore the impact of politeness strategies in dialogue on negotiation outcomes, showing how linguistic politeness can influence consensus-building and satisfaction among parties.

Van Olmen et al. (2023) examine innate linguistic impoliteness using the offensive expression “you + NP” in Dutch, English, and Polish languages, elucidating mechanisms of verbal aggression. Wechsler and Hahm (2011) study “polite plurals” and adjective agreement, analyzing how grammatical structures in language reflect politeness and social relations. Xafizovna (2022) conducts discourse analysis of politeness strategies in a literary work, studying speech acts and politeness strategies, allowing for a deeper understanding of the correlation between literature and speech pragmatics.

An and Abeillé (2022) examine the agreement of the nearest attributive adjective, demonstrating the importance of grammatical structures in expressing politeness and other social meanings. Betti (2022.) offers a deep analysis of using adjectives and adverbs in the English in his online resource, revealing their role in forming polite and effective linguistic constructions.

Bybee and Thompson (2021) focus on interaction and grammar, analyzing constructions with predicative adjectives in English spoken language, indicating their importance in creating informal and polite interaction. Enwere et al. (2021) conduct a contrastive analysis of adjectives in English and Nkoro languages, revealing linguistic and cultural features in the use of adjectives in these languages. This research contributes to understanding interlinguistic differences and similarities.

Hollmann (2021) studies the “nouniness” of attributive adjectives and the “verbiness” of predicative adjectives, based on phonological data. This study reveals important grammatical and phonological features of adjectives, which are significant for understanding their role in linguistic structure. Jaratjarungkiat et al. (2022) analyze predicative adjectives in the Thai language, focusing on diachronic changes over the past century. This work sheds light on language evolution and changes in linguistic expression, which are crucial for linguistic studies.

Karunakaran and Ang (2023) offer a comparative analysis of adjective types and their functions in print media, analyzing headlines from “The Star” newspaper and “Reader’s Digest” magazine.

This research reveals the specificity of adjective usage in media discourse. Putra (2023) conducts a comparison between Indonesian and English adjectives based on their basic forms, exploring grammatical and semantic features in the context of the two languages. This study contributes to a better understanding of cross-linguistic differences. Ritchie (2021) focuses on essentialism-based conclusions in language, examining how linguistic structures are used to form generalized perceptions of people and groups. This research makes an important contribution to understanding language as a tool of social perception and identification.

The analyzed studies represent a highly significant contribution to the issue under study. However, the aforementioned illustrates that predicative adjectives’ function in politeness techniques is still somewhat of a “blank spot”, which further emphasizes the topic’s importance.

Aims

The purpose of the present research is to analyze and comparatively study politeness strategies, the use of adjectives, and their functions in various linguistic and cultural contexts, including political debates, media content, online communication, and literary works. This will allow for a deeper understanding of the mechanisms of linguistic politeness and their impact on intercultural communication, as well as reveal the peculiarities of adjectives usage in the structure of language and ways of their adaptation to different communicative needs.

Research methodology

The methodology of the present research is based on a comprehensive approach, which includes analysis, comparative analysis, and synthesis. The analysis of linguistic expressions involves a detailed study of specific examples of using adjectives and politeness strategies in practical speech. This includes examining texts, transcripts of communication, media materials, and literary works, allowing for a deeper understanding of linguistic nuances and their impact on communication. The application of comparative analysis aims to identify similarities and differences in politeness strategies and the use of adjectives across different languages and cultural contexts. Finally, synthesis is applied to

formulate new knowledge and patterns, which are reflected in the conclusions of the proposed academic paper.

A comparative analysis was conducted to identify the features of adjectives within expressions as tactics for positive and negative politeness strategies. It primarily involved studying the factors that govern a person's speech behavior, including the relationship between verbal and non-verbal actions of speakers, the link between speech and the speech situation, the social conditioning of the choice of speech means, the relationship between actual speech practice and the standard (norm); the differentiation of speech, its units and means according to age, gender, professional, educational, and other characteristics.

Discourse analysis was implemented as a structural-semiotic study of texts, with the identification of hidden meanings of the text, the context of its creation, and plausible interpretations by the reader. Words were analyzed and divided into subgroups for comparison, correlation, analysis, and identifying specific patterns.

Results and discussion

First and foremost, we will focus on defining key concepts underlying politeness strategies and the role of adjectives in speech, paying attention to the theoretical frameworks that shape our understanding of these phenomena. Politeness strategies and the use of adjectives are typically studied through the lens of sociolinguistics, pragmatics, and politeness theory, which enables a more thorough comprehension of their relevance in language and cultural contexts.

Politeness strategies play a crucial role in interpersonal communication, allowing speakers to mitigate potential conflicts, express respect, and consider the emotional state of the interlocutor. They encompass a wide range of linguistic resources and tactics aimed at fostering positive social relations. Brown and Levinson's politeness theory distinguishes between positive and negative politeness, where positive politeness is aimed at acknowledging the individual's desires for approval within society, while negative politeness recognizes his right to independence and personal space.

Adjectives are integral parts of speech that serve various functions, from describing object characteristics to expressing evaluations and emotions. They have the power to amplify or

change the meaning of the nouns they alter, which affects how the message is perceived by the audience. When using adjectives in a polite manner, one might consider cultural norms and audience expectations and use them to either strengthen or soften words.

The comparative analysis proposed below is based on the examination of literary sources, linguistic corpora, and the analysis of real communicative acts aimed at identifying similarities and differences in using politeness strategies and adjectives. We take into account such aspects as cultural norms of politeness, contextual factors influencing the choice of linguistic means, and the role of adjectives in shaping expressions.

Therefore, in English, adjectives are often used to express respect or admiration. For example, in the phrase 'You made an **excellent** choice!' the word '**excellent**' not only characterizes the choice but also conveys the speaker's positive attitude and recognition of the interlocutor's decision. In this case, the use of the adjective '**excellent**' serves as a strategy of positive politeness, demonstrating acknowledgment and approval of the interlocutor's choice. This reinforces positive interpersonal relationships.

It's interesting to note that various levels of politeness are often used in Japanese, which are expressed through word choice and forms. For instance, one can say 'You must be tired, aren't you?' (*お疲れではありませんか?*), thereby using a more polite form instead of directly asking 'Are you tired?' (*疲れた?*). Such an approach reflects the strategy of negative politeness, which aims to minimize imposition and consider the interlocutor's personal space. Using a more polite form ensures the preservation of harmony in relationships.

For comparison, euphemisms may be used in Ukrainian to soften direct criticism. For example, one can say 'It seems like this is not the best idea' (*Схоже, це не найкраща ідея*) instead of saying directly 'This is a bad idea' (*Це погана ідея*). The use of the phrase '**not the best idea**' is an example of the strategy of negative politeness, aimed at reducing potential negative reactions. Such word choice allows expressing one's opinion softly without causing offense to the interlocutor.

In French, to express concern or care, softening can be achieved with the use of adjectives. For example, one can say 'Maybe you are driving a little fast, aren't you?' (*Peut-être que tu conduis*

un peu vite, n'est-ce pas?) instead of 'You are driving too fast' (*Tu conduis trop vite*). This expression uses the strategy of negative politeness, where the inclusion of '*un peu*' (**a little**) and the interrogative form make the statement less categorical and allow the interlocutor to save face by reducing the directness of criticism.

Contrary to the aforementioned, adjectives that intensify emotional load can be used in Spanish to express deep gratitude. For example, the phrase '*muchas gracias por tu amable invitación*' (thank you very much for your kind invitation) is used, where '*amable*' (**kind**) not only describes the invitation but also reinforces the gratitude. The use of the adjective '*amable*' in this context is an example of the positive politeness strategy, which reflects recognition and appreciation of the interlocutor's kindness, fostering positive interpersonal interaction.

Finally, etiquette and politeness are often conveyed through the use of special expressions and formulations in the Chinese language. For instance, it is desirable and more polite to say 'I would like this, if possible' (*如果可以的话 · 我想要这个 - Rúguǒ kěyǐ de huà, wǒ xiǎng yào zhège*) instead of saying directly 'I want this' (*我要这个 - Wǒ yào zhège*). The phrase '*如果可以的话*' (**if possible**) is a negative politeness strategy indicating a desire not to impose one's will and to consider the agreement of the interlocutor, thereby ensuring mutual respect and reducing potential pressure.

These examples illustrate how the choice and use of adjectives in combination with politeness strategies can influence intercultural communication, allowing speakers to adapt to social norms and expectations in different cultural contexts. It should be noted that adjectives are often used to provide evaluation, express attitudes, or emotions, which can be crucial in shaping positive interpersonal relationships. For example, adjectives may serve to enhance the positive image of a person or idea in public speaking, while they may be used to show respect or sympathy towards the interlocutor in everyday communication.

The analysis of speech acts in different situations reveals that politeness strategies are often manifested through the choice of specific adjectives and linguistic constructions. For example, the use of mitigating expressions or euphemisms helps reduce the potential negative

reaction of the interlocutor to criticism or refusal. These strategies play a crucial role in intercultural communication ensuring smooth and effective information exchange.

The above analysis of specific examples of using adjectives and politeness strategies in practical speech allows for a deeper understanding of the mechanisms of linguistic interaction as well as reveals the specificity of their application in different communicative contexts. Our analysis underscores the importance of considering contextual and cultural factors in choosing linguistic means to achieve communicative goals while ensuring polite and respectful communication.

The multifaceted nature of the topic under study could not but reflect the contentiousness of its individual aspects. Therefore, let us first consider the debate regarding the universality and cultural specificity of politeness strategies. Some researchers believe that politeness strategies are universal since they are based on fundamental human needs for respect and social harmony, which are not dependent on cultural boundaries. However, another viewpoint prevails, suggesting that politeness strategies are deeply rooted in cultural norms and values, making them distinctly culturally specific. They emphasize that what is considered polite in one culture may be perceived as impolite or inappropriate in another.

We believe that both standpoints have their merits; however, the reality of linguistic communication likely lies somewhere in the middle: while there are some general principles of politeness, such as the necessity to mitigate direct conflict, the specific expressions of these principles vary significantly across cultures. Thus, a deep understanding of the cultural specificity of the interlocutor is necessary in one way or another for effective intercultural communication.

The impact of technological advancements on civility practices is another controversial issue. One viewpoint contends that when communication becomes more remote and anonymous online, more direct and impolite interactions may occur, undermining the significance of conventional politeness techniques. In contrast, it is contended that digitization provides new opportunities for politeness through the use of emojis, stickers, and other non-verbal means to convey tones and nuances that may be lost in textual communication. We believe that digitization

indeed transforms the ways we communicate, presenting both challenges and opportunities for politeness. New digital communication tools require the development of additional skills for the effective use of politeness strategies in the online environment. Thus, digitization does not diminish the importance of politeness but rather reformulates its expression.

Finally, we would like to address the role of adjectives in politeness strategies. While it is often believed that adjectives play a marginal role in politeness strategies since the main focus is on choosing polite formulations and constructions, there is an opposing viewpoint that adjectives are key elements in politeness strategies. This perspective argues that adjectives allow speakers to precisely regulate the intensity of their expressions, provide emotional coloring, and express attitudes with great accuracy. In our opinion, adjectives indeed play an important role in politeness strategies since they enable speakers to finely tune their expressions, adapting them to the context and communication needs. They are a crucial tool for achieving the desired level of formality, emotionality, and politeness, making them indispensable in complex interpersonal interactions.

Conclusion

Concluding this brief investigation dedicated to the analysis of politeness strategies and the use of adjectives in intercultural linguistic spaces, it is worthwhile to summarize the ideas that, seemingly, open up new perspectives for further linguistic inquiries.

First and foremost, the extensive analysis of politeness strategies in various cultural contexts underscores their fundamental significance both for maintaining social harmony and for navigating complex interpersonal relationships. It has been established that despite the universal need for politeness, the specific manifestations of this phenomenon are deeply rooted in cultural traditions and norms, requiring speakers to possess not only knowledge of their own language but also a deep understanding of the cultural peculiarities of their interlocutors.

The comparative analysis of using adjectives has revealed their indispensable role in the structure of linguistic politeness strategies. Adjectives, due to their ability to nuance and emotionally color expressions, become instruments for conveying subtle nuances of attitude and emotions, which is particularly important in intercultural communication.

Examining specific examples of using adjectives and politeness strategies in practical speech not only illustrates theoretical principles but also reveals practical aspects of their application. This, in turn, contributes to a better understanding of the mechanisms of linguistic adaptation and strategies for minimizing linguistic conflict.

Therefore, the research underscores the importance of an integrated approach to studying linguistic phenomena, where theoretical conclusions are verified and supplemented through the analysis of real speech acts. It also emphasizes the necessity for further development of interdisciplinary studies that combine linguistics with cultural studies, sociology, and psychology to delve deeper into the essence of linguistic politeness and its impact on intercultural interaction.

Ultimately, the present research lays the groundwork for further exploration in the field of intercultural communication, offering new directions for analyzing and studying language strategies in the context of a globalized world, where understanding and respect for linguistic and cultural diversity become crucial factors in successful interaction.

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DOI: <https://doi.org/10.34069/AI/2024.74.02.21>

How to Cite:

Gazuda, S., Erfan, V., Gazuda, M., Hertseh, V., & Zavadska, O. (2024). Modeling the impact of the agricultural sector on the development of the regional economic systems. *Amazonia Investiga*, 13(74), 248-263. <https://doi.org/10.34069/AI/2024.74.02.21>

Modeling the impact of the agricultural sector on the development of the regional economic systems

Modelando el impacto del sector agrícola en el desarrollo de los sistemas económicos regionales

Received: January 4, 2024

Accepted: February 21, 2024

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Abstract

The purpose of the article is to study the role of the agricultural sector in the development of regional economic systems. The article uses general scientific and specific research methods, including: abstraction, analysis and synthesis, generalization, statistical and comparative analysis, dialectical and graphic. Within the framework of the study, it is proposed to investigate the impact of the agricultural sector on the regions' development using the correlation-regression analysis method. The use of the specified methodology made it possible to simulate the regularity of the influence of the volume of agricultural products sold on the gross regional product.

The authors investigated the challenges faced by the agricultural sector since the full-scale invasion of Russia on the territory of Ukraine, among which the following are highlighted: the danger of the farmers' work, limited access to land plots, equipment, fuel and fertilizers,

Resumen

El propósito del artículo es estudiar el papel del sector agrícola en el desarrollo de los sistemas económicos regionales. El artículo utiliza métodos de investigación científicos generales y específicos, que incluyen: abstracción, análisis y síntesis, generalización, análisis estadístico y comparativo, dialéctico y gráfico. En el marco del estudio, se propone investigar el impacto del sector agrícola en el desarrollo de las regiones utilizando el método de análisis de correlación-regresión. El uso de esta metodología permitió simular la regularidad de la influencia del volumen de productos agrícolas vendidos sobre el producto regional bruto.

Los autores investigaron los desafíos que enfrenta el sector agrícola desde la invasión a gran escala de Rusia en el territorio de Ucrania, entre los que se destacan: el peligro del trabajo de los agricultores, el acceso limitado a terrenos, equipos, combustible y fertilizantes, campos minados de tierras agrícolas, disminución de las cosechas, pérdidas

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minefields of agricultural land, crop decline, significant economic losses, insufficient resources, destroyed or damaged agricultural enterprises. The share of regions in agricultural production was analyzed, the leader and the outsider regions were distinguished. The study analyzed the impact of the agricultural sector on the development of the Carpathian Economic Region of Ukraine, which includes the Lviv, Chernivtsi, Transcarpathian and Ivano-Frankivsk regions. The results of the study demonstrate a significant relationship between the parameters of the volume of agricultural products sold and the gross regional product in Lviv (0.8801), Chernivtsi (0.8962), Transcarpathian (0.9674) and Ivano-Frankivsk (0.8985) regions. Also, the results of the calculations prove that the defined regression model is significant and corresponds as closely as possible to the real functioning model for all four regions.

Keywords: agricultural sector, agriculture, agricultural business, region, regional economic system, branding of agricultural regions.

Introduction

The agricultural sector plays a significant role in the development of Ukraine's economy and its regions. There are regions in which the agricultural sector is developing so rapidly and successfully that it creates a regional brand. Ukraine provides not only the domestic market with food products, but also demonstrates successful exports in this direction. It should be noted that the agricultural sector is the main source of employment for the rural population and contributes to the development of rural areas. The agricultural sector has a positive impact on the health of the population due to the production of environmentally friendly products. The majority of modern agricultural enterprises implement innovative technologies, which contribute to increasing the efficiency of management, reducing costs and increasing the yield of crops. This increases the competitiveness of the Ukrainian agricultural sector on the world market. However, since the full-scale invasion of Russia on the territory of Ukraine, the agricultural sector has faced numerous challenges and extremely difficult operating conditions. Among the main problems, it is appropriate to single out: dangerous of farmers' work, limited access to land plots, equipment, fuel and fertilizers, minefields of agricultural lands, reduced harvest, significant economic losses, insufficient resources, destroyed or damaged agricultural enterprises, etc. However, despite the listed problems, agricultural

económicas importantes, recursos insuficientes, empresas agrícolas destruidas o dañadas. Se analizó la participación de las regiones en la producción agrícola y se distinguieron las regiones líderes y las marginadas. El estudio analizó el impacto del sector agrícola en el desarrollo de la región económica de los Cárpatos de Ucrania, que incluye las regiones de Lviv, Chernivtsi, Transcarpacia e Ivano-Frankivsk. Los resultados del estudio demuestran una relación significativa entre los parámetros del volumen de productos agrícolas vendidos y el producto regional bruto en las regiones de Lviv (0,8801), Chernivtsi (0,8962), Transcarpacia (0,9674) e Ivano-Frankivsk (0,8985). Además, los resultados de los cálculos demuestran que el modelo de regresión definido es significativo y se corresponde lo más fielmente posible al modelo de funcionamiento real para las cuatro regiones

Palabras clave: sector agrícola, agricultura, empresas agrícolas, región, sistema económico regional, marca de regiones agrícolas.

enterprises, due to the support of international partners, are trying to function and provide the population with high-quality and affordable products. This once again proves the important role of the agricultural sector in the economy of the country and its regions.

The purpose of the article is to study the role of the agricultural sector in the regional economic systems' development.

Literature review

Many domestic and foreign scientists' study various aspects of agriculture development. Let's consider some of them. The potential of agriculture in contributing to the integrated development of the regional rural economy was analyzed within the scope of the study (Loizou Efstratios et al., 2019). Scientists prove the importance of agriculture and its significant role in the economic growth of the region. The results of the authors' research in four mountain regions of Switzerland (Flury et al., 2008) demonstrate the importance of agriculture in the regional economy. The article proves that the role of agriculture is determined not only by direct employment and created added value, but also by its impact on the rest of the economy. In support of study (Bansah et al., 2023), it is pertinent to note that small-scale agriculture is largely rain-fed, and erratic rainfall and rising

temperatures significantly affect crop production and farmers' incomes.

The authors' study (Pradeleix et al., 2023) analyzed the potential impact of irrigated farming systems on the environment. The authors assessed the impact of the agricultural region under current conditions, and considered two perspective scenarios. According to the authors (Wanghai et al., 2023), agricultural production depends on a variety of natural conditions in the arid areas of northwest China. The authors note the lack of coordination between agricultural production and the ecological environment as one of the urgent problems. Scientists have studied the peculiarities of the development of modern agriculture with the aim of balancing ecological constraints and efficient use of resources. Scientific work (Cervelli et al., 2023) is devoted to the study of the analysis of spatial policy and purposeful processes of landscape planning and land use in the context of the development of the agricultural sector. The authors of the article offer approaches to landscape planning and modern solutions to environmental problems. Within the framework of article (Aidat et al., 2023), the system of greenhouse production, its significant advantages for production in terms of quality and quantity, creating a very important socio-economic dynamic in the respective regions, is investigated. According to the authors (Sutradhar et al., 2023), assessment of regional differences and recognition of underdeveloped areas are an important aspect of achieving sustainable regional development in agriculture. Scientists evaluate the spatial distribution of agricultural development and investigate the factors responsible for this variability.

Article (Verma et al., 2023) argues that agriculture, forestry and other land use is one of the most important sectors for food security. To reduce greenhouse gas emissions in the agricultural sector, the authors of the study propose to develop cost-effective mitigation strategies and adaptation measures through investments for adequate land and environmental management.

The result of the article (Zhang et al., 2023) is to prove that the green development of agriculture and rural areas and economic growth are the main challenges that are common in developing

countries. According to the authors, in the future it is vital to promote the transformation of the agricultural sector, while reducing the risk of deterioration of the coordinated relationship with economic growth. The main goal of the article (Zafeiriou et al., 2023) is to investigate the relationship between the use of pesticides in agriculture per hectare of arable land and GDP per capita in rural areas for twenty-five EU countries. The authors are convinced that it is advisable to take measures related to the education of farmers, which will contribute to increasing their awareness of environmental issues. Fully supporting the results of research (Muhammedov et al., 2023; Butko et al., 2019), we would like to note that the role of agriculture in ensuring food security, as well as creating jobs and generating income from exports makes the analysis of the impact of this industry on the socio-economic development of the country particularly relevant. The authors are convinced that effective management of resources, productivity improvement, creation of new jobs, product promotion and production expansion are important areas of the future development of the agricultural sector.

However, despite significant results in this direction of research, the issue of economic and mathematical modeling of the impact of agriculture on the Ukraine's regions development requires further research and analysis.

Methodology

The article uses general scientific and specific research methods, including: abstraction, analysis and synthesis, generalization, statistical and comparative analysis, dialectical and graphic. Within the framework of the study, it is proposed to investigate the impact of the agricultural sector on the regions' development using the method of correlation and regression analysis. The use of the specified methodology will allow modeling the regularity of the impact of the volume of agricultural products sold on the gross regional product. Based on the analysis of the available statistical information, it should be noted that the outlined influence at the regional level can be described using the construction of one-factor models, and for their accuracy we consider it appropriate to use the cubic type. The stages of calculations are presented in Fig. 1.

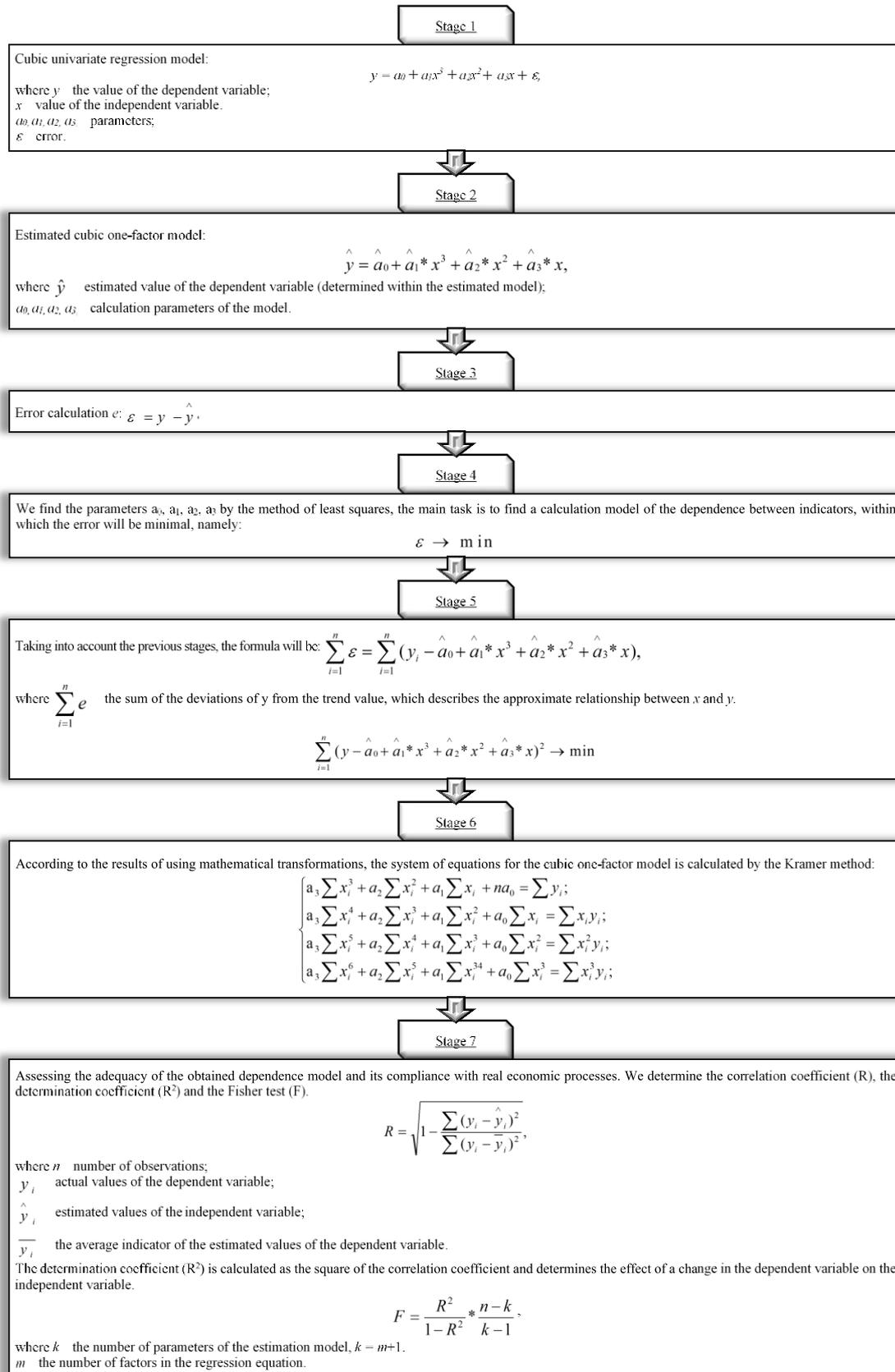


Figure 1. Stages of implementation of economic and mathematical modeling of the impact of agriculture on the regions development.

Source: systematized by the authors.

So, the specified methods and the presented phasing of the scientific research made it possible to analyze the development of the agricultural sector and investigate the impact on the regional economic systems' development.

Results and discussion

The agricultural sector has a great impact on the regional economy, providing a significant share of the country's gross domestic product and export potential. The cultivation of various agricultural products in Ukraine allows to

provide the population with high-quality and affordable food products and contributes to ensuring the country's food security. If we analyze the share of regions in agricultural production, the leading regions include Vinnytsia (8.3%), Dnipropetrovsk (6.2%), Poltava (5.9%), Kyiv (5.7%), Khmelnytsky (5.6%), Kirovograd and Kharkiv (5.2%) regions. The regions with the smallest share in agricultural production are: Transcarpathian (1.1%), Chernivtsi (1.6%), Luhansk (1.9%) and Ivano-Frankivsk (2.0%) regions (Fig. 2).

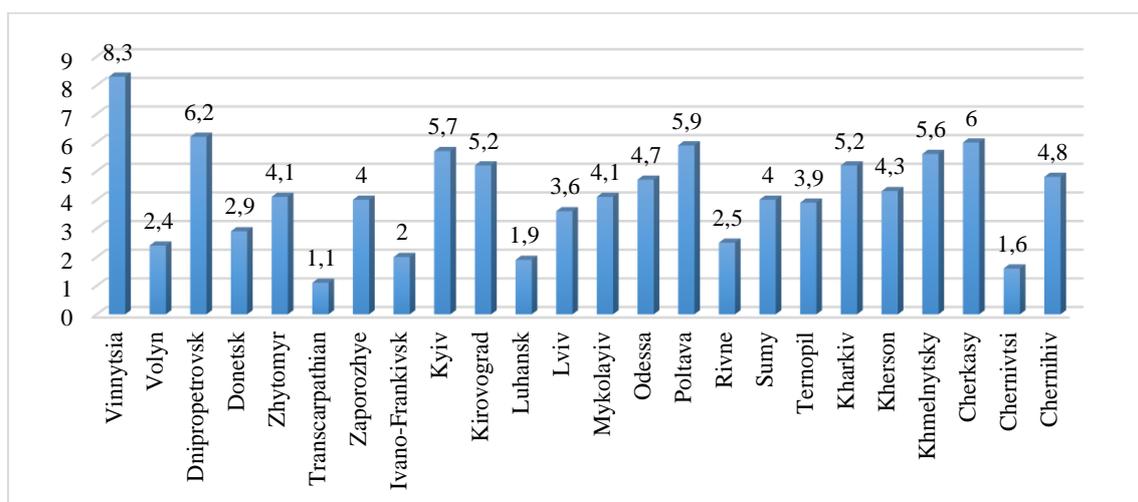


Figure 2. Share of regions in the agricultural production.

Source: calculated on the basis (State Statistical Service of Ukraine).

Within the framework of the study, we analyze the impact of the agricultural sector on the development of the Carpathian Economic Region of Ukraine, which includes the Lviv, Chernivtsi, Transcarpathian and Ivano-Frankivsk regions.

The initial data for calculations, namely the volume of the gross regional product (GRP) and the volume of realized agricultural products (AP) for the period 2012-2021 are given in the Table 1.

Table 1.

Dynamics of the gross regional product and the volume of agricultural products sold in the Carpathian Economic Region.

Year	Chernivtsi region		Transcarpathian region		Ivano-Frankivsk region		Lviv region	
	GRP, mln \$	AP, mln \$	GRP, mln \$	AP, mln \$	GRP, mln \$	AP, mln \$	GRP, mln \$	AP, mln \$
2012	1633.5	169.6	2655.6	329.5	4005.7	250.9	7687.6	357.7
2013	1685.9	142.3	2622.5	321.4	4068.1	266.5	7760.9	393.0
2014	1753.9	191.5	2811.2	327.7	4387.3	399.7	8499.2	755.6
2015	1107.5	135.9	1732.6	103.7	2744.1	263.7	5666.7	447.0
2016	558.2	45.0	851.2	22.4	1350.9	100.7	3018.2	157.9
2017	820.1	61.7	1234.9	35.4	1830.9	159.5	4226.9	241.1
2018	849.9	58.8	1314.7	32.9	1966.4	150.4	4443.0	284.5
2019	1135.5	59.4	1671.4	45.6	2362.5	171.1	5843.6	316.9
2020	1369.4	104.5	1885.2	57.3	2747.7	222.7	7180.9	368.4
2021	1406.4	76.7	1948.6	50.2	3083.7	176.9	7641.6	417.3

Source: calculated on the basis (State Statistical Service of Ukraine (n/f)).

The analysis of the impact of the volume of agricultural products sold on the gross regional product for the Lviv region is carried out as

follows. The value of auxiliary values necessary for calculations is presented in the Table 2.

Table 2.
Results of calculations of auxiliary values (Lviv region)

i	x_i	y_i	x_i^2	x_i^3	x_i^4	x_i^5	x_i^6	$x_i y_i$	$x_i^2 y_i$	$x_i^3 y_i$
1	358	7688	128164	45882712	16426010896	5880511900768	2105223260474944	2752304	985324832	352746289856
2	393	7761	154449	60698457	23854493601	9374815985193	3684302682180849	3050073	1198678689	471080724777
3	756	8499	571536	432081216	326653399296	246949969867776	186694177220038660	6425244	4857484464	3672258254784
4	447	5667	199809	89314623	39923636481	17845865507007	7977101881632129	2533149	1132317603	506145968541
5	160	3018	25600	4096000	655360000	104857600000	16777216000000	482880	77260800	12361728000
6	241	4227	58081	13997521	3373402561	812990017201	195930594145441	1018707	245508387	59167521267
7	285	4443	81225	23149125	6597500625	1880287678125	535881988265625	1266255	360882675	102851562375
8	317	5844	100489	31855013	10098039121	3201078401357	1014741853230169.1	1852548	587257716	186160695972
9	368	7181	135424	49836032	18339659776	6748994797568	2483630085505024	2642608	972479744	357872545792
10	417	7632	173889	72511713	30237384321	12608989261857	5257948522194369	3182544	1327120848	553409393616
Σ	3742	61960	1628666	823422412	476158886678	305408361016852	209965715303667230	25206312	11744315758	6274054684980

Source: calculated by the authors

$$\begin{cases} a \sum x_i^3 + b \sum x_i^2 + c \sum x_i + nd = \sum y_i; \\ a \sum x_i^4 + b \sum x_i^3 + c \sum x_i^2 + d \sum x_i = \sum x_i y_i; \\ a \sum x_i^5 + b \sum x_i^4 + c \sum x_i^3 + d \sum x_i^2 = \sum x_i^2 y_i; \\ a \sum x_i^6 + b \sum x_i^5 + c \sum x_i^4 + d \sum x_i^3 = \sum x_i^3 y_i. \end{cases} \Leftrightarrow$$

$$\begin{cases} 823422412a + 1628666b + 3742c + 10d = 61960, \\ 476158886678a + 823422412b + 1628666c + 3742d = 25206312, \\ 305408361016852a + 476158886678b + 823422412c + 1628666d = 11744315758, \\ 1209965715303667230a + 305408361016852b + 476158886678c + 823422412d = 6274054684980. \end{cases}$$

$$\Delta = \begin{vmatrix} 823422412 & 1628666 & 3742 & 10 \\ 476158886678 & 823422412 & 1628666 & 3742 \\ 305408361016852 & 476158886678 & 823422412 & 1628666 \\ 1209965715303667230 & 305408361016852 & 476158886678 & 823422412 \end{vmatrix} = 2,3059383239206676e + 30;$$

Solving the system of linear equations by Kramer's method:

$$\Delta a = \begin{vmatrix} 61960 & 1628666 & 3742 & 10 \\ 25206312 & 823422412 & 1628666 & 3742 \\ 11744315758 & 476158886678 & 823422412 & 1628666 \\ 6274054684980 & 305408361016852 & 476158886678 & 823422412 \end{vmatrix} = 1,0533228241132923e + 26 \Rightarrow$$

$$\Rightarrow a = \frac{\Delta a}{\Delta} = \frac{1,0533228241132923e + 26}{2,3059383239206676e + 30} \approx 0;$$

$$\Delta b = \begin{vmatrix} 823422412 & 61960 & 3742 & 10 \\ 476158886678 & 25206312 & 1628666 & 3742 \\ 305408361016852 & 11744315758 & 823422412 & 1628666 \\ 1209965715303667230 & 6274054684980 & 476158886678 & 823422412 \end{vmatrix} = -1,9293163646730278e + 29 \Rightarrow$$

$$\Rightarrow b = \frac{\Delta b}{\Delta} = \frac{-1,9293163646730278e + 29}{2,3059383239206676e + 30} \approx -0,0837;$$

$$\Delta c = \begin{vmatrix} 823422412 & 1628666 & 61960 & 10 \\ 476158886678 & 823422412 & 25206312 & 3742 \\ 305408361016852 & 476158886678 & 11744315758 & 1628666 \\ 209965715303667230 & 305408361016852 & 6274054684980 & 823422412 \end{vmatrix} = 1,2365180089518777e + 32 \Rightarrow$$

$$\Rightarrow c = \frac{\Delta c}{\Delta} = \frac{1,2365180089518777e + 32}{2,3059383239206676e + 30} \approx 53,6232;$$

$$\Delta d = \begin{vmatrix} 823422412 & 1628666 & 3742 & 61960 \\ 476158886678 & 823422412 & 1628666 & 25206312 \\ 305408361016852 & 476158886678 & 823422412 & 11744315758 \\ 209965715303667230 & 305408361016852 & 476158886678 & 6274054684980 \end{vmatrix} = -9,23408658055352e + 33 \Rightarrow$$

$$\Rightarrow d = \frac{\Delta d}{\Delta} = \frac{-9,23408658055352e + 33}{2,3059383239206676e + 30} \approx -4004,4812.$$

So, the cubic one-factor regression equation, which describes the influence of the volume of agricultural products sold on the gross regional product (GRP) of the Lviv region, will be:

$$\text{GRP} = -0.0837\text{AP}^2 + 53.6232\text{AP} - 4004.4812,$$

GRP – gross regional product of Lviv region;

AP - volume of agricultural products sold in Lviv region.

Fig. 3 shows the dependence between two indicators, namely the influence of the volume of agricultural products sold on the gross regional product of the Lviv region.

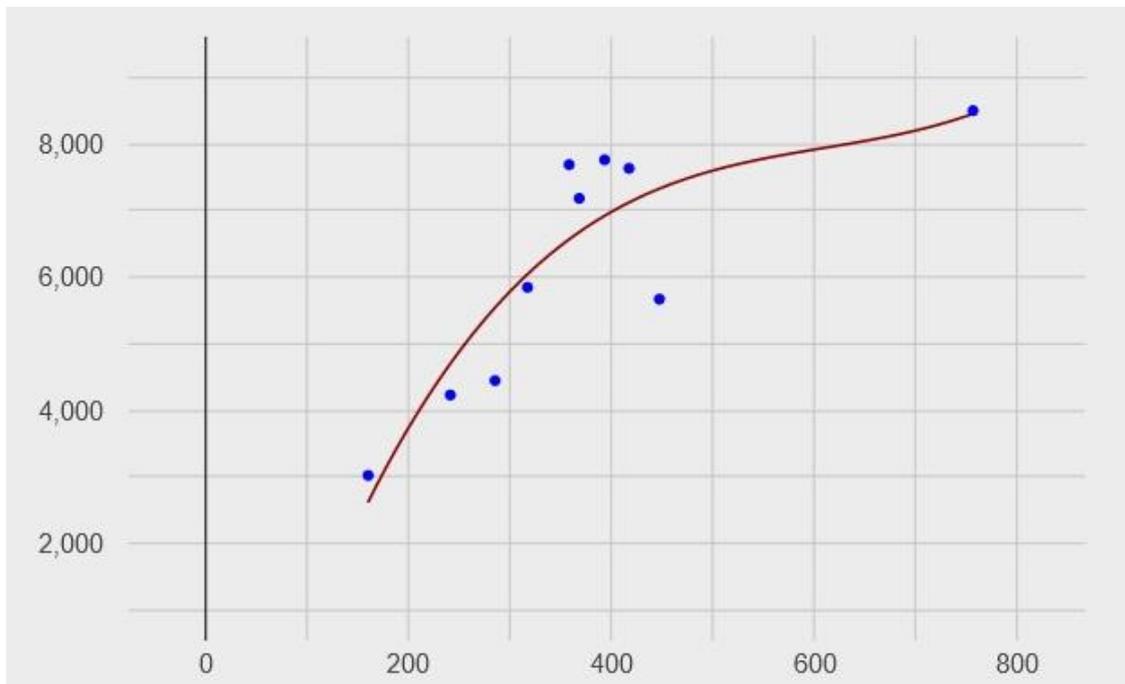


Figure 3. Graphic representation of the influence of the volume of agricultural products sold on the gross regional product of the Lviv region.

Source: developed by the authors.

Table 3.
The value of auxiliary values for evaluating the significance of correlation parameters (Lviv region)

i	i	x_i	y_i	\hat{y}	$x_i - \bar{x}$	$(x_i - \bar{x})^2$	ε_i	ε_i^2	A_i	$\Delta \varepsilon_i$
1	358	7688	6565,3528	1492	2226064	1122,6472	1260336,7061	0,146	—	—
2	393	7761	6919,734	1565	2449225	841,266	707728,4512	0,1084	-281,3812	79175,3829
3	756	8499	8452,6978	2303	5303809	46,3022	2143,8942	0,0054	-794,9638	631967,4046
4	447	5667	7327,3877	-529	279841	-1660,3877	2756887,3868	0,293	-1706,6899	2912790,5085
5	160	3018	2620,4485	-3178	10099684	397,5515	158047,169	0,1317	2057,9392	4235113,7054
6	241	4227	4698,6191	-1969	3876961	-471,6191	222424,592	0,1116	-869,1706	755457,5051
7	285	4443	5539,6775	-1753	3073009	-1096,6775	1202701,563	0,2468	-625,0584	390697,9952
8	317	5844	6041,5269	-352	123904	-197,5269	39016,8588	0,0338	899,1507	808471,9006
9	368	7181	6674,7428	985	970225	506,2572	256296,3596	0,0705	703,7841	495312,007
10	417	7632	7119,8128	1436	2062096	512,1872	262335,6851	0,0671	5,93	35,1643
Σ	—	—	—	—	30464818	—	6867918,6658	1,2144	—	10309021,5735

Source: calculated by the authors

The correlation coefficient:

$$R = \sqrt{1 - \frac{\sum (y_i - \hat{y}_i)^2}{\sum (y_i - \bar{y})^2}} = \sqrt{1 - \frac{6867918,6658}{30464818}}$$

The determination coefficient:

$$R^2 = 0,8801^2 \approx 0,7746.$$

Fisher's F-test:

– critical (tabular)

$$F_{tabl} = F(a, k_1, k_2) = F(0,05, 3, 6) \approx 4,7571.$$

$$- \text{factual } F_{fact} = \frac{R^2}{1-R^2} \cdot \frac{k_2}{k_1} = \frac{0,7746}{1-0,7746} \cdot \frac{6}{3} \approx 6,8716.$$

where $k_1 = m = 3, k_2 = n - m - 1 = 12 - 3 - 1 = 8, (a=0.05)$

m – the number of parameters in the variables of the regression equation.

Next, for the analysis of the influence of the volume of agricultural products sold on the gross regional product, we take the Chernivtsi region.

The value of the auxiliary values necessary for calculations is presented in Table 4.

Table 4.
Results of calculations of auxiliary values (Chernivtsi region)

i	x_i	y_i	x_i^2	x_i^3	x_i^4	x_i^5	x_i^6	$x_i y_i$	$x_i^2 y_i$	$x_i^3 y_i$
1	169	1634	28561	4826809	815730721	137858491849	23298085122481	276146	46668674	7887005906
2	142	1686	20164	2863288	406586896	57735339232	8198418170944	239412	33996504	4827503568
3	191	1754	36481	6967871	1330863361	254194901951	48551226272641	335014	63987674	12221645734
4	136	1108	18496	2515456	342102016	46525874176	6327518887936	150688	20493568	2787125248
5	45	558	2025	91125	4100625	184528125	8305765625	25110	1129950	50847750
6	62	820	3844	238328	14776336	916132832	56800235584	50840	3152080	195428960
7	59	850	3481	205379	12117361	714924299	42180533641	50150	2958850	174572150
8	59	1136	3481	205379	12117361	714924299	42180533641	67024	3954416	233310544
9	105	1369	11025	1157625	121550625	12762815625	1340095640625	143745	15093225	1584788625
10	77	1406	5929	456533	35153041	2706784157	208422380089	108262	8336174	641885398
Σ	1045	12321	133487	19527793	3095098343	514314716545	88073231543207	1446391	199771115	30604113883

Source: calculated by the authors

$$\begin{cases} a \sum x_i^3 + b \sum x_i^2 + c \sum x_i + nd = \sum y_i; \\ a \sum x_i^4 + b \sum x_i^3 + c \sum x_i^2 + d \sum x_i = \sum x_i y_i; \\ a \sum x_i^5 + b \sum x_i^4 + c \sum x_i^3 + d \sum x_i^2 = \sum x_i^2 y_i; \\ a \sum x_i^6 + b \sum x_i^5 + c \sum x_i^4 + d \sum x_i^3 = \sum x_i^3 y_i. \end{cases} \Leftrightarrow \begin{cases} 19527793a + 133487b + 1045c + 10d = 12321; \\ 3095098343a + 19527793b + 133487c + 1045d = 1446391; \\ 514314716545a + 3095098343b + 19527793c + 133487d = 199771115; \\ 88073231543207a + 514314716545b + 3095098343c + 19527793d = 30604113883. \end{cases}$$

Solving the system of linear equations by Kramer's method:

$$\Delta = \begin{vmatrix} 19527793 & 133487 & 1045 & 10 \\ 3095098343 & 19527793 & 133487 & 1045 \\ 514314716545 & 3095098343 & 19527793 & 133487 \\ 88073231543207 & 514314716545 & 3095098343 & 19527793 \end{vmatrix} = 3,814277662511121e + 23;$$

$$\Delta a = \begin{vmatrix} 12321 & 133487 & 1045 & 10 \\ 1446391 & 19527793 & 133487 & 1045 \\ 199771115 & 3095098343 & 19527793 & 133487 \\ 30604113883 & 514314716545 & 3095098343 & 19527793 \end{vmatrix} = 565339319481689240000 \Rightarrow$$

$$\Rightarrow a = \frac{\Delta a}{\Delta} = \frac{565339319481689240000}{3,814277662511121e + 23} \approx 0,0015;$$

$$\Delta b = \begin{vmatrix} 19527793 & 12321 & 1045 & 10 \\ 3095098343 & 1446391 & 133487 & 1045 \\ 514314716545 & 199771115 & 19527793 & 133487 \\ 88073231543207 & 30604113883 & 3095098343 & 19527793 \end{vmatrix} = 2,1736585449016174e + 23 \Rightarrow$$

$$\Rightarrow b = \frac{\Delta b}{\Delta} = \frac{-2,1736585449016174e + 23}{3,814277662511121e + 23} \approx -0,5699;$$

$$\Delta c = \begin{vmatrix} 19527793 & 133487 & 12321 & 10 \\ 3095098343 & 19527793 & 1446391 & 1045 \\ 514314716545 & 3095098343 & 199771115 & 133487 \\ 88073231543207 & 514314716545 & 30604113883 & 19527793 \end{vmatrix} = 2,78788459895433e + 25 \Rightarrow$$

$$\Rightarrow c = \frac{\Delta c}{\Delta} = \frac{2,78788459895433e + 25}{3,814277662511121e + 23} \approx 73,0908;$$

$$\Delta d = \begin{vmatrix} 19527793 & 133487 & 1045 & 12321 \\ 3095098343 & 19527793 & 133487 & 1446391 \\ 514314716545 & 3095098343 & 19527793 & 199771115 \\ 88073231543207 & 514314716545 & 3095098343 & 30604113883 \end{vmatrix} = -6,458135938364854e + 26 \Rightarrow$$

$$\Rightarrow d = \frac{\Delta d}{\Delta} = \frac{-6,458135938364854e + 26}{3,814277662511121e + 23} \approx -1693,1478.$$

The cubic one-factor regression equation, which describes the impact of the amount of agricultural products sold on the gross regional product (GRP) of the Chernivtsi region, will be:

$$\text{GRP} = 0.0015\text{AP}^3 - 0.5699\text{AP}^2 + 73.0908\text{AP} - 1693.1478$$

GRP – gross regional product of the Chernivtsi region;

AP – the volume of agricultural products sold in Chernivtsi region.

Fig. 4 shows the dependence between two indicators, namely the influence of the volume of agricultural products sold on the gross regional product of the Chernivtsi region.

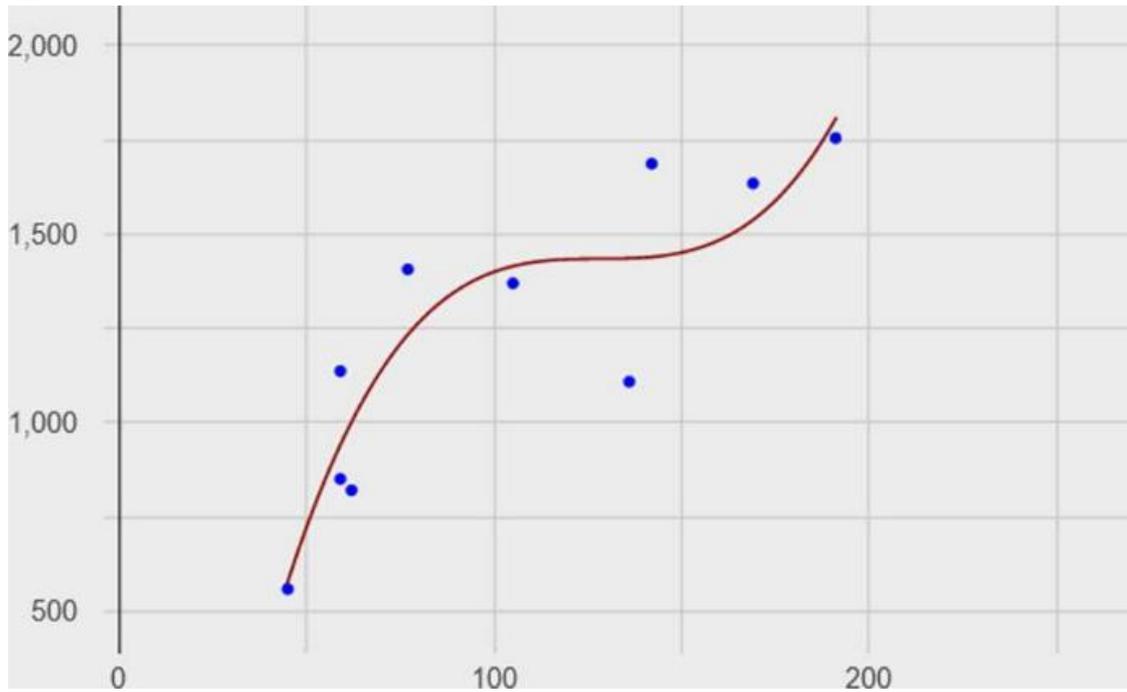


Figure 4. Graphic representation of the influence of the amount of agricultural products sold on the gross regional product of the Chernivtsi region.

Source: developed by the authors.

Table 5.

The value of auxiliary values for evaluating the significance of correlation parameters (Chernivtsi region)

i	i	x_i	y_i	\hat{y}	$x_i - \bar{x}$	$(x_i - \bar{x})^2$	\mathcal{E}_i	\mathcal{E}_i^2	A_i	$\Delta \mathcal{E}_i$
1	169	1634	1537,1459	401,9	161523,61	96,8541	9380,7184	0,0593	—	—
2	142	1686	1438,6649	453,9	206025,21	247,3351	61174,6556	0,1467	150,481	22644,5311
3	191	1754	1805,1483	521,9	272379,61	-51,1483	2616,1534	0,0292	-298,4835	89092,3731
4	136	1108	1435,1257	-124,1	15400,81	-327,1257	107011,2395	0,2952	-275,9774	76163,5126
5	45	558	577,0035	-674,1	454410,81	-19,0035	361,134	0,0341	308,1222	94939,2894
6	62	820	1001,1246	-412,1	169826,41	-181,1246	32806,1039	0,2209	-162,121	26283,2277
7	59	850	939,8807	-382,1	146000,41	-89,8807	8078,5441	0,1057	91,2438	8325,4369
8	59	1136	939,8807	-96,1	9235,21	196,1193	38462,7714	0,1726	286	81796
9	105	1369	1414,3114	136,9	18741,61	-45,3114	2053,1184	0,0331	-241,4306	58288,7484
10	77	1406	1232,7143	173,9	30241,21	173,2857	30027,9431	0,1232	218,5971	47784,682
Σ	—	—	—	—	1483784,9	—	291972,382	1,22	—	505317,8012

Source: calculated by the authors

The correlation coefficient:

$$R = \sqrt{1 - \frac{\sum (y_i - \hat{y}_i)^2}{\sum (y_i - \bar{y})^2}} = \sqrt{1 - \frac{291972,382}{1483784,9}} \approx 0,8962.$$

The determination coefficient:

$$R^2 = 0,8962^2 \approx 0,8032.$$

Fisher's F-test:

– critical (tabular)
 $F_{\text{tabl}} = F(a, k_1, k_2) = F(0,05, 3, 6) \approx 4,7571.$

$$F_{\text{fact}} = \frac{R^2}{1-R^2} \cdot \frac{k_2}{k_1} = \frac{0,8032}{1-0,8032} \cdot \frac{6}{3} \approx 8,1639.$$

– factual

where $k_1 = m = 3$, $k_2 = n - m - 1 = 12 - 3 - 1 = 8$, ($a=0.05$)

m – the number of parameters in the variables of the regression equation.

The analysis of the impact of the volume of agricultural products sold on the gross regional product for the Transcarpathian region is carried out as follows. The value of the auxiliary values necessary for calculations is presented in Table 6.

Table 6.
Results of calculations of auxiliary values (Transcarpathian region)

i	x_i	y_i	x_i^2	x_i^3	x_i^4	x_i^5	x_i^6	$x_i y_i$	$x_i^2 y_i$	$x_i^3 y_i$
1	330	2656	108900	35937000	11859210000	3913539300000	1291467969000000	876480	289238400	95448672000
2	321	2623	103041	33076161	10617447681	3408200705601	1094032426497921	841983	270276543	86758770303
3	328	2811	107584	35287552	11574317056	3796375994368	1245211326152704	922008	302418624	99193308672
4	104	1733	10816	1124864	116985856	12166529024	1265319018496	180232	18744128	1949389312
5	22	851	484	10648	234256	5153632	113379904	18722	411884	9061448
6	35	1235	1225	42875	1500625	52521875	1838265625	43225	1512875	52950625
7	33	1315	1089	35937	1185921	39135393	1291467969	43395	1432035	47257155
8	46	1671	2116	97336	4477456	205962976	9474296896	76866	3535836	162648456
9	57	1885	3249	185193	10556001	601692057	34296447249	107445	6124365	349088805
10	50	1949	2500	125000	6250000	312500000	15625000000	97450	4872500	243625000
Σ	1326	18729	341004	105922566	34192164852	11131499494926	3632039679526764	3207806	898567190	284214771776

Source: calculated by the authors

$$\begin{cases} a \sum x_i^3 + b \sum x_i^2 + c \sum x_i + nd = \sum y_i; \\ a \sum x_i^4 + b \sum x_i^3 + c \sum x_i^2 + d \sum x_i = \sum x_i y_i; \\ a \sum x_i^5 + b \sum x_i^4 + c \sum x_i^3 + d \sum x_i^2 = \sum x_i^2 y_i; \\ a \sum x_i^6 + b \sum x_i^5 + c \sum x_i^4 + d \sum x_i^3 = \sum x_i^3 y_i. \end{cases} \Leftrightarrow$$

$$\begin{cases} 105922566a + 341004b + 1326c + 10d = 18729, \\ 34192164852a + 105922566b + 341004c + 1326d = 3207806, \\ 11131499494926a + 34192164852b + 105922566c + 341004d = 898567190, \\ 13632039679526764a + 11131499494926b + 34192164852c + 105922566d = 284214771776 \end{cases}$$

Solving the system of linear equations by Kramer's method:

$$\Delta = \begin{vmatrix} 105922566 & 341004 & 1326 & 10 \\ 34192164852 & 105922566 & 341004 & 1326 \\ 11131499494926 & 34192164852 & 105922566 & 341004 \\ 13632039679526764 & 11131499494926 & 34192164852 & 105922566 \end{vmatrix} = 1,6997378314774298e + 26;$$

$$\Delta a = \begin{vmatrix} 18729 & 341004 & 1326 & 10 \\ 3207806 & 105922566 & 341004 & 1326 \\ 898567190 & 34192164852 & 105922566 & 341004 \\ 284214771776 & 11131499494926 & 34192164852 & 105922566 \end{vmatrix} = 1,465169819909349e + 23 \Rightarrow$$

$$\Rightarrow a = \frac{\Delta a}{\Delta} = \frac{1,465169819909349e + 23}{1,6997378314774298e + 26} \approx 0,0009;$$

$$\Delta b = \begin{vmatrix} 105922566 & 18729 & 1326 & 10 \\ 34192164852 & 3207806 & 341004 & 1326 \\ 11131499494926 & 898567190 & 105922566 & 341004 \\ 13632039679526764 & 284214771776 & 34192164852 & 105922566 \end{vmatrix} = -7,081523586277719e + 25 \Rightarrow$$

$$\Rightarrow b = \frac{\Delta b}{\Delta} = \frac{-7,081523586277719e + 25}{1,6997378314774298e + 26} \approx -0,4166;$$

$$\Delta c = \begin{vmatrix} 105922566 & 341004 & 18729 & 10 \\ 34192164852 & 105922566 & 3207806 & 1326 \\ 11131499494926 & 34192164852 & 898567190 & 341004 \\ 13632039679526764 & 11131499494926 & 284214771776 & 105922566 \end{vmatrix} = 8,90039704793933e + 27 \Rightarrow$$

$$\Rightarrow c = \frac{\Delta c}{\Delta} = \frac{8,90039704793933e + 27}{1,6997378314774298e + 26} \approx 52,3634;$$

$$\Delta d = \begin{vmatrix} 105922566 & 341004 & 1326 & 18729 \\ 34192164852 & 105922566 & 341004 & 3207806 \\ 11131499494926 & 34192164852 & 105922566 & 898567190 \\ 3632039679526764 & 11131499494926 & 34192164852 & 284214771776 \end{vmatrix} = 1,0336494102946565e + 27 \Rightarrow$$

$$\Rightarrow d = \frac{\Delta d}{\Delta} = \frac{1,0336494102946565e + 27}{1,6997378314774298e + 26} \approx 6,0812.$$

So, the cubic one-factor regression equation, which describes the impact of the amount of agricultural products sold on the gross regional product (GRP) of the Transcarpathian region, will be:

$$GRP = 0.0009AP^3 - 0.4166AP^2 + 52.3634AP + 6.0812.$$

GRP – gross regional product of the Transcarpathian region;
AP – the volume of agricultural products sold in Transcarpathian region.

Fig. 5 shows the dependence between two indicators, namely the impact of the volume of agricultural products sold on the gross regional product of the Transcarpathian region.

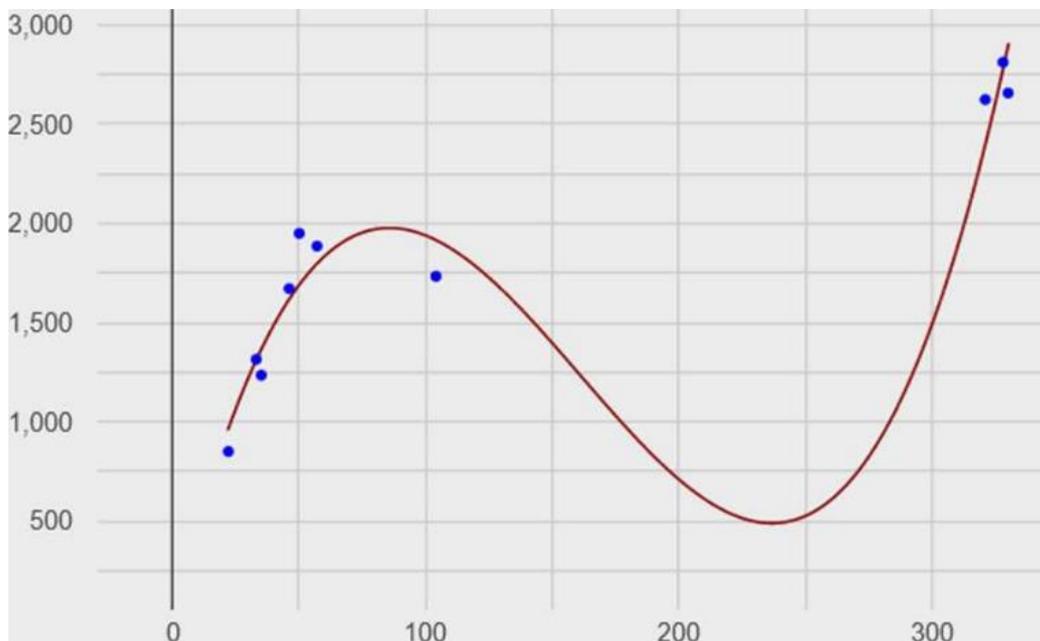


Figure 5. Graphic representation of the influence of the amount of agricultural products sold on the gross regional product of the Transcarpathian region.

Source: developed by the authors

Table 7 provides supporting data for evaluating the significance of the correlation parameters.

Table 7.

The value of auxiliary values for evaluating the significance of correlation parameters (Transcarpathian region)

i	x_i	y_i	\hat{y}	$x_i - \bar{x}$	$(x_i - \bar{x})^2$	ε_i	ε_i^2	A_i	$\Delta \varepsilon_i$	
1	330	2656	2893.189	783.1	613245.61	-237.189	56258.5991	0.0893	—	
2	321	2623	2396.8853	750.1	562650.01	226.1147	51127.84	0.0862	463.3036	
3	328	2811	2776.9175	938.1	880031.61	34.0825	1161.6192	0.0121	-192.0321	
4	104	1733	1915.2897	-139.9	19572.01	-182.2897	33229.521	0.1052	-216.3722	
5	22	851	965.6073	-1021.9	1044279.61	-114.6073	13134.8296	0.1347	67.6824	
6	35	1235	1365.3917	-637.9	406916.41	-130.3917	17002.0031	0.1056	-15.7844	
7	33	1315	1311.3454	-557.9	311252.41	3.6546	13.356	0.0028	134.0463	
8	46	1671	1617.1215	-201.9	40763.61	53.8785	2902.8976	0.0322	50.224	
9	57	1885	1796.8153	12.1	146.41	88.1847	7776.536	0.0468	34.3061	
10	50	1949	1690.4374	76.1	5791.21	258.5626	66854.6338	0.1327	170.378	
Σ	—	—	—	—	3884648.9	—	249461.8354	0.7475	—	353869.9769

Source: calculated by the authors

The correlation coefficient:

$$R = \sqrt{1 - \frac{\sum (y_i - \bar{y})^2}{\sum (y_i - \bar{y})^2}} = \sqrt{1 - \frac{249461,8354}{3884648,9}} \approx 0,9674.$$

The determination coefficient:

$$R^2 = 0,9674^2 \approx 0,9358.$$

Fisher's F-test:

– critical (tabl)

$$F_{\text{tabl}} = F(a, k_1, k_2) = F(0,05, 3, 6) \approx 4,7571.$$

$$F_{\text{fakt}} = \frac{R^2}{1-R^2} \cdot \frac{k_2}{k_1} = \frac{0,9358}{1-0,9358} \cdot \frac{6}{3} \approx 29,1442.$$

– factual where $k_1 = m = 3$, $k_2 = n - m - 1 = 12 - 3 - 1 = 8$, ($a=0.05$)

m – the number of parameters in the variables of the regression equation.

The fourth region of the Carpathian Economic Region is Ivano-Frankivsk. Let's analyze the impact of the volume of agricultural products sold on the gross regional product of the Ivano-Frankivsk region. The value of the auxiliary values necessary for calculations is presented in Table 8.

Table 8.

Results of calculations of auxiliary values (Ivano-Frankivsk region)

i	x_i	y_i	x_i^2	x_i^3	x_i^4	x_i^5	x_i^6	$x_i y_i$	$x_i^2 y_i$	$x_i^3 y_i$
1	251	4006	63001	15813251	3969126001	996250626251	250058907189001	1005506	252382006	63347883506
2	267	4068	71289	19034163	5082121521	1356926446107	362299361110569	1086156	290003652	77430975084
3	400	4387	160000	64000000	2560000000	1024000000000	409600000000000	1754800	701920000	280768000000
4	264	2744	69696	18399744	4857532416	1282388557824	338550579265536	724416	191245824	50488897536
5	101	1351	10201	1030301	104060401	10510100501	1061520150601	136451	13781551	1391936651
6	160	1831	25600	4096000	655360000	104857600000	1677721600000	292960	46873600	7499776000
7	150	1966	22500	3375000	506250000	75937500000	11390625000000	294900	44235000	6635250000
8	171	2363	29241	5000211	855036081	146211169851	25002110044521	404073	69096483	11815498593
9	223	2748	49729	11089567	2472973441	551473077343	122978496247489	612804	136655292	30474130116
10	180	3084	32400	5832000	1049760000	188956800000	34012224000000	555120	99921600	17985888000
Σ	2167	28548	533657	147670237	45152219861	14953511877876,998	5258131039007717	6867186	1846115008	547838235486

Source: calculated by the authors

$$\begin{cases} a \sum x_i^3 + b \sum x_i^2 + c \sum x_i + nd = \sum y_i; \\ a \sum x_i^4 + b \sum x_i^3 + c \sum x_i^2 + d \sum x_i = \sum x_i y_i; \\ a \sum x_i^5 + b \sum x_i^4 + c \sum x_i^3 + d \sum x_i^2 = \sum x_i^2 y_i; \\ a \sum x_i^6 + b \sum x_i^5 + c \sum x_i^4 + d \sum x_i^3 = \sum x_i^3 y_i. \end{cases} \Leftrightarrow \begin{cases} 147670237a + 533657b + 2167c + 10d = 28548, \\ 45152219861a + 147670237b + 533657c + 2167d = 6867186, \\ 14953511877876,998a + 45152219861b + 147670237c + 533657d = 1846115008, \\ 15258131039007717a + 14953511877876,998b + 45152219861c + 147670237d = 547838235486. \end{cases}$$

Solving the system of linear equations by Kramer's method:

$$\Delta = \begin{vmatrix} 147670237 & 533657 & 2167 & 10 \\ 45152219861 & 147670237 & 533657 & 2167 \\ 14953511877876,998 & 45152219861 & 147670237 & 533657 \\ 15258131039007717 & 14953511877876,998 & 45152219861 & 147670237 \end{vmatrix} = 1,3347003245641903e + 27;$$

$$\Delta a = \begin{vmatrix} 28548 & 533657 & 2167 & 10 \\ 6867186 & 147670237 & 533657 & 2167 \\ 1846115008 & 45152219861 & 147670237 & 533657 \\ 547838235486 & 14953511877876,998 & 45152219861 & 147670237 \end{vmatrix} = -8,117299831574964e + 22 \Rightarrow$$

$$\Rightarrow a = \frac{\Delta a}{\Delta} = \frac{-8,117299831574964e + 22}{1,3347003245641903e + 27} \approx -0,0001;$$

$$\Delta b = \begin{vmatrix} 147670237 & 28548 & 2167 & 10 \\ 45152219861 & 6867186 & 533657 & 2167 \\ 14953511877876,998 & 1846115008 & 147670237 & 533657 \\ 5258131039007717 & 547838235486 & 45152219861 & 147670237 \end{vmatrix} = 2,535663738503598c + 25 \Rightarrow$$

$$\Rightarrow b = \frac{\Delta b}{\Delta} = \frac{2,535663738503598c + 25}{1,3347003245641903e + 27} \approx 0,019;$$

$$\Delta c = \begin{vmatrix} 147670237 & 533657 & 2167 & 10 \\ 45152219861 & 147670237 & 6867186 & 2167 \\ 14953511877876,998 & 45152219861 & 1846115008 & 533657 \\ 5258131039007717 & 14953511877876,998 & 547838235486 & 147670237 \end{vmatrix} = 1,8171485540403015e + 28 \Rightarrow$$

$$\Rightarrow c = \frac{\Delta c}{\Delta} = \frac{1,8171485540403015e + 28}{1,3347003245641903e + 27} \approx 13,6147;$$

$$\Delta d = \begin{vmatrix} 147670237 & 533657 & 2167 & 28548 \\ 45152219861 & 147670237 & 533657 & 6867186 \\ 14953511877876,998 & 45152219861 & 147670237 & 1846115008 \\ 5258131039007717 & 14953511877876,998 & 45152219861 & 547838235486 \end{vmatrix} = -2,8194954381027008e + 29 \Rightarrow$$

$$\Rightarrow d = \frac{\Delta d}{\Delta} = \frac{-2,8194954381027008e + 29}{1,3347003245641903e + 27} \approx -211,2456.$$

The cubic one-factor regression equation, which describes the influence of the volume of agricultural products sold on the gross regional product (GRP) of the Ivano-Frankivsk region will be:

$$GRP = -0.0001AP^3 + 0.019AP^2 + 13.6147AP - 211.2456$$

GRP – gross regional product of the Ivano-Frankivsk region;

AP – the volume of agricultural products sold in Ivano-Frankivsk region.

Fig. 6 shows the dependence between two indicators, namely the influence of the volume of agricultural products sold on the gross regional product of the Ivano-Frankivsk region.

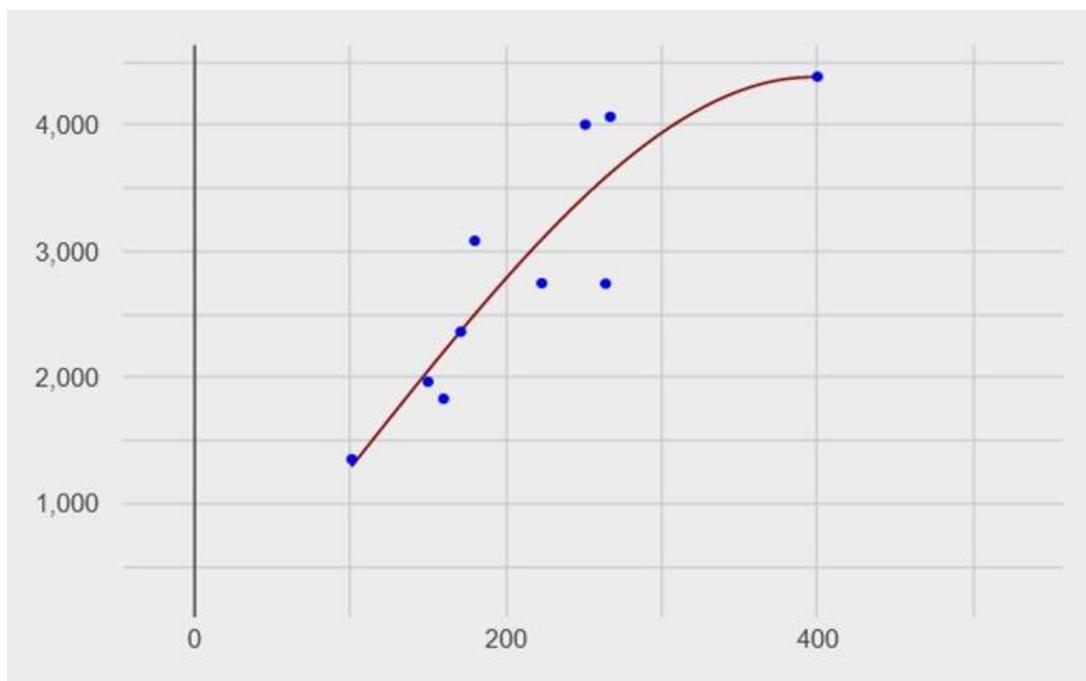


Figure 6. Graphic representation of the impact of the volume of agricultural products sold on the gross regional product of the Ivano-Frankivsk region

Source: developed by the authors

Table 9 provides supporting data for evaluating the significance of the correlation parameters.

Table 9.

The value of auxiliary values for evaluating the significance of correlation parameters (Ivano-Frankivsk region)

i	x_i	y_i	\hat{y}	$x_i - \bar{x}$	$(x_i - \bar{x})^2$	ε_i	ε_i^2	A_i	$\Delta \varepsilon_i$
1	251	4006	3441,2053	1151,2	1325261,44	564,7947	318993,0437	0,141	—
2	267	4068	3620,6077	1213,2	1471854,24	447,3923	200159,8268	0,11	-117,4024
3	400	4387	4381,9835	1532,2	2347636,84	5,0165	25,1656	0,0011	-442,3757
4	264	2744	3588,0837	-110,8	12276,64	-844,0837	712477,2551	0,3076	-849,1002
5	101	1351	1294,973	-1503,8	2261414,44	56,027	3139,0206	0,0415	900,1106
6	160	1831	2204,3401	-1023,8	1048166,44	-373,3401	139382,8368	0,2039	-429,3671
7	150	1966	2053,1491	-888,8	789965,44	-87,1491	7594,9642	0,0443	286,191
8	171	2363	2368,2813	-491,8	241867,24	-5,2813	27,892	0,0022	81,8678
9	223	2748	3095,1356	-106,8	11406,24	-347,1356	120503,1554	0,1263	-341,8544
10	180	3084	2500,2406	229,2	52532,64	583,7594	340775,0036	0,1893	930,895
Σ	—	—	—	—	9562381,6	—	1843078,1639	1,1673	—

Source: calculated by the authors

The correlation coefficient:

$$R = \sqrt{1 - \frac{\sum (y_i - \hat{y})^2}{\sum (y_i - \bar{y})^2}} = \sqrt{1 - \frac{1843078,1639}{9562381,6}} \approx 0,8985.$$

The determination coefficient:

$$R^2 = 0,8985^2 \approx 0,8073.$$

Fisher's F-test:

– critical (tabular)

$$F_{\text{tabl}} = F(a, k_1, k_2) = F(0,05, 3, 6) \approx 4,7571.$$

– factual

$$F_{\text{fact}} = \frac{R^2}{1 - R^2} \cdot \frac{k_2}{k_1} = \frac{0,8073}{1 - 0,8073} \cdot \frac{6}{3} \approx 8,3765.$$

Where $k_1 = m = 3$, $k_2 = n - m - 1 = 12 - 3 - 1 = 8$, ($a=0.05$)

m – the number of parameters in the variables of the regression equation.

The correlation coefficient should be in the range from -1 to 1, and when it approaches 1, the closeness of the interaction is stronger. With a value of 1, the equation is generally functional rather than correlational. So, it can be stated that the dependence between the two parameters in the Lviv (0.8801), Chernivtsi (0.8962), Transcarpathian (0.9674) and Ivano-Frankivsk (0.8985) regions is significant, according to the model, the change in the volume of agricultural products sold in the region leads to the change in gross regional product. Taking into account the rapid development of the agricultural sector before the start of hostilities on the territory of Ukraine, the above is quite real and justified.

Also, the results of calculations demonstrate a situation when $F_{\text{fact}} > F_{\text{tabl}}$, which suggests that the determined regression model is significant and

corresponds as closely as possible to the real functioning model for all four regions.

Conclusions

The conducted analysis proved the significant role of agriculture in the development of the economy of Ukraine's regions. Ukraine is an agrarian country with a rich agricultural history, but in today's extremely difficult conditions of war, it faces extreme challenges, including: worker safety, limited access to resources, significant economic losses, destruction of agricultural facilities, insufficient funding and support, environmental risks and natural resources, etc.

The following should be noted among the promising directions that should be aimed at the restoration of the agricultural sector and the formation of branding of agricultural regions. Implementation of the latest technologies, digital solutions, modern methods of soil cultivation and plant cultivation, will contribute to increasing the productivity and quality of agricultural products. Stimulating young farmers and agro-entrepreneurs, providing financial and consulting support, training and providing access to modern technologies helps young specialists develop their agricultural businesses. Attracting investments in the agricultural sector, which optimizes the processes of introducing innovative technologies, will contribute to the development of infrastructure and the creation of jobs. The development of organic production in the agricultural sector aimed at protecting the health of the population and the environment. It is also extremely important to establish cooperation with international partners, which will facilitate the exchange of experience and technologies, and financial support. Support is effective through the creation of state programs

aimed at financial assistance, consultations, ensuring access to markets and exports, encouraging start-ups in the field of agricultural entrepreneurship development.

However, in the conditions of war, for the recovery and further development of the agricultural sector, it is necessary to create a favorable investment climate, ensure transparency and stability in legislation, which is currently a significant problem for Ukraine.

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DOI: <https://doi.org/10.34069/AI/2024.74.02.22>

How to Cite:

Alhamad, I.A., & Singh, H.P. (2024). Predicting dropout at master level using educational data mining: A case of public health students in Saudi Arabia. *Amazonia Investiga*, 13(74), 264-275. <https://doi.org/10.34069/AI/2024.74.02.22>

Predicting dropout at master level using educational data mining: A case of public health students in Saudi Arabia

العربية المملكة في العامة الصحة طلاب حالة: التعليمية البيانات في التنقيب باستخدام الماجستير مستوى في بالتسرب التنقيب
السعودية

Received: January 7, 2024

Accepted: February 25, 2024

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Abstract

خلاصة

Student dropout and its economic and social consequences are significant issues in developing countries. Students who drop out experience reduced employment prospects and encounter social stigma. While early dropout prediction can assist in mitigating the consequences, it remains a considerable challenge. The present research employed a data mining approach to predict dropout of public health master-level students in Saudi Arabia, a developing nation that has invested considerable resources to promote higher education. The research model focused on three fundamental determinants of students' dropout: individual, institutional, and academic. The study analysis on a dataset of 150 students revealed that all three determinants predicted student dropout. The results indicated that students with low academic performance who received an academic warning were likelier to drop out. Freshmen with poor academic achievement were particularly at risk of dropping out of college. Students between 31 and 36 years old who attended technical courses as a subject specialization could also dropout. The research contributes to the literature by suggesting that universities should consider these individual, institutional, and academic determinants to develop their dropout prevention strategies. This study has ramifications for university administrators in developing nations, such as Saudi Arabia, who can establish dropout

يعد تسرب الطلاب وعواقبه الاقتصادية والاجتماعية من القضايا المهمة في البلدان النامية. يعاني الطلاب الذين يتركون المدرسة من انخفاض فرص العمل ويواجهون ضغوطا اجتماعية. وفي حين أن التنبؤ المبكر بالتسرب يمكن أن يساعد في تخفيف العواقب، إلا أنه لا يزال يمثل تحديًا كبيرًا. استخدم البحث الحالي أسلوب استخراج البيانات للتنبؤ بتسرب طلاب درجة الماجستير في الصحة العامة في المملكة العربية السعودية، وهي دولة نامية استثمرت موارد كبيرة لتعزيز التعليم العالي. ركز النموذج على ثلاث محددات أساسية لتسرب الطلاب: الفردية والمؤسسية والأكاديمية. كشفت تحليل الدراسة على مجموعة البيانات المكونة من 150 طالبًا أن المحددات الثلاثة جميعها تنبأت بتسرب الطلاب. أشارت النتائج إلى أن الطلاب ذوي الأداء الأكاديمي المنخفض والذين تلقوا تحذيرًا أكاديميًا كانوا أكثر عرضة للتسرب. كان الطلاب الجدد ذوي التحصيل الأكاديمي الضعيف معرضين بشكل خاص لخطر التسرب من الكلية. يمكن أيضًا للطلاب الذين تتراوح أعمارهم بين 31 و36 عامًا والذين حضروا الدورات الفنية المتخصصة أن يتسربوا من الدراسة. يساهم البحث في الأدبيات من خلال اقتراح أن الجامعات يجب أن تأخذ في الاعتبار هذه المحددات الفردية والمؤسسية والأكاديمية لتطوير استراتيجياتها لمنع التسرب. ولهذه الدراسة تداعيات على قيادات الجامعات في الدول النامية، مثل المملكة العربية السعودية، الذين يمكنهم إنشاء برامج لمنع التسرب بناءً على المحددات التي كشفت عنها هذه الدراسة.

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prevention programs based on the determinants revealed in this study.

Keywords: Dropout, educational data mining, higher education institutions, public health, Saudi Arabia, Saudi Vision 2030.

Introduction

Higher education is a vital constituent for the progress of a country. Higher education is particularly important for developing countries like Saudi Arabia (Singh et al., 2011a). In 1932, when the Kingdom was established, Saudi Arabia had no university. King Saud University was the inaugural university founded in Saudi Arabia in 1957 (Al-Omar, 2023). Saudi Arabia undertook an ambitious effort in the 1990s to establish a vast array of educational facilities, recognizing the importance of education to the growth of the nation (Singh & Chand, 2012). In Saudi Arabia, the proportion of education spending to GDP climbed from 5.3% in 1985 to 7.3% in 2018 (Singh et al., 2022a).

This illustrates that Saudi Arabia invested extensively in education to enhance human capital and improve its human resources in accordance with the ideals of the Vision 2030 government program (Singh & Alodaynan, 2023). Currently, Saudi Arabia has 67 public and private universities and colleges that deliver higher education to students (CGIJ, 2023).

Students' academic performance during university education is a turning point in their career (Singh et al., 2013). Students obtain employment opportunities depending on their academic performance at the university level (Singh et al., 2022b). The improved performance of students has a favorable effect on the reputation of higher education institutions (HEIs) (Singh & Alhamad, 2022a). However, student dropout negatively influences the employment prospects of the affected students and seriously impacts a nation's scarce resources (Alhamuddin et al., 2023). Typically, student dropout negatively affects the reputation of the institution and leads to strategic and monetary loss for the nation (Singh et al., 2011b). Further, dropout reduces employment possibilities and leads to societal stigma, resulting in negative social and economic effects for the students (Ye et al., 2022). This is especially critical in the case of public health students, who, following graduation, play a crucial role in educating the population about diverse health issues and their management. The dropout of public health students diminishes the likelihood that

الكلمات المفتاحية: التسرب، التنقيب في البيانات التعليمية، مؤسسات التعليم العالي، الصحة العامة، المملكة العربية السعودية، رؤية السعودية 2030.

governments, particularly in developing nations (Kumari & Singh, 2021) (like Saudi Arabia), will produce sufficient health educators in the future. The dropout of public health students from HEIs is critical for Saudi Arabia, as it has invested significant resources to manage public health (Alam et al., 2022).

Prior research has thoroughly investigated the issue of higher education student dropout. However, most of the prior higher education research has primarily focused on the dropout of undergraduate university students (Baalman, 2023; Abdulghani et al., 2023). Some studies have examined master's student dropout (Dlungwane & Voce, 2020; Rotem et al., 2020), however, there is a shortage of empirical research on the dropout of public health students, especially in Saudi Arabia. The current study is built on earlier studies but differs from the existing ones in context (Saudi Arabia) and focus (public health).

The current study also employs data mining techniques (Singh & Alhamad, 2022b) to identify the predictive factors affecting dropout of students, which is unique in the Saudi context.

The rest of the paper is arranged as follows. The second section deals with the study objectives. The third section is dedicated to the literature review on educational data mining and students' dropout. The fourth section deals with the methods employed in this study. The fifth section is related to the results and discussion. The sixth section presents the conclusion of the study. The last section is dedicated to the limitations and future research directions.

Objectives of study

This study aims to develop a predictive model using educational data mining to predict students' dropout. The following are the objectives of this study:

- To identify the important attributes that help to predict the students' dropout.

- To identify an appropriate data mining algorithm suitable for building a students' dropout predictive model.
- To apply the selected algorithm to train, test, and build the students' dropout model.
- To suggest strategies to reduce the dropout rate of students.

Literature review on educational data mining and students' dropout

Higher education is deemed essential for a country's progress, particularly in developing nations (Alhulail & Singh, 2023). Early dropout prediction is crucial to mitigate its detrimental impact on the standard of higher education. The commitment of the faculty (Robert, 2023) and technology (Singh et al., 2011c) can play a vital role in the early identification of students at the risk of dropping out (Alkhalil, 2021; Alazemi, 2023). Student dropout rates may negatively impact individuals in developing nations such as Saudi Arabia (Ibeaheem et al., 2018), as it diminishes their job opportunities in nations with constraints on economic resources (Singh & Alwaqaa, 2023).

Educational data mining utilizes education-related data to produce data mining results (Singh et al., 2023; Alhamad & Singh, 2021). In line with the prior research (Gentle et al., 2012; Singh & Alhamad, 2021; Singh & Alhulail, 2023), we employ predictive modelling in this study. Consequently, we undertake a literature review on using educational data mining (EDM) and other empirical methods to examine critical factors affecting student dropout.

Zhang et al. (2010) leveraged EDM to identify key student dropout determinants and improve retention. They conducted the study by collecting institutional data from Thames Valley University students in the United Kingdom (UK). They employed classification algorithms like naïve bayes, decision trees, and support vector machine (SVM) to identify the key predictive factors. The study results indicated that the students' average course marks were a key determinant of their dropout. Further, the study informed that first-year students are more likely to drop out.

Bharadwaj & Pal (2011) employed EDM to conduct a study using institution-specific internal factors to analyze and predict students' retention at VBS Purvanchal University, Jaunpur, India. In their study, the classification method of data mining was used to analyze the performance of 50 MCA students using the classification approach of data mining. From the university

database, the study used data such as attendance, class quizzes, seminars, and assignment grades to predict the students' performance. The study employed ID3, C4.5, and ADT decision tree classifiers to predict student performance. Applying the model to the student data of incoming freshmen revealed that the ADT algorithm generated a concise and precise prediction list for student retention. In this study, the decision tree classification technique was tested and found to be highly accurate for improving student retention.

Bharadwaj & Pal (2012) employed EDM to conduct a study based on external factors to predict the retention of students at RML Awadh University, Faizabad, India. Data from 300 students from 5 different degree colleges studying Bachelor of Computer Applications (BCA) was collected for this study. A prediction model for student performance enhancement was developed utilizing the data mining classification method. Bayesian classification model was applied to 17 data attributes of the students. Students' senior secondary exam marks, dwelling location, teaching medium, specialized courses, mother's qualification, family income, and family status were found to be highly connected with their dropout.

Yadav et al. (2012) employed EDM to predict university students' retention using machine learning classifiers. They utilized decision tree algorithms like ID3, C4.5, and ADT to a dataset of selected students from VBS Purvanchal University in Jaunpur, India. The study informed that students' grades play a key role in their continuation of studies. Pal (2012) conducted another study to predict the dropout rate of engineering students at VBS Purvanchal University, Jaunpur, India. They employed decision tree algorithms such as ID3, C4.5, CART, and ADT to identify the key predictive factors influencing the dropout of students. The results of this study revealed that students' high school and secondary school grades, family income, and mother's education level impacted their dropout.

Márquez-Vera et al. (2015) employed EDM to predict early dropout among high school students in Mexico. They proposed a methodology and an ICRM2 algorithm to improve the accuracy of early dropout prediction. They compared the efficacy of their ICRM2 algorithm with traditional data mining algorithms. The study results informed that the developed ICRM2 algorithm could predict dropout within four to six weeks of the start of the course and could be

employed to detect early dropout of students. The study results also suggested that students' grades, absenteeism, and motivation level influenced their dropout.

Casanova et al. (2018) utilized EDM to identify the key determinants of first-year students' attrition at a public university in Portugal. The study employed IBM SPSS software version 24 to create a decision tree for predicting the key determinants of students' dropout. The study results revealed that students' academic performance played a key role in determining their dropout. Specifically, low-achieving first-year students were at a higher risk of dropping out. Further factors such as sex, course type, and education level of the mother also affected the dropout of first-year university students.

A study was carried out by Ahmed et al. (2018) in Bahrain to examine the relationship between academic support and student involvement. The study focused on how academic elements influence students' academic engagement and performance. The study findings indicated that increased academic engagement among students contributes to their retention in higher education. Therefore, students who receive academic support and are academically engaged are less likely to drop out.

Rodríguez-Muñiz et al. (2019) leveraged EDM to identify the profiles of students at risk of dropping out at the University of Oviedo, Spain. They employed data mining algorithms such as CART, C4.5, bayesnet, RF, and SVM to identify the risk profiles. The study results informed that students were at a higher risk of dropping out in the first year of university. Specifically, the first-year students with low academic performance were at a higher risk of dropping out. The other factors that influenced students' dropout included students full-time or part-time education, age, and attendance.

Mubarak et al. (2020) utilized EDM to predict the dropout of students studying online at the Open University, UK. They employed data mining algorithms such as SVM, random forest, and decision trees to develop the early prediction model. The study's results indicated that the likelihood of a student dropping out of an online course decreased as their participation in course activities increased. The study also indicated that the study models were 82 percent accurate in predicting the chance of students dropping out during the second week of the online course.

Singh & Alhulail (2022) conducted a study on dropout of students in teacher-training colleges in Ethiopia. The authors employed a four-step logistic regression approach to predict the critical determinants of students dropout in the context of the least-developed country (Ethiopia). The study found that academic variables, such as academic performance and higher education aspirations, have a crucial role in affecting student dropout rates. The study found that cultural influences, family education level, and economic considerations did not significantly affect dropout decisions in Ethiopian teacher training colleges.

Hashim et al. (2024) did an empirical study to evaluate the factors influencing student dropout rates in Malaysia. They analyzed a database of over 100,000 students to identify the dropout determinants. The study indicated that academic characteristics, students' gender, and family financial level influence student dropout rates.

The literature review reveals that individual, institutional, academic, and economic factors predict dropout of students. The individual factor comprises students' age, gender, and parents' education. The institutional factor comprises the student's field of study and the type of course. The academic factor encompasses students' marks, GPA, CGPA, and attendance. The economic factor encompasses family income and the availability of a job for the student. The current study aims to evaluate the impact of these factors on the dropout rate of public health masters' students in Saudi Arabia.

The literature review indicates a lack of empirical studies in Saudi Arabia that have applied dropout factors identified in the literature, including individual, institutional, academic, and economic aspects. Further, the majority of dropout studies utilizing EDM have been undertaken outside Saudi Arabia. In addition, there is a dearth of dropout research employing EDM on students of public health, particularly at the master's level. Therefore, the data lies unused in Saudi universities and is not mined to uncover hidden knowledge regarding the causes of master's students dropping out of public health programs. It is crucial to analyze the factors influencing the dropout of public health students in Saudi Arabia, especially at the master's level, given Saudi Arabia's substantial investment in higher education. The insufficient research in this field warranted the necessity of doing this study. This study aims to fill this research gap.

Methods

In this study, we adapted the six stages of the Cios et al. (2000) model to predict the dropout of public health students.

Stage 1 – Understand Problem Domain

In this stage, we reviewed the literature on EDM to understand the important factors influencing dropout of students. This stage clarified EDM goals in line with Cios et al. (2007). This study considered the individual, institutional, and academic determinants of public health masters' students at the University of Ha'il (UoH), Saudi Arabia. We did not consider the economic factors as information such as income level was not retained by the UoH, Saudi Arabia.

Stage 2 – Understand Data

At this stage, we collected academic data from the UoH, Saudi Arabia. We obtained 161 records for students pursuing a master's in public health. The UoH kept the data of the public health students related to individual, institutional, and academic determinants. The factors corresponding to individual determinants were student ID number, national ID number, name, mobile number, email address, gender, and date of birth. The students' ID number, national ID number, name, mobile number, and email address could have no influence on their dropout, therefore we ignored them. The factor corresponding to institutional determinant was the

subject specialty offered to public health masters' students. The factors corresponding to academic determinants were cumulative GPA (CumGPA) (0 to 4), academic warnings (0 to 2), number of credit hours required (45), number of credit hours passed (0 to 45), and number of credit hours remaining (0 to 45). The number of credit hours remaining can be computed as a difference between the number of credit hours required and passed; therefore, we ignored the number of credit hours remaining attribute.

Stage 3 – Prepare Data

In this stage, we evaluated the dataset for missing values and outliers (Han et al., 2012). We found 11 missing values in the dataset; therefore, we ignored those records. There were no outliers found in the dataset. The selected dataset consisted of 150 records. The dataset values should be converted from continuous to categorical for data mining tasks (Liu et al. (2002). For this purpose, first, we derived age, cumulative GPA, and percentage of credit hours completed (CRPER) attributes. We derived the age from the date of birth. The CRPER was derived as a proportion of the number of credit hours passed to the number of required credit hours. We converted the cumulative GPA from a number to a percentage, where a cumulative GPA of 4 denoted 100%. Next, we transformed the age, specialty, cumulative GPA, and CRPER attributes from continuous to categorical.

Table 1 portrays the criteria for data transformation.

Table 1.
Criteria for Data Transformation

Attribute(s)	Continuous Value(s)	Transformed Value(s)
Age	24 to 30	A1
	31 to 36	A2
	37 to 42	A3
Specialty	Electronic Health	S1
	Health Informatics	S2
	Health Service Management	S3
	Hospital and Health Services	S4
	Occupational Health	S5
	Public Health	S6
Cumulative GPA (CumGPA)	>95%	A+
	90% to 94.99%	A
	85% to 89.99%	B+
	80% to 84.99%	B
	75% to 79.99%	C+
	70% to 74.99%	C
	65% to 69.99%	D+
	60% to 64.99%	D
Percentage of credit hours completed (CRPER)	<60%	F
	0% to 25%	CR1
	26% to 50%	CR2
	51% to 75%	CR3
	76% to 100%	CR4

(Source: Authors design)

We transformed the age into three categories. Students aged 24 to 30 were transformed as A1, 31 to 36 as A2, and 37 to 42 as A3. The six subject specialties were given to code from S1 to S6. The cumulative GPA was transformed as per the grading criteria employed by the UoH. Accordingly, cumulative GPA $\geq 95\%$ was transformed as A+, $\geq 90\%$ as A, $\geq 85\%$ as B+, $\geq 80\%$ as B, $\geq 75\%$ as C+, $\geq 70\%$ as C, $\geq 65\%$ as D+, $\geq 60\%$ as D, and $< 60\%$ as F. The percentage of credit hours completed, ranging from 0% to 25%, was transformed as CR1, 26% to 50% as CR2, 51% to 75% as CR3, and 76% to 100% as CR4.

The final dataset consisted of six non-class attributes and one class attribute. The non-class attributes were gender (male or female), age (A1 to A3), specialty (S1 to S6), cumulative GPA (A+ to F), warnings (0 to 2), and percentage of credit hours completed (CR1 to CR4). The class attribute was status (active or dropout).

Table 2.
Experimentation Results

Algorithm	Accuracy-%	TPR	FPR	Precision	Recall	F-Measure
J-48	90.67%	0.907	0.093	0.909	0.907	0.907
REP-Tree	86.67%	0.867	0.133	0.869	0.867	0.866
J-Rip	86.00%	0.860	0.140	0.862	0.860	0.860
PART	95.33%	0.953	0.047	0.957	0.953	0.953

Note: The meaning of TPR is true positive rate, whereas FPR is false positive rate.
 (Source: Authors design)

The Table 2 experimentation results depict that the PART algorithm performs better than the other three algorithms in terms of accuracy-% (95.33%), TP-rate (0.953), precision (0.957), recall (0.953), and F-measure (0.953). The FP-rate (0.047) of PART is also lower than the other

Finally, we converted the dataset into Weka software's understandable arff format for data mining.

Stage 4 – Mine Data

In this stage, we employed the classification approach of data mining to predict key determinants of public health master students at the UoH, Saudi Arabia. Prior to experimentation, we balanced the data based on the class attribute (active or dropout) utilizing Weka software's resample filter. Before balancing, the dataset's active and dropout cases were 140 and 10, respectively. Post-balancing, the active and dropout cases in the dataset were 75 each. We conducted experimentation by employing two tree-based and two rule-based algorithms. In accordance with Refaeilzadeh et al. (2009), we did experimentation utilizing ten-fold cross-validation to make sure that the study findings were valid. Table 2 portrays the results of the experiments.

three algorithms. In view of these results, we selected the PART algorithm to extract rules. Only the rules corresponding to the dropout class, having coverage above 5%, and accuracy over 90% were chosen. Table 3 depicts the chosen rules.

Table 3.
PART Rules

S.No.	Rule(s)	Coverage	Accuracy
1	IF (Warnings = 1) AND (CumGPA = F) THEN (Class = Dropout) (36.0/1.0)	24%	97.22%
2	IF (CRPER = CR1) AND (CumGPA = D+) THEN (Class = Dropout) (21.0/1.0)	14%	95.24%
3	IF (CRPER = CR1) AND (Age = A2) THEN (Class = Dropout) (18.0/1.0)	12%	94.44%
4	IF (CumGPA = D+) AND (CRPER = CR1) THEN (Class = Dropout) (15.0/1.0)	10%	93.33%
5	IF (CumGPA = D+) AND (Age = A2) AND (Specialty = S1) THEN (Class = Dropout) (12.0/1.0)	8%	91.67%

(Source: Authors design)

Rule 1 states that if a student has received one academic warning and the cumulative GPA belongs to the F category (means less than 60% or 2.4), then the student is likely to dropout. This rule covered 36 out of 150 instances and gave incorrect result once. Accordingly, the rule coverage and accuracy are 24% and 97.22%, respectively.

Rule 2 informs that if the percentage of credit hours completed by the student belongs to the CR1 category, (means between 0% to 25%) and cumulative GPA belongs to D+ category (means between 65% (2.4) to 69.99% (2.6)), then the student is likely to dropout. This rule covered 21 out of 150 instances and gave incorrect result once. Accordingly, the rule coverage and accuracy are 14% and 95.24%, respectively.

Rule 3 asserts that if the percentage of credit hours completed by the student belongs to the CR1 category (means between 0% to 25%) and the age belongs to the A2 category (means between 31 and 36 years), then the student will likely drop out. This rule covered 18 out of 150 instances and gave incorrect result once. Accordingly, the rule coverage and accuracy are 12% and 94.44%, respectively.

Rule 4 states that if the cumulative GPA belongs to the D+ category (means between 65% (2.4) to

69.99% (2.6)) and the percentage of credit hours completed by the student belongs to the CR1 category (means between 0% to 25%), then the student is likely to dropout. This rule covered 15 out of 150 instances and gave incorrect result once. Accordingly, the rule coverage and accuracy are 10% and 93.33%, respectively.

Rule 5 informs that if the cumulative GPA belongs to the D+ category (means between 65% (2.4) to 69.99% (2.6)) and age belongs to the A2 category (means between 31 and 36 years), then the student is likely to dropout. This rule covered 12 out of 150 instances and gave incorrect result once. Accordingly, the rule coverage and accuracy are 8% and 91.67%, respectively.

Stage 5 – Evaluate Knowledge

In this stage, we discussed the chosen rules with the domain experts. The domain experts agreed with all the five rules. Consequently, we accepted all the five rules.

Stage 6 – Utilize Knowledge

In this stage, we utilized the five rules to identify the determinants of health science masters' students' dropout at the UoH.

Table 4.
Critical Dropout Determinants

Rule	Age	Specialty	CumGPA	Warnings	CRPER	Class
R-1			F	1		Dropout
R-2			D+		CR1	Dropout
R-3	A2				CR1	Dropout
R-4			D+		CR1	Dropout
R-5	A2	S1	D+			Dropout
	Individual	Institutional	Academic			Dropout

(Source: Authors design)

Table 4 depicts that individual, institutional, and academic determinants affect public health university student dropout in Saudi Arabia. Students who have a low cumulative GPA (less than 2.6) are at risk of dropping out. Students with a GPA of less than 2.4 and who have received an academic warning are especially likely to drop out. The dropout risk is higher in the case of students who have completed less than 25% of their credit hours. The freshmen who have a low GPA and belong to the age group 31 to 36 years are likely to dropout. Also, the low-performing students aged 31 to 36 years and have taken the subject specialty of electronic health could drop out.

Results and discussion

According to the current study findings, student attrition has multiple causes, such as individual, institutional, and academic determinants. The study results show that a student's age is an individual determinant of dropout. In this regard, the current study's findings are consistent with those of Rodríguez-Muñiz et al. (2019), who found that a student's age is one of the factors influencing their dropout. However, the current study results contribute to the literature by indicating that low-performing public health master's students between the ages of 31 and 36 are more likely to drop out.

The current study results reveal that the subject specialty taken by the students could be a determinant of their dropout. This could be a significant determinant of dropout for students aged 31 to 36 whose academic performance is below average. In this regard, the current study's findings resonate with Bharadwaj & Pal (2012), who stated that the subject specialty taken by students could influence their dropout. However, the present study contributes to the body of knowledge by revealing that students between the ages of 31 and 36 who have taken a subject specialty in electronic health could drop out.

The present study further informs that student's cumulative GPA, academic warnings, and percentage of credit hours completed are the academic determinants of their dropout. This study indicates that students with low academic performance are at risk of dropping out. This result is in alignment with Casanova et al. (2018), Ahmed et al. (2018), Mubarak et al. (2020), Singh & Alhulail (2022), and Hashim et al. (2024) who anticipated that students with low academic performance could dropout. The current study enriches the body of knowledge by suggesting that public health master students with a cumulative GPA of less than 2.60 are at risk of dropping out. The students could be given academic warnings due to their low attendance in class. This result is aligned with Bharadwaj & Pal (2011) and Rodríguez-Muñiz et al. (2019), who found that students with low-class attendance may drop out. The present study also suggests that low-performing students who have completed fewer than 25 percent of credit hours (freshmen) are more likely to dropout. This result is aligned with Zhang et al. (2010), Casanova et al. (2018), and Rodríguez-Muñiz et al. (2019), who found that low-performing freshmen have a greater probability of dropping out.

The study findings also depict a relationship between individual, institutional, and academic determinants of dropout. Age is an individual determinant of dropout, the subject specialty is an institutional determinant of dropout, whereas cumulative GPA, academic warnings, and percentage of credit hours completed are academic determinants of dropout. The results of the study indicate that masters' of public health students between the ages of 31 and 36, who are specializing in electronic health and exhibit low academic performance in terms of CGPA and attendance, are more likely to drop out.

Conclusions

The issue of student dropout is a complex issue due to the long-term effects it can have on a student's life and career. Student dropout is a serious issue for Saudi Arabia as it has invested significant resources to promote its education sector. Particularly, the dropout of public health masters' students is more serious as it reduces the supply of adequate health educators for the country. In addition, Saudi Arabia has invested large resources to upgrade its education and health sectors as part of its Vision 2030 program (Saudi Gazette, 2020); hence, Saudi educational institutions should have dropout prevention measures in place.

In this study, we employed the data mining's classification approach to identify the key determinants of student dropout in the public health master's program at the UoH. We adapted the Cios et al. (2000) model to conduct the data mining analysis. We analyzed 150 student records to identify the key determinants of students' dropout. The analysis was conducted using two tree-based (J-48 and Rep-Tree) and two rule-based algorithms (J-Rip and PART). The PART method was used to extract the rules because it performed the best among the four algorithms. The extracted knowledge informed that individual (age), institutional (specialty), and academic (cumulative GPA, academic warnings, and percentage of credit hours completed) determinants affect public health university student dropout in Saudi Arabia.

The study reveals that low-performing students who have been issued an academic warning are likelier to drop out. Freshmen with low academic performance are especially vulnerable to dropping out of university. The study also suggests that students between the ages of 31 and 36 who have studied technical courses as a subject specialization (e.g., electronic health) may drop out.

To develop dropout prevention strategies, universities should consider these individual, institutional, and academic determinants. The universities should pay close attention to the academic performance of the freshmen. The freshmen whose performance is below average should be offered remedial classes. Further, they should be given academic counseling to discourage them from dropping out. The universities should also monitor the performance of the students in technical courses (e.g., electronic health). The students who perform below average in the technical courses should

also be given remedial classes to improve their performance. The universities should increase the practical content of the technical courses to improve students' understanding of these courses.

Limitations and future research

The present study has shortcomings that can be resolved in future research. The first limitation pertains to the sample size of 161 public health master's students. We obtained data from the UoH, where a sample of 161 students pursuing a master's degree in public health was available. Future research can opt for a larger sample size to enhance the generalizability of the research findings. The current study exclusively utilized data from a single public university in Saudi Arabia. Future research can gather data from multiple public and private universities in Saudi Arabia to extrapolate the research results. Future research can also gather data from universities in other Gulf Cooperation Council countries due to their analogous political, economic, and social characteristics to Saudi Arabia.

The second limitation is the selection of study variables. The study focused on identifying factors contributing to student dropout, such as individual, institutional, and academic variables. The current research did not consider economic factors because student economic data from the UoH was unavailable. Subsequent studies can gather this data using questionnaires to enhance the existing research results.

The current study used data mining techniques to investigate the UoH public health masters' student dropout rates. The data mining technique has its advantages but relies on classified data rather than continuous data. The regression analysis utilizes continuous data to uncover subtle insights. Future research can utilize regression analysis as a robustness check on the current research findings.

Lastly, the current study focused on master's students in public health. Future research can select both undergraduate and graduate students majoring in public health to extend the research findings to the field of public health. Future research can select students from various disciplines, such as Applied Sciences and Engineering, to compare dropout profiles and draw generalized research findings.

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DOI: <https://doi.org/10.34069/AI/2024.74.02.23>

How to Cite:

Luhovyi, V., Drozd, V., Hahach, V., Oliinyk, S., & Frantovskyi, Y. (2024). Forensic aspect of international cooperation against transnational criminal groups. *Amazonia Investiga*, 13(74), 276-285. <https://doi.org/10.34069/AI/2024.74.02.23>

Forensic aspect of international cooperation against transnational criminal groups

Криміналістичний аспект міжнародного співробітництва в рамках боротьби з транснаціональними організованими злочинними угрупованнями

Received: January 6, 2024

Accepted: February 27, 2024

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Abstract

The aim of the article is to study legal regulation and determine the forensic aspect of international cooperation during the investigation of crimes committed by transnational organized criminal groups. Methodology. The following methods were used in the course of the research: dialectical, method of theoretical analysis and synthesis, systemic and structural, formal and logical, comparative and legal method, summarization. Research results. Attention is focused on the fact that international cooperation is a necessary condition for the investigation of certain types of crimes committed by transnational organized groups. The need for all countries of the world to coordinate and improve their legal basis for effective cooperation both in the investigation of criminal offenses and in their prevention is stressed. Practical meaning. It is noted that there are two structural subdivisions in the system of the Ministry of Internal Affairs of Ukraine, which are entrusted with the responsibility of coordinating international cooperation with law enforcement agencies of

Анотація

Метою статті є опрацювання правового регулювання та визначення криміналістичного аспекту міжнародного співробітництва під час розслідування злочинів, вчинених транснаціональними організованими злочинними угрупованнями. Методологія. У ході дослідження використовувалися такі методи: діалектичний, метод теоретичного аналізу та синтезу, системно-структурний, формально-логічний, порівняльно-правовий метод, резюмування. Результати дослідження. Акцентовано увагу на тому, що міжнародне співробітництво є необхідною умовою для розслідування окремих видів злочинів, вчинених транснаціональними організованими угрупованнями. Зауважено на необхідності всіх країн світу координувати та вдосконалювати власні нормативно-правові акти для ефективної співпраці як з приводу розслідування кримінальних правопорушень, так і стосовно запобігання їх вчиненню. Практичне значення. Зазначено, що в системі МВС України існує два структурні підрозділи,

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other countries on issues of combating and investigating criminal offenses. Value/originality. Based on the analysis of the cited works, the forms of international cooperation during the investigation of offences committed by transnational organized criminal groups are determined.

Keywords: transnational organized criminal group, offenses, crime, international cooperation, investigation.

Introduction

Recently, crime has become international in nature. Organized criminal groups are increasingly crossing borders, creating analogues of transnational companies engaged in criminal activity. There is a tendency to include Ukrainian organized crime in transnational criminal structures. Therefore, criminal situation in Ukraine has recently been characterized extremely negatively. There is a fairly steady trend towards changing the structure and nature of crime. Its organization is being strengthened, which requires the adoption of urgent legislative and organizational management measures.

International cooperation is a necessary condition for the investigation of certain types of criminal offenses. Crimes committed by transnational organized groups clearly fall under this category, since these groups commit illegal acts in various countries (drug trafficking, sex tourism, terrorism, trade in weapons and ammunition, cybercrime, etc.). All these crimes are characterized by a large spread not only in neighboring States, with which we share a common border, but also within the countries even on other continents. The commission of criminal offenses of a certain category is investigated and regulated by the legal instruments of the respective countries, as well as of international organizations and structures. In view of the above, we need to investigate this issue in connection with the specifics of our research.

One of the main tasks to be solved by science in the indicated direction is the actualization of scientific and methodical support for the fight against crime, increasing its effectiveness by introducing the latest scientific research and best practices into the activities of law enforcement agencies. Therefore, it is necessary to focus on

на які покладено обов'язок щодо координування міжнародного співробітництва з правоохоронними органами інших країн з питань протидії та розслідування кримінальних правопорушень. Цінність/оригінальність. На підставі аналізу наведених праць визначено форми міжнародного співробітництва під час розслідування злочинів, вчинених транснаціональними організованими злочинними угрупованнями.

Ключові слова: транснаціональне організоване злочинне угруповання, кримінальні правопорушення, злочин, міжнародне співробітництво, розслідування.

the forensic aspect of this problem. This is because of the forensic profile of organized crime is generally grounded on the data of scientific generalization, which can be laid as a basis for the forensic understanding of the essence and features of organized criminal activity, means, methods and tactics to combat it.

Consequently, the purpose of this article is to study legal regulation and determine the forensic aspect of international cooperation during the investigation of crimes committed by transnational organized criminal groups. Through this analysis, we seek to identify the challenges and opportunities presented by international cooperation in this area, as well as propose recommendations to strengthen it and improve its effectiveness. The results of this study are expected to be useful to researchers, legal professionals and law enforcement officials working to combat transnational organized crime.

Methodology

The methodological basis for the research is a system of general scientific and special scientific methods and approaches that provided an objective analysis of the subject matter under study. Taking into account the specifics of the topic, the purpose and objectives of the article, the following methods were used:

Dialectical method was applied to conduct a full and comprehensive study of the international cooperation when investigating crimes committed by transnational organized groups.

The method of theoretical analysis and synthesis (induction, deduction, comparison, analogy, abstraction, classification) helped to examine

scientific views on the problem of transnational organized crime, as well as the forms of international cooperation to combat it.

Systemic and structural method was used to identify the structural subdivisions of the law enforcement system of Ukraine entrusted with the responsibility of coordinating international cooperation with the relevant agencies of other countries in matters of combating and investigating criminal offenses.

Formal and logical method made it possible to interpret and distinguish the main concepts of the phenomenon under study.

With the help of comparative and legal method the provisions of the international legal instruments governing international cooperation in combating and preventing organized crime, as well as the rules of Ukrainian legislation on this matter were examined.

Summarization method was helpful in highlighting the forms of international cooperation during the investigation of crimes committed by transnational organized criminal groups.

Therefore, the article uses general scientific and special scientific methods that ensure the reliability of the obtained results and conclusions.

Literature review

Transnational crime is the object of research in a number of branch legal sciences (in criminal law, criminology, international law, etc.). The issues of international cooperation in the direction of combating and preventing transnational crime have remained insufficiently studied for a long time, and the focus on the issue began at the end of the 20th century. This is primarily due to the intensification of international relations between the countries of the world, the intensification of migration and globalization processes, which contributed to the further transformation and evolution of organized crime, associated with the spread of its activities beyond the borders of Ukraine.

The first publication related to the concept of international crime dates to 1974 and was presented in the work by Kale entitled "International police communications" (1974), where it is stressed that police mutual assistance and cooperation play a vital role in providing reliable means of communication for the police

forces of different countries. There is a need for a universal international organization to be available to the police forces of different countries to prevent and uncover international crime.

The concept of transnational crime appeared in 1982 and belongs to Lopez-Rey M., who used it in the work "Crime, criminal justice, and criminology: An inventory" (1982). It states that the deficit of criminal justice and criminology makes existing crime more successful and feasible. According to the author, "criminology, as well as criminal policy, "must understand" that national, international and transnational crime become more interconnected and to effectively implement and «rescue» criminal policy something radical should be done.

Skulysh and Hlushkov (2012) noted that transnational organized crime should be understood as a qualitatively new form of national organized crime development, one of the highest levels of criminal evolution, which actors are persistent criminal organizations, whose sphere of influence and activity in the form of criminal business extends to several States, a group of neighboring States, a region, a continent or the world community. According to the authors, there is no single model of transnational organized crime in the world. The actors of this type of crime, which include criminal organizations, operate in different regions of the world, have their own specific specialization, use different methods, techniques, tactics of activity, have different quantitative and ethnic composition, etc., but they are united by a single common goal – acquisition of extremely high profit from engaging in criminal activity, which can be combined with seemingly legitimate activities.

A significant contribution to highlighting problematic issues related to theoretical and applied problems of combating organized crime in European countries was made by Shostko (2010). The author states that "the international community does not have a unified approach to the definition of the term "organized crime". There are a lot of alternative approaches to this issue, but there is no comprehensive theory that reconciles different points of view regarding the understanding of this concept. Conditionally, the author divides all theoretical models into local, or ethnic, hierarchical, entrepreneurial (with such a variety as the bureaucratic-corporate model)". In addition, she highlights essential criminological features of organized crime.

The research by Filippov (2019) is devoted to the comprehensive study of criminological principles of combating cross-border crimes, where scientific problems related to overcoming the fragmentation of scientific explanation, phenomena in combating cross-border crime and the development of modern conceptual approaches to combating cross-border crime are solved.

A national monographic study "Transnational Crime: A Forensic Analysis" by Bilenchuk et al. (2011) deserves special attention. In this work the authors focus on the essence of the forensic concept of "transnational crime", distinguish its signs, characterize the methodology of its investigation, outline the foundations of its forensic characteristics, perform forensic analysis of modern transnational organized crime, as well as factors, properties, features and trends of its development. The authors pay special attention to the general characteristics of organized criminal groups in the countries of the European Union and organized criminal groups of the CIS countries, as well as the peculiarities of their criminal activities.

The monographic study by Zelinskaya "International offences and international crime" (2006), which is dedicated to countering transnational organized crime, is also worthy of note. This complex interdisciplinary study thoroughly outlines the differences in the essence of the concepts of "international crime", "international offence" and "transnational crime". The defining feature of this monograph is presenting the concept of transnational criminal law and the view on the issue of combating transnational organized crime from the perspective of international criminal law.

Besides, the work proposes the international legal standards of criminalization of certain types of transnational offenses, such as corruption, laundering of proceeds of crime, human trafficking, smuggling of migrants, illicit manufacturing of and trafficking in firearms etc.

The author believes that "over time, the concept of international crime evolves, changes, is filled with new meaning, becomes transnational; crimes under international law constitute only a part of international crime, the second part of which consists of crimes belonging to the category of transnational".

In this study, cross-border crime is investigated as an open social system that mediates a destructive phenomenon, which in its

manifestation – statistical aggregation of crimes committed in a given territory in a given period of time – is relatively massive and historically volatile, and whose parameters characterize the dynamic balance of social institutions and personal activity in cross-border relations.

All scientific publications, which are of significant scientific development in the investigation of the problem of international cooperation in the prevention and counteraction of transnational crime can be grouped according to the following characteristics:

- studies devoted to issues of a general theoretical nature, i.e. the concepts of "crime" and "organized crime";
- research devoted to the concept of "ethnic crime", "transnational crime", "transnational organized crime", "international crime";
- works devoted to issues of international cooperation in the field of transnational crime prevention and counteraction (including by the types of transnational crimes).

Recognizing the above-mentioned achievements in the study of this issue, it is worth noting that the degree of development of issues of international cooperation in countermeasures and prevention transnational organized crime has not yet been sufficiently explored. The object of study by most scholars is combating specific forms of transnational and cross-border crime; however, comprehensive studies in the field of international cooperation in the fight against transnational crime have not been carried out yet. The development of an effective mechanism of international cooperation in fighting and preventing transnational crime in Ukraine is complicated by the relative novelty and insufficient study of this socially dangerous phenomenon, which creates obstacles to the implementation of proven experience in the activities of the relevant State institutions of Ukraine.

Results and discussion

On a separate category of criminal offences (namely, against morality), Yefimov (2021, p. 147) expressed quite correct opinion that their transnational character makes it possible for them to be committed in different countries of the world. "Sex tourism", human trafficking, child pornography, the cult of cruelty – all these acts "find" people willing to commit them in different countries of the world. Therefore, Ukraine needs to cooperate fruitfully with various foreign

institutions in terms of both the investigation of the specified category of acts and with regard to the prevention of crime in general. After all, under such conditions, international cooperation in the field of law enforcement, the involvement of the best specialists of domestic and foreign structures in law enforcement activities, as well as the exchange of experience between them are mandatory requirements to prevent various illegal manifestations. In other words, the scientist directly pointed to the mandatory international cooperation between different countries, which we definitely support.

Matviychuk (2011, p. 270) states that the existence and well-being of an individual today depends on whether we will be able to adhere to the principles of long-term development defined by the international community. For this, Ukraine should make great efforts and demonstrate readiness for cooperation in such areas as increasing international security, rational, economical use, protection, reproduction and improvement of global common natural resources, solving energy problems (maximum involvement of alternative energy types, increasing reliability and safety existing), protection of flora and fauna. The initiatives of the public, legislative and executive authorities come up against the lack of incentives and executive discipline on the local level. Besides, the solution to these problems is negatively affected by the lack of perfect legislative acts and mechanisms for the implementation of existing ones. The time demands that even the greatest conservatives abandon the practice of maintaining social and ecological stability through old approaches and legal prescriptions and move more actively toward the development and environmental protection. Clearly, there are great differences between the countries regarding the above-mentioned issues, especially concerning the profits, organizational traditions, management experience, etc. Therefore, only the executive and legislative powers of the countries (each in their own way) can most effectively use the positive international experience and make the necessary changes in the legislation. That is, the researcher suggests that all countries of the world coordinate and improve their own legal instruments for effective cooperation both regarding the investigation of criminal offenses and their prevention.

A separate group of scientists (Drizhchanyi, Pavlychenko, & Umanskyi), having worked out a number of legal acts relevant at the time of their research (1998), expressed the following

opinion: “The Council of Europe in its activities paid great attention to the creation of an effective mechanism for providing international legal assistance; in particular, a number of European conventions on criminal matters were drafted and opened for signature. Ukraine joined six of them, which define the following types of international legal assistance in criminal proceedings:

extradition of offenders;
 providing assistance in criminal prosecution, in particular, the transfer of items, documents relevant to the proceedings, service of documents and court orders on attendance of witnesses and persons prosecuted;
 transfer of proceedings in criminal cases;
 transfer of convicted persons to serve their sentence, etc.

With regard to the legal regulation of international cooperation, for example, Par. a), Art. 2 of the United Nations Convention Against Transnational Organized Crime (United Nations Office On Drugs And Crime, 2004), which was ratified by the Verkhovna Rada of Ukraine on February 04, 2004, formulated the concept of an organized criminal group as a structurally organized group consisting of three or more persons that exists during a certain period of time and acts in concert to commit one or more serious crimes or crimes recognized as such in accordance with this Convention, in order to obtain, directly or indirectly, a financial or other material benefit.

Besides, Part 1, Art. 5 of the said Convention defines the criminalization of participation in an organized criminal group, namely the main forms of interaction of its members: leadership, assistance, incitement, facilitation or giving advice regarding a serious crime committed with the participation of an organized criminal group.

Part 3, Art. 18 discloses that mutual legal assistance under this article may be requested for any of the following purposes: obtaining witness statements or statements from individuals; service of court documents; search and seizure; inspection of objects and areas; provision of information, physical evidence and expert assessments; providing originals or certified copies of relevant documents and materials, including government, banking, financial, corporate or commercial ones; identification or tracing of proceeds of crime, property, instrumentalities of crime or other objects for evidentiary purposes; facilitating the voluntary appearance of the persons concerned to the bodies of the requesting Member State; provision

of any other type of assistance that does not contradict the domestic legislation of the requested participating State. That is, Ukraine, as a founding Member of the United Nations, can and should provide any of the above measures.

At the same time, Clause 1, Art. 6 of the Convention on Mutual Assistance in Criminal Matters (Council of Europe, 1959) between the Member States of the European Union, which, unfortunately, has not yet been ratified by our country, indicates the following provisions: "Requests for mutual assistance and unplanned exchanges of information referred to in Article 7 shall be made in writing or in any method allowing for a written record under conditions that allow the receiving member State to establish its authenticity. Such requests shall be made directly between the judicial authorities vested with territorial jurisdiction to initiate and execute them, and shall be returned through the same channels, unless otherwise specified in this Article".

In this regard Burkal (2019, p. 246) correctly points out that it is expedient to identify priority areas of activity for preventing and countering the legalization of illegal income guided by international experience: strengthening control over currency transactions, especially of an international nature; improvement of cooperation mechanisms of banks, law enforcement agencies and specialized international institutions and organizations; development of a system of specialization and coordination of the activities of the authorities in the formulation and implementation of the strategy for combating transnational economic crime; creation of new mechanisms for monitoring and identification of persons spotted in connection with transnational organized criminal groups; development of the legal framework for the interaction of domestic law enforcement agencies with foreign ones, as well as with the specialized international organizations". That is, the author emphasizes many possible measures that must be implemented to increase the effectiveness of cooperation between different States in the context of counteraction and investigation of criminal offenses committed by transnational organized criminal groups.

We also share the position of the authors (Chaplynskyi et al., 2023, p. 477), who indicate that the implementation of the powers entrusted to the Ministry of Internal Affairs regarding the formulation of State policy on the problems of international cooperation, as well as the control over its implementation by the constituent

elements of the apparatus of the Ministry of Internal Affairs, is implemented by the Department of International cooperation and European integration of the Ministry of Internal Affairs. Concerning the cooperation of operational units to combat crime with investigative bodies of foreign countries, it is implemented by the Department of International Police Cooperation of the National Police of Ukraine. In other words, there are two structural subdivisions, which are entrusted with the responsibility of coordinating international cooperation with the law enforcement agencies of other countries on countermeasures and investigations of criminal offenses in the system of the Ministry of Internal Affairs of Ukraine.

In turn, in her dissertation study, Leshukova (2004) worked out the relationship between the terms "legal aid" and "cooperation in the fight against crime" and defined legal assistance in criminal cases as a form of cooperation between the States in the fight against crime, which lies in performing, on the basis of reciprocity, actions permissible under national laws and international agreements, which contribute to the detection of crimes, their investigation and trial, as well as ensuring the execution of sentences and other decisions of judicial bodies. The author noted that the legal basis for providing legal aid as one of the elements of international cooperation in criminal matters consists of: 1) international intergovernmental agreements (bilateral and multilateral): pacts, conventions, treaties, agreements; 2) intergovernmental agreements on specific issues related to cooperation in the fight against crime; 3) interdepartmental contracts (agreements) on the same issues. These documents have common characteristics and features, which allows them to be systematized according to the form, name and actor of conclusion of international agreements. Besides, the legal basis for international cooperation in criminal matters should also include national legislation on the provision of international legal assistance and unwritten norms (customs, traditions) of international law (international courtesy, reciprocity, etc.

Regarding the forms of international cooperation in countering transnational organized crime, for example, Sidorov and Zdorovko (2017, p. 66) distinguish among them the following:

- 1) adoption of pre-agreed measures to establish at the international legal level criminalization of certain socially dangerous acts (treaty-based criminalization of

- international crimes and crimes of an international nature);
- 2) development and conclusion of international agreements, adoption of other international legal instruments as a legal basis for the activity of States, international organizations and their bodies in the field of fighting crime;
 - 3) adoption of documents governing the exercise of powers by States within the concluded international agreements, the procedure for the implementation of international justice, as well as the cooperation of states in the fight against crime;
 - 4) creation and formation on a contractual and other international legal basis of international organizations and other bodies performing their activities in the field of combating crime;
 - 5) cooperation regarding crime prevention that are being prepared or committed, in particular, by conducting, if necessary, operational and investigative measures (special investigations regarding the terminology of international agreements);
 - 6) provision of mutual legal assistance in the field of criminal justice (extradition, criminal prosecution at the request of foreign States or transfer of jurisdiction, cooperation with international criminal justice agencies);
 - 7) the activities of international organizations and bodies (bodies of international criminal justice) on the administration of justice for committed transnational crimes, the implementation of criminal prosecution of perpetrators.

Currently, one of the characteristic illegal acts committed by transnational organized criminal groups is cybercrime. For most of them, V.V. Popko and E.V. Popko (2021, p. 279) highlight the following features:

increased secrecy of the commission of the crime, which is ensured by the specificity of the network information space (developed mechanisms of anonymity, complexity of the infrastructure, etc.);
 the transnational nature of network crimes, in which the offender, the object of crime, the victim may be located in the territories of different states;
 special preparation of criminals, intellectual nature of criminal activity;
 non-standard, complex, multifaceted and frequently updated methods of committing crimes and special means used;

the possibility of committing a crime in an automated mode in several places at the same time;
 multi-episode nature of criminal acts with a large number of victims;
 lack of awareness among victims of criminal influence;
 the remote nature of criminal acts in the absence of physical contact between the criminal and the victim;
 inability to prevent and suppress this type of crime by ordinary means.

Cybercrime is the set of offences for which a criminal prohibition is provided, which are committed in cyberspace, where the main direct objects of criminal encroachment are the constitutional rights and freedoms of an individual and a citizen, as well as social relations in the spheres of computer information and information technologies, economic activity, State power, etc. Cybercrimes are directed against the confidentiality, integrity and availability of computer systems, networks and computer data and their misuse. This is violation of social relations in the sphere of safe creation, storage, processing and transmission of computer information protected by law, with the aim of causing economic, political, moral, ideological, cultural and other harm to the person, the State and the world as a whole.

In light of the above, we consider it necessary to cite the Yvonne and Majid, eds (2009, p. 10), who noted that the changes caused by the Internet cannot simply be quantified by studying penetration rates and the number of users. The authors pointed out that significant qualitative changes have occurred in the short life of the Internet that have changed the nature of online interactions and activities. In particular, the researchers determined that early users were constrained by a combination of factors, including limited computing power (especially in the case of personal computers), limited communication bandwidth (mainly using the copper wire technology of existing telecommunications networks designed for telephony) and basic computer software. At the moment, all of these restrictions are a thing of the past, is developing tremendously.

Regarding the implementation of positive foreign experience in crime prevention, Kolodiazhnyi (2017, p. 204) suggests applying the following aspects in domestic law-making and law-enforcement practice:

- 1) strengthening the effectiveness of the preventive activities of law enforcement agencies through the participation of citizens in arresting criminals and offenders, maintaining law and order, providing information about committed crimes;
- 2) economic benefits of fiscal saving through the use of free assistance of citizens in crime prevention;
- 3) optimization of time, forces and resources of police officers to focus their attention from secondary to more critical operational law enforcement issues;
- 4) deepening the interaction of various social institutions and crime prevention actors;
- 5) increasing citizens' trust in state authorities in general and law enforcement agencies in particular.

For his part, Burkal (2019, p. 212) offers the following forms of international cooperation, such as: extradition of criminals; mutual legal assistance; transfer of criminal proceedings to another country; transfer of convicts; cooperation for the purpose of confiscation to deprive traffickers of property acquired by criminal means; interaction between law enforcement agencies, including information exchange and cooperation in conducting investigations; joint investigations; cooperation in the use of special investigative methods.

Tsymbal (2005, p. 16), having studied the current legal acts on international cooperation and taking into account the dynamic state of economic relations development, as well as population migration and the spread of transnational crime, highlighted such forms as exchange of information on violations of tax legislation by legal entities and individuals on the territories of Ukraine and beyond; provision of duly certified copies of documents related to the taxation of legal entities and individuals; exchange of information about national tax systems, changes and amendments to tax legislation; development of methodological recommendations for combating tax offenses; exchange of experience regarding the creation and functioning of information systems used in the practice of investigating crimes in the field of taxation; interaction on the implementation of measures aimed at prevention, detection and investigation of these crimes; conducting international scientific and practical conferences and seminars on combating tax offenses; implementation of coordination on the issues that arose in the process of cooperation.

Pashkovskyy (2003, pp. 10) emphasizes that international cooperation is a consequence of the following factors: it is activity provided for by national criminal procedural legislation, international legal instruments (treaties, conventions, pacts, protocols, regulations, agreements, etc.), signed by Ukraine, related to the implementation of procedural actions to establish a certain status for criminal proceedings actors: collection, verification of evidence; search and seizure of property; provision of information about foreign and international law and the practice of its application; ensuring the protection and representation of the interests of foreigners, foreign states and legal entities, international organizations in criminal proceedings.

We also consider the position of Chornous (2017, p. 245) to be quite correct and logical, who, after carefully working out the provisions of international treaties and the Criminal Procedure Code of Ukraine (Law of Ukraine No. 4651-VI, 2012), defined the following forms of international cooperation:

- 1) international legal assistance (Articles 541 (Par. 1), 542, 551 – 560 of the Criminal Procedure Code of Ukraine);
- 2) surrender of a person (extradition) (Article 541 (Par. 2), 573 – 575, 589 – 594 of the Criminal Procedure Code of Ukraine);
- 3) taking over criminal proceedings (Article 541 (Par. 3), 595 – 599 of the Criminal Procedure Code of Ukraine).

Based on the analysis of the cited works, we identified the following forms of international cooperation during the investigation of crimes committed by transnational organized criminal groups:

- mutual exchange of information on the activities of transnational organized criminal groups and their members;
- mutual legal assistance during the investigation and trial of materials on crimes committed by transnational organized criminal groups, through the implementation of separate procedural actions;
- extradition of offenders to an international body or State for criminal prosecution;
- prevention of offences covered by relevant treaties between States;
- joint participation in training of law enforcement officials, as well as the provision of relevant scientific and technical means and material and technical assistance to the specified bodies.

Conclusions

Summing up, we note that international cooperation is a necessary condition for the investigation of certain types of crimes committed by transnational organized groups. Currently, the basis of the legal regulation of the mentioned activity is the United Nations Convention against Transnational Organized Crime, which was ratified by the Verkhovna Rada of Ukraine on February 4, 2004, and the Convention on Mutual Assistance in Criminal Matters between the Member States of the European Union, adopted on May 29, 2000. Based on the analysis of the cited works, the following forms of international cooperation were determined during the investigation of crimes committed by transnational organized criminal groups: mutual exchange of information on the activities of transnational organized criminal groups and their participants; mutual legal assistance during the investigation and trial of materials on crimes committed by transnational organized criminal groups through the implementation of separate procedural actions; extradition of offenders to an international body or state for criminal prosecution; prevention of crimes for which relevant agreements have been concluded between states; joint participation in the training of authorized persons of law enforcement agencies, as well as the provision of relevant scientific and technical means and material and technical assistance to the specified bodies.

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DOI: <https://doi.org/10.34069/AI/2024.74.02.24>

How to Cite:

Klymenko, I., Tverdokhlib, N., Zlobin, O., Karachynskiy, O., & Kononenko, O. (2024). PTSD in military personnel: diagnosis, treatment and support. *Amazonia Investiga*, 13(74), 286-298. <https://doi.org/10.34069/AI/2024.74.02.24>

PTSD in military personnel: diagnosis, treatment and support

TEPT en el personal militar: diagnóstico, tratamiento y apoyo

Received: January 20, 2024

Accepted: February 26, 2024

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Abstract

Posttraumatic stress disorder (PTSD) in military personnel demands urgent attention for enhanced diagnosis, treatment, and support, addressing mental health challenges in this crucial demographic. The main goal is to offer a detailed comprehension of how PTSD is diagnosed, treated, and supported among military personnel. This research utilizes established such methodology as surveys from respected sources, such as Hill & Ponton and the Center for Advancing Health. The criteria for including scientific sources underwent a rigorous selection process using academic. In the results it was discussed the treatments for PTSD in the military, such as psychotherapy, pharmacotherapy, and other approaches aimed at reducing stress and alleviating distress. Special attention is paid to support for service members with PTSD, which may include social support, rehabilitation programs and other interventions

Resumen

El trastorno de estrés postraumático (TEPT) en el personal militar exige una atención urgente para mejorar el diagnóstico, el tratamiento y el apoyo, abordando los desafíos de salud mental en este grupo demográfico crucial. El objetivo principal es ofrecer una comprensión detallada de cómo el TEPT es diagnosticado, tratado y apoyado entre el personal militar. Esta investigación utiliza metodología establecida como encuestas de fuentes respetadas, como Hill & Ponton y el Center for Advancing Health. En los resultados se analizaron los tratamientos para el TEPT en los militares, como la psicoterapia, la farmacoterapia y otros enfoques destinados a reducir el estrés y aliviar la angustia. Se presta especial atención al apoyo a los miembros del servicio con TEPT, que puede incluir apoyo social, programas de rehabilitación y otras intervenciones para su vuelta vida normal tras una experiencia traumática. Se descubrió que un diagnóstico y tratamiento

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for their return to normal life after a traumatic experience. It was found that effective diagnosis and treatment of PTSD in military personnel can significantly improve their quality of life and reduce the risk of mental deterioration. The conclusions emphasize the need for further improvement of the support system for military personnel with PTSD and spreading awareness about this problem in order to improve the quality of life of this group of people.

Keywords: military veterans, mental health, trauma impact, psychological well-being, therapeutic approaches, comprehensive support, psychological rehabilitation.

Introduction

Posttraumatic stress disorder (PTSD) remains a pressing concern for military personnel, underscoring the profound psychological impact of exposure to traumatic events during their service. As a complex mental health condition, PTSD not only poses challenges to individual well-being but also jeopardizes the overall effectiveness and resilience of military forces. The persistent nature of PTSD within the military milieu underscores the urgent need for tailored interventions and support structures. Its repercussions reverberate throughout military ranks, influencing not only individual psychological well-being but also permeating the operational readiness and cohesion of armed forces.

In navigating the aftermath of traumatic experiences, addressing and mitigating the far-reaching consequences of PTSD becomes imperative for sustaining a robust and resilient military force. The prevalence of PTSD in military populations has spurred a growing body of literature focusing on diagnosis, treatment, and support systems tailored to the unique needs of military personnel. Despite considerable efforts, the research problem persists – how can we comprehensively understand and effectively manage PTSD among military members? This question highlights the critical need for ongoing research and intervention strategies that consider the multifaceted aspects of PTSD within the military context.

To contribute to the existing body of knowledge, this study delves into the intricacies of PTSD among military personnel. The primary objective is to provide a nuanced understanding of diagnosis, treatment modalities, and support mechanisms available to military members grappling with PTSD. The study will undertake

eficaces del TEPT en el personal militar pueden mejorar significativamente su calidad de vida y reducir riesgo de deterioro mental. Las conclusiones subrayan la necesidad de seguir mejorando el sistema de apoyo al personal militar con TEPT y difundir la concienciación sobre este problema para mejorar la calidad de vida de este grupo de personas.

Palabras clave: veteranos militares, salud mental, impacto del trauma, bienestar psicológico, enfoques terapéuticos, apoyo integral, rehabilitación psicológica.

specific tasks, including a thorough literature review, analysis of diagnostic criteria, examination of treatment effectiveness, and exploration of support systems.

By addressing these tasks, the research aims to unravel the complexities of PTSD within military contexts and offer insights that can inform more targeted and effective approaches to diagnosis, treatment, and support. Ultimately, this study aspires to contribute valuable knowledge that enhances the well-being of military personnel and advances the broader understanding of PTSD as a psychological phenomenon. In the following sections, we will provide a brief summary of each, outlining our approach to literature review, analysis of diagnostic criteria, examination of treatment effectiveness, and exploration of support systems within the military context.

Literature review

In the backdrop of contemporary conflicts, such as the ongoing hybrid war in Ukraine and conflicts in regions like Israel and Syria empirical investigations reveal an alarming susceptibility to specific psychological disorders, with a particular focus on chronic post-traumatic stress disorder (PTSD) among combatants. A study conducted by Hrynzovskyi et al. (2022) brought attention to a significant diagnosis rate of approximately 20% for chronic PTSD among former participants in the Anti-terrorist operation (ATO) and those presently engaged in the Joint Forces Operation in Ukraine. The intricate interplay between warfare and mental and physical health has become a pivotal focal point in the scholarly discourse, especially in the context of ongoing conflicts. Scholars have systematically probed the psychological challenges faced by combatants, shedding light

on various strategies for their social reintegration and support (Bowd & Özerdem, 2013; Duel et al., 2019). The examination of the psychological well-being of individuals engaged in conflicts, such as those in Ukraine and other regions, remains critical for understanding the broader implications of warfare on mental health (Kryvolapchuk & Protsyk, 2020; Melnyk, Prykhodko & Stadnik, 2019). Current studies underscore the need for comprehensive research that goes beyond diagnosing mental health disorders, emphasizing the development of effective support mechanisms and interventions tailored to the unique challenges faced by combatants in contemporary conflicts. The modernization of medical care systems, particularly in the context of armed conflicts, has garnered significant attention in recent research literature. Iliina-Stohniienko and Malets (2022) delve into the modernization of the medical care system for victims of armed conflicts, focusing on the Ukrainian experience. Their work explores innovative approaches to medical care, shedding light on the challenges and advancements in providing healthcare services to those affected by armed conflicts. Rakhimov and Mukhamediev (2022) shift the focus towards the implementation of digital technologies in future medicine. Their study examines the role of digital technologies in shaping the future of healthcare, presenting a forward-looking perspective on the integration of technology into medical practices. Kaminsky and Viesova (2022) contribute to the discourse on innovative activities in healthcare institutions of the future. In their research, they discuss models for overcoming dilemmas and challenges within healthcare, providing valuable insights into the evolving landscape of healthcare practices. Studies on the modernization of healthcare systems in conflict zones have highlighted the importance of innovation and technology to improve the quality of care.

The exploration of psychological rehabilitation for military personnel has not only been a focus in global contexts but has also extended to the experiences in Latin America, particularly in Colombia. A series of studies sheds light on various aspects of trauma, PTSD, and resilience among military service members, guerrilla, and paramilitary soldiers in this region. Bonanno et al.'s (2012) prospective cohort study examines trajectories of trauma symptoms and resilience in deployed US military service members. The study provides insights into the dynamic nature of trauma responses and the factors contributing to resilience among deployed personnel. The findings contribute to understanding the long-

term impact of military deployment on mental health and underscore the importance of resilience as a crucial factor in coping with trauma. In the Colombian context, de la Espriella, Pingel, and Falla (2010) engage in the (de)construction of a psychiatric diagnosis, specifically PTSD, among former guerrilla and paramilitary soldiers. The study highlights the complexity of diagnosing and understanding PTSD in the unique socio-political context of Colombia. By examining the experiences of individuals involved in armed conflict, the research sheds light on the challenges of applying traditional psychiatric diagnoses in diverse cultural and contextual settings. Hourani, Williams, Bray, and Kandel (2015) delve into gender differences in the expression of PTSD symptoms among active-duty military personnel. This study brings attention to the nuanced ways in which PTSD may manifest differently in men and women within military contexts. Understanding gender-specific expressions of trauma symptoms is crucial for tailoring effective interventions and support systems. Maldonado et al. (2024) contribute valuable lessons learned in military trauma in Colombia, providing insights into the practical aspects of managing trauma in a complex and dynamic environment. Their work outlines practical approaches and considerations in dealing with military trauma, offering a comprehensive perspective on the challenges faced in trauma care in the Colombian context. Lastly, Thoene, García Alonso, and Blanco Bernal (2020) focus on memory and trauma among soldier victims in the Colombian Armed Conflict. The study delves into the psychological aspects of memory and trauma, shedding light on the enduring impact of armed conflict on the mental health of military personnel. Understanding the interplay between memory and trauma is crucial for developing targeted interventions and support strategies. In summary, these studies collectively contribute to a nuanced understanding of trauma, PTSD, and resilience among military personnel, with a specific focus on the experiences in Latin America, particularly Colombia. The exploration of trajectories, cultural nuances, gender-specific expressions, practical lessons, and the interplay between memory and trauma enriches the broader discourse on psychological rehabilitation for military members. As the current study delves into PTSD in military personnel, these insights will inform and contextualize the exploration of diagnosis, treatment, and support mechanisms within the unique context of armed forces facing contemporary conflicts.

Moreover, Chovhaniuk, Bashkirova, Meleha, and Yakymenko (2023) present a study on the state of health in conditions of constant numerous transitional and intermediate stages. Their research explores the dynamics of health under challenging circumstances, contributing to a nuanced understanding of health in transitional phases. Vostrotnin and Litovchenko (2023) focus on the clinical and paraclinical features of psychopathological disorders in right hemisphere stroke. Their research explores the psychological aspects of stroke, contributing to the broader understanding of mental health in the context of neurological disorders. Lastly, the work of Dobrovol'ska, Moroz, Shpak, Tsekhmister and Vovchenko (2021) delves into motivational mechanisms for emotional intelligence development in practicing psychologists. Their study explores the factors influencing the development of emotional intelligence among psychologists. These studies provide a comprehensive overview of diverse topics within the realm of healthcare, ranging from the modernization of medical care systems in conflict zones to the role of technology, innovative activities and mental health dynamics. The synthesis of these works contributes to a holistic understanding of the evolving landscape of healthcare practices and challenges.

Collectively, these diverse studies offer a comprehensive overview of the multifaceted challenges and innovations within the healthcare landscape of conflict zones. In alignment with the insights gained from this literature, the current study on PTSD in military personnel seeks to contribute to this discourse by specifically focusing on the diagnosis, treatment, and support mechanisms within the unique context of armed forces facing contemporary conflicts. By synthesizing and building upon the key findings of the reviewed studies, our research aims to provide a nuanced understanding of the complexities surrounding PTSD among military personnel, offering insights that can inform more targeted and effective approaches to enhance the well-being of those serving in challenging environments. This endeavor aligns with the broader goal of advancing the understanding of mental health in conflict settings and underscores the significance of ongoing research and intervention strategies to address the intricate challenges faced by military personnel.

Hence, the topic of posttraumatic stress disorder among military personnel continues to be highly relevant in the face of ongoing conflicts and the emergence of new possibilities. Therefore, this research aims to synthesize existing knowledge

and provide a fresh perspective on the treatment and support of military personnel experiencing this disorder. Efforts to consolidate existing data and introduce new approaches are crucial steps in ensuring quality assistance and understanding the intricacies of this disorder within a military context. As contemporary conflicts can expose military personnel to various traumatic situations, understanding, diagnosing, and treating PTSD become essential tasks to ensure their optimal physical and mental well-being.

Methodology

Research design

Posttraumatic stress disorder (PTSD) remains a pervasive and critical issue within the military landscape, necessitating a comprehensive examination of the multifaceted challenges faced by military personnel exposed to traumatic events during active service. Recognized as a complex mental health condition, PTSD extends its impact beyond individual well-being, affecting the overall effectiveness and resilience of military forces.

Data collection

1. Quantitative data collection: survey

The study leverages existing surveys sourced from reputable platforms, including Hill & Ponton (Hill & Ponton., (n.d.)) and National Center for PTSD (U. S. Department of veterans affairs (2023)). A detailed examination of the statistical data was obtained from these surveys, emphasizing key statistics related to the prevalence, diagnosis, and treatment outcomes of PTSD among military personnel.

Prior to using surveys from Hill & Ponton and the National PTSD Center, this study used Statistica to process the data.

2. Qualitative data collection: scientific literature

The inclusion criteria for scientific sources involve a meticulous selection process using academic databases like Google Scholar, Scopus, and WoS, Publons, Crossref.

A comprehensive search using keywords such as "military personnel", "PTSD diagnosis" "treatment strategies", "rehabilitation" and "psychological support". The selection of sources within a specific date range ensures relevance and recency, encompassing scholarly

articles, books, and reports that address the diagnosis, treatment, and support of PTSD among military personnel.

The selection of literature for a study was a critical process that involved the careful consideration of various criteria to ensure the relevance, credibility, and reliability of the sources:

1. **Relevance to the research topic.** The literature had to directly address or contribute to the understanding of the research topic, in this case, PTSD among military personnel. Each selected source needed to provide valuable insights, data, or perspectives related to the specific aspects of diagnosis, treatment, and support mechanisms for PTSD in the military.
2. **Publication date.** Recent and up-to-date sources were preferred to ensure that the information reflected the latest developments, research findings, and advancements in the field. However, seminal works or foundational theories could also be included, with an emphasis on incorporating contemporary literature.
3. **Authoritativeness and credibility.** The credibility of the author or source was crucial. Scholarly articles, peer-reviewed journals, books from reputable publishers, and reports from established organizations contributed to the reliability of the literature. The academic and professional background of the authors also played a role in determining the credibility of the source.
4. **Methodology and research design.** For empirical studies, the methodology and research design had to be sound. Research that employed rigorous methods, such as randomized controlled trials, longitudinal studies, or systematic reviews, enhanced the reliability of the information presented.
5. **Currency of statistical data.** When the literature included statistical data, it was essential to consider the timeliness of the data. Statistics needed to be current and relevant to the time frame of the study. This was particularly important for understanding the prevalence rates, diagnostic criteria, and treatment outcomes associated with PTSD.
6. **Peer Review.** Peer-reviewed sources underwent a rigorous evaluation process by experts in the field. These sources were more likely to be accurate, reliable, and of high quality. Including peer-reviewed articles enhanced the scholarly integrity of the literature.

By adhering to these criteria, the researcher built a robust literature review that formed the foundation for a comprehensive and credible exploration of PTSD among military personnel, addressing the specific objectives of the study.

Data analysis

Quantitative Data Analysis:

The quantitative survey data collected will undergo a thorough and rigorous statistical analysis. This process will utilize descriptive statistics to concisely summarize key findings derived from the survey responses. The quantitative survey data were subjected to rigorous statistical analysis using Microsoft Excel, employing descriptive statistics to summarize key findings and inferential analyses.

Qualitative Data Analysis:

In the qualitative domain, the literature review underwent a robust thematic analysis. This involved identifying recurrent themes pertaining to the diagnosis, treatment, and support of military personnel with PTSD within the selected scholarly sources. To enhance the credibility of the qualitative findings, transparent coding procedures were implemented. Moreover, an exploration of intercoder reliability was undertaken, reinforcing the trustworthiness of the qualitative insights extracted from the literature. Through these meticulous procedures, the qualitative analysis aimed to provide a nuanced understanding of the complexities surrounding PTSD in military personnel.

Synthesis of Qualitative and Quantitative Insights:

This research adopts an integrative approach, synthesizing qualitative insights from scholarly literature with rigorously analyzed quantitative data derived from surveys. By combining these two distinct but complementary methods, the study aspires to construct a comprehensive and cohesive understanding of PTSD among military personnel. The overarching goal is to generate valuable insights that inform effective strategies for the diagnosis, treatment, and support of military personnel experiencing posttraumatic stress disorder.

Results and discussion

Posttraumatic stress disorder (PTSD) among military personnel is often exposed to intense and life-threatening situations, such as combat,

natural disasters, or other high-stress scenarios, which can trigger symptoms of PTSD (Palmer et al., 2019). PTSD can significantly impact a military member's daily life, relationships, and overall well-being (Engel et al., 2016). It is essential to diagnose and treat PTSD promptly to enhance the individual's quality of life and functioning. Therefore, recognizing and addressing PTSD is crucial for supporting the mental health and resilience of military personnel who have faced the challenges of traumatic experiences during their service. American researchers studying PTSD in military personnel argue that when providing assistance, attention should also be paid to the possibility of suicide and violence towards others, especially family members (Duel et al., 2019). In the United States, it has been observed that more veterans died by suicide after the Vietnam War than were killed in combat. Studies show a connection between guilt

feelings and suicide (Duel et al., 2019). It should also be noted that there is a higher risk of suicide in physically injured military personnel.

The presented statistics in modern survey shed light on the multifaceted aspects of posttraumatic stress disorder among military personnel, emphasizing the prevalence and consequences of trauma within this demographic (Engel et al., 2016). The development of PTSD among military personnel is critical dimension. Approximately 660,000 out of 5.5 million American military personnel who served in specific areas are reported to have developed PTSD (Hill & Ponton, n.d.). The prevalence of PTSD varies with age, with a higher incidence among veterans aged 18 to 29 years (29.3%) compared to those over the age of 60 (4%) (U. S. Department of veterans affairs, 2023). (See Figure 1).

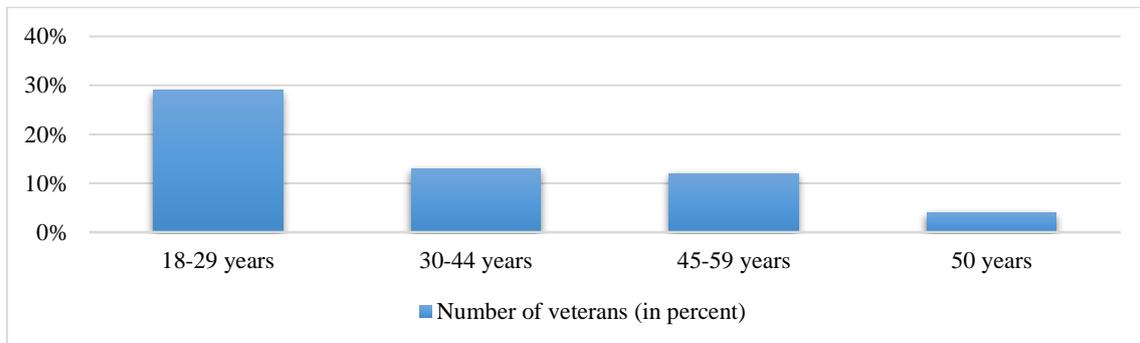


Figure 1. Prevalence of PTSD among American veterans by age group.
Source: Author's development

Moreover, the prevalence statistics of post-traumatic stress disorder (PTSD) among Ukrainian military personnel suggest that many veterans may conceal their psychological issues. Specifically, 54% of veterans feel ashamed or reluctant to acknowledge certain problems related to PTSD (Gordiychuk, 2017). This indicates that social stigmas or the fear of revealing personal difficulties may impact openness about psychological struggles. Significantly, 22% of veterans have chosen to keep their problems hidden (Gordiychuk, 2017).

This may reflect a desire to avoid disclosing internal conflicts or an attempt to refrain from societal judgment. Such an approach could lead to a portion of veterans not receiving the necessary psychological assistance or support, negatively affecting their overall mental well-being and adaptation to civilian life. Therefore, it is crucial to develop programs and initiatives aimed at reducing social stigmatization and fostering open discussions about psychological issues among Ukrainian veterans (See Figure 2).

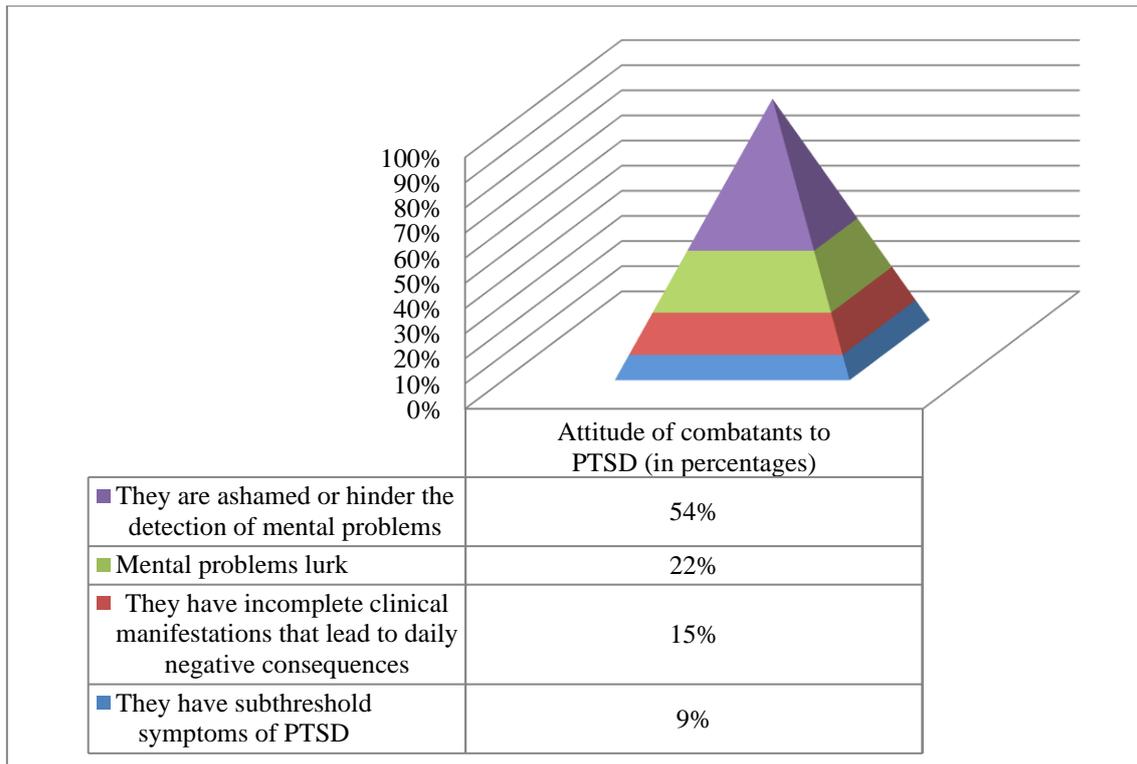


Figure 2. The attitudes of combatants towards receiving psychological assistance for addressing PTSD (in percentages).

Source: based on Gordiychuk (2017)

In the international classification of mental disorders, PTSD is characterized by three groups of symptoms: symptoms of re-experiencing (or intrusion symptoms); avoidance symptoms; and symptoms of physiological hyperarousal (Brownlow et al., 2018). In response to a traumatic event, dissociative, somatoform, panic disorders, depression, antisocial behavior, and addictions may also develop. Some European authors suggest supplementing the diagnosis of PTSD with post-traumatic personality disorders, as chronic PTSD symptoms can be felt throughout a person's life (Walsh & Rosenblum, 2022). This is why such individuals require social and psychological support. In the other hand, combat-related PTSD is generally understood as prolonged or delayed conditionally adaptive mental changes and disorders that arise as a result of the influence of combat factors. Some of these mental changes in wartime are adaptive, but in peacetime, they lead to various forms of social adaptation.

Exploring the effectiveness of interventions, a 2021 study suggests that about 10 weeks of treatment in a military clinic can significantly improve mental health issues among military personnel (Hill & Ponton, (n.d.)). The positive outcomes are reflected in the statistics, where 38% of individuals experienced significant

improvements in their PTSD checklist or PCL scores. Furthermore, 28% of individuals no longer met the criteria for PTSD after the intervention, indicating a noteworthy reduction in symptoms. A success rate of 12.8% underscores the positive impact of targeted treatments on the overall well-being of military personnel dealing with PTSD (U. S. Department of veterans affairs, 2023). In summary, these comprehensive findings underscore the urgent need for addressing sexual harassment and PTSD within the military. The success rates reported in interventions, particularly in military clinics, highlight the potential for positive outcomes and signify the importance of ongoing efforts to support and improve the mental health of military personnel. The following are the main psychological and physiological manifestations of post-traumatic stress disorders in combatants: excessive vigilance, exaggerated reactions, emotional blunting, aggressiveness, memory and attention concentration impairments, depression, general anxiety, outbursts of anger, substance abuse, intrusive memories, hallucinatory experiences, sleep problems, suicidal thoughts, and guilt for surviving (Palmer et al., 2019). Researchers showed that 75% of PTSD patients experienced headaches and feelings of weakness in various parts of the body, 56% experienced nausea, heart and back pain, dizziness, feelings

of heaviness in the limbs, numbness in various parts of the body, "lump in the throat," and 40% of those surveyed had difficulty breathing (Hussain, 2022; Kaminsky & Viesova, 2022). Psychological rehabilitation is part of the overall rehabilitation complex (along with medical, vocational, and social) aimed at restoring lost (disturbed) mental functions, optimal performance, social activity, restoring (correcting) self-esteem and social status of military personnel with mental disorders, combat injuries, and disabilities (Napryeyenko et al.,

2019; Rakhimov & Mukhamediev, 2022; Chovhaniuk et al., 2023). Rehabilitative tools of psychological assistance during PTSD in military personnel encompass a variety of approaches aimed at addressing the complex effects of trauma on mental health and well-being (Zang et al., 2017). These tools are designed to help individuals cope with and recover from traumatic experiences, regain a sense of control over their lives, and improve their overall quality of life (See Table 1).

Table 1.
Rehabilitative tools of psychological assistance during PTSD

Tools	Characteristic
Cognitive Behavioral Therapy (CBT)	Cognitive Behavioral Therapy (CBT) is widely used in treating PTSD and helps individuals identify and change negative thought patterns and behaviors related to their traumatic experience. This therapy aims to reduce symptoms and improve coping strategies.
Exposure Therapy	Exposure therapy gradually exposes individuals to memories, thoughts, or situations related to their trauma in a safe and controlled environment. This approach helps them confront and process their traumatic experiences, ultimately reducing the intensity of their emotional responses over time.
Eye Movement Desensitization and Reprocessing (EMDR)	EMDR is a specialized therapy that utilizes bilateral stimulation, such as eye movements, to assist individuals in processing traumatic memories and alleviating emotional distress.
Mindfulness-Based Therapies	Mindfulness-based approaches, like mindfulness-based stress reduction (MBSR) or mindfulness-based cognitive therapy (MBCT), can aid individuals in cultivating heightened awareness and acceptance of their thoughts and emotions. This can be beneficial in effectively managing symptoms of PTSD.
Group Therapy	Group therapy provides a supportive environment for individuals to share their experiences, learn from others, and develop coping strategies together. It can help reduce feelings of isolation and stigma often associated with PTSD.
Medication	In certain instances, medications like antidepressants or anti-anxiety medications may be prescribed to assist in symptom management for PTSD. These medications are frequently utilized alongside therapy (Vostrotin & Litovchenko, 2023).
Education and Psychoeducation	Providing information about PTSD, its symptoms, and available treatments can help individuals better understand their condition and engage more effectively in their recovery process.
Peer Support	Peer support programs connect individuals with lived experience of PTSD, allowing them to share insights, offer mutual support, and learn from each other's experiences.
Physical Activity and Recreation	Engaging in physical activity and recreational activities can help reduce stress, improve mood, and promote overall well-being, which can be beneficial for individuals with PTSD.

Source: Author's development

Contemporary research confirms the effectiveness of pharmacological medications in treating this syndrome. In the realm of PTSD treatment, medications such as paroxetine and sertraline have been employed. A noteworthy double-blind, placebo-controlled trial revealed that the continuation of sertraline treatment resulted in a mere 5% relapse rate, a stark contrast to the 26% relapse rate observed in patients administered a placebo. Beyond

medications specifically designed for PTSD, researchers undertook a comprehensive examination encompassing over a thousand medications (Marx & Gutner, 2015). Employing incidence rate ratios (IRR), the study identified 15 medications demonstrating protective associations or robust protective effects against PTSD. Notably, these drugs not only refrained from escalating the risks of PTSD but also exhibited risk reduction ranging from

approximately 30% to over 50%. The IRRs of these drugs manifest a bias toward the protective direction, with a higher IRR indicating a stronger inclination towards protection. The IRRs for the identified medications are as follows:propranolol: 0.63; dexmethylphenidate:

0.68; Atomoxetine: 0.64; Guanfacine: 0.64; Disulfiram: 0.48; Dextroamphetamine: 0.73; Methylphenidate: 0.65; Clonidine: 0.65; Prazosin: 0.33 and others (U. S. Department of veterans affairs, 2023). (See Figure 3).

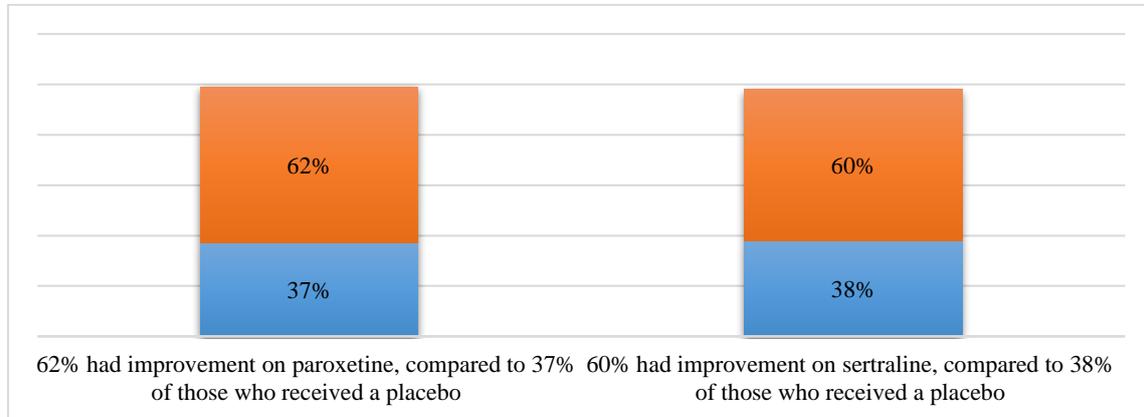


Figure 3. Effectiveness of medications for PTSD
Source: Author’s development

These rehabilitative tools can be tailored to meet the individual needs and preferences of military personnel with PTSD, helping them effectively manage their symptoms and improve their

overall quality of life (Zang et al., 2017). Support for military personnel with PTSD is crucial and can come in various forms. Researchers wrote about some examples of it (See Table 2).

Table 2.
Forms of support of military personnel with PTSD

Forms	Characteristic
Therapeutic Interventions	Offering access to evidence-based therapies like Cognitive Behavioral Therapy (CBT), Eye Movement Desensitization and Reprocessing (EMDR), and group therapy can assist individuals in processing their trauma and developing coping strategies..
Medication Management	In certain instances, medications like antidepressants or anti-anxiety medications may be prescribed to aid in managing symptoms of PTSD.
Family Support	Involving family members in therapy or providing education about PTSD can help create a supportive environment at home.
Education and Awareness	Raising awareness about PTSD and reducing the stigma associated with mental health problems can encourage individuals to seek assistance.
Employment and Vocational Support	Assisting individuals in transitioning back to civilian life or finding meaningful employment can improve their overall well-being.
Access to Healthcare	Ensuring that military personnel have access to mental health services and resources is essential for effective treatment.
Crisis Intervention	Offering immediate support during moments of crisis or acute distress is critical in preventing further harm.
Holistic Approaches	Incorporating holistic approaches such as yoga, meditation, or art therapy can complement traditional treatments and promote overall well-being.
Continued Monitoring and Follow-Up	Regular check-ins and follow-up appointments can help track progress and address any new challenges that may arise.

Source: author’s development based on Vujanovic et al. (2011)

Overall, a comprehensive and multi-faceted approach to supporting military personnel with PTSD is essential in helping them recover and lead fulfilling lives.

Several studies suggest that a brief course of Cognitive Behavioral Therapy (CBT) for PTSD can result in symptom reduction. Specifically, within a six-week period, 21% to 46% of PTSD patients receiving CBT exhibited a 50% decrease in the severity of their mental health symptoms.

Another study indicated that around 32% to 53% of PTSD patients who underwent at least 10 CBT sessions experienced a 50% reduction in the severity of their mental health symptoms. However, it is important to note that 14% of PTSD patients discontinued psychotherapy, with exposure therapy having the highest dropout rate at 50% (Hill & Ponton (n.d.)).

These results illuminate that psychological rehabilitation emerges as a vital component of the overall rehabilitation complex, focusing on restoring mental functions, optimal performance, and social activity while addressing self-esteem and social status. Early initiation of psychological rehabilitation, particularly during the formation of psychopathology and post-treatment, is crucial for effective intervention, as confirmed in works such as (Agah, 2022; Brownlow et al., 2018). These asserting that the rehabilitative tools of psychological assistance during PTSD in military personnel encompass diverse approaches aimed at addressing the complex effects of trauma on mental health and well-being are also supported in contemporary works by Marx & Gutner (2015), where patient interviews describe their recovery and realization. Specifically, according to Rona et al. (2012) and Sommer et al. (2022), these tools aim to help individuals cope with and recover from traumatic experiences, regain control over their lives, and enhance their overall quality of life.

On the other hand, the obtained results somewhat contradict certain claims of contemporary researchers. The findings challenge the assertion that there is a direct link between heightened arousal caused by PTSD and immune dysfunction, potentially leading to autoimmune diseases (Bookwalter et al., 2020). While evidence suggests an interaction, the precise mechanisms and causative factors remain complex and may involve numerous contributing elements beyond PTSD itself. However, it is worth agreeing with hypotheses regarding a noticeable connection between hearing loss and posttraumatic stress disorder (PTSD) (MacGregor et al., 2020; McLean et al., 2019). Researchers noted that first-time hearing loss was identified in 14.4% of the wounded with varying degrees of severity (10.3% unilateral, 4.1% bilateral). At the same time, the rates of diagnosed posttraumatic stress disorder (PTSD) differed between groups: 9.1% for those with no hearing loss, 13.9% for unilateral hearing loss, and 29.2% for bilateral hearing loss (MacGregor et al., 2020). Thus, these results indicate a potentially significant link between bilateral hearing loss and increased vulnerability to PTSD,

emphasizing the importance of further exploration and understanding of these relationships in the context of traumatic injuries (MacGregor et al., 2020).

Similarly, a point of departure from Simon et al. (2019) involves the assumption that "lower levels of perceived social support (PSS) will be reported for the Complex Posttraumatic Stress Disorder (CPTSD) group compared to the non-CPTSD group." It is crucial to consider that various factors could influence the relationship between perceived social support and complex posttraumatic stress disorder (CPTSD), and this hypothesis might oversimplify the complexity of this connection. Additionally, the authors of this study presume causal relationships between lower PSS and CPTSD, but it is important to recognize that correlation does not necessarily imply a causal relationship. Bidirectional influences may exist, where CPTSD affects social support and vice versa.

Hence, the novelty of the research lies in its focused examination of Posttraumatic Stress Disorder (PTSD) within the specific context of military personnel. While PTSD is a well-studied condition, this research uniquely tailors its approach to the distinctive challenges encountered by those in the military. It delves into the intricate interplay of factors that contribute to PTSD within this demographic, acknowledging the nuances that set military-related trauma apart. In terms of diagnosis, treatment, and support, the study adopts a holistic perspective, recognizing the interconnected nature of these elements in addressing the psychological impact of military service. This integrative approach goes beyond isolated examinations of each aspect, providing a more comprehensive understanding of how these components interact and influence the overall well-being of military personnel. Practically, the research holds significant implications for the development of targeted interventions and support systems for military members grappling with PTSD. The findings offer practical insights for mental health professionals, policymakers, and military leadership, guiding the formulation of more effective strategies to diagnose, treat, and support individuals dealing with PTSD in the military.

Conclusions

Hence, the study highlights the critical dimensions of PTSD among military personnel, emphasizing its prevalence, consequences, and potential connections to various factors. The

prevalence of PTSD varies with age, with higher incidence among younger veterans, and specific symptoms, such as headaches and feelings of weakness, are reported by a significant percentage of individuals with PTSD.

Psychological rehabilitation, an integral part of the overall rehabilitation complex, focuses on restoring lost mental functions, optimal performance, and social activity. This comprehensive approach aims to correct self-esteem and social status among military personnel dealing with mental disorders, combat injuries, and disabilities. Initiated even in the presence of pre-pathological mental changes caused by extreme psychogenic influence, psychological rehabilitation is crucial at early psychopathology stages and becomes especially active in the final stages of treatment and post-treatment. Therefore, the research emphasizes the multifaceted aspects of posttraumatic stress disorder among military personnel, recognizing the significance of psychological rehabilitation as a vital component of the overall rehabilitation complex. It supports the idea that diverse tools of psychological assistance are essential for helping individuals cope with and recover from traumatic experiences, enhancing their overall quality of life.

In light of the obtained results, it is essential to provide key recommendations for further actions and improvement of support for military personnel dealing with post-traumatic stress disorder (PTSD).

1. Enhancement of psychological rehabilitation. Considering the successful outcomes of interventions, particularly in military clinics, it is crucial to support and develop psychological rehabilitation programs for military personnel. Exploring the extension of the duration and accessibility of such programs is advisable.
2. Early detection and intervention. Recognizing the importance of early identification of PTSD, it is crucial to develop systems for timely diagnosis and effective interventions. Training medical personnel and increasing awareness about these matters can enhance outcomes.
3. Post-service and deployment support. Given the potential for delayed PTSD, ensuring access to psychological support after completing service is crucial. The development of services for veterans and their adaptation to civilian life can help mitigate negative consequences.

These recommendations underscore the need for an integrated and systematic approach to addressing issues related to PTSD among military personnel, with a focus on psychological support and rehabilitation.

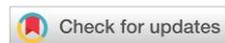
On the same time, the research among military personnel is limited by several factors. For example, it is hard for researchers to obtain permission and access to military personnel for research purposes can be restricted due to internal military protocols and confidentiality of information. Researchers may find it challenging to obtain sufficient data for studying a large number of military personnel with varying levels of traumatic experiences and PTSD. Also, it can be challenging to recruit an effective control group in PTSD research among military personnel, making it difficult to determine the effectiveness of treatments and support. There are some diversities of sociocultural factors in military populations can affect how treatment and support are perceived and responded to. Despite these limitations, researching PTSD among military personnel remains crucial for improving the diagnosis, treatment, and support for this vulnerable population. The study provides valuable insights into the diagnosis, treatment, and support of military personnel with PTSD. Future research could delve deeper into refining intervention strategies based on the specific needs and experiences of different subgroups within the military population.

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DOI: <https://doi.org/10.34069/AI/2024.74.02.25>

How to Cite:

Yefymenko, T., Bilous, T., Zhukovska, A., Sieriakova, I., & Moysenko, I. (2024). Technologies for using interactive artificial intelligence tools in the teaching of foreign languages and translation. *Amazonia Investiga*, 13(74), 299-307. <https://doi.org/10.34069/AI/2024.74.02.25>

Technologies for using interactive artificial intelligence tools in the teaching of foreign languages and translation

Технології Використання Інтерактивних Засобів Штучного Інтелекту у Викладанні Іноземних Мов та Перекладу

Received: January 6, 2024

Accepted: February 27, 2024

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Abstract

The article explores the potential of artificial intelligence technologies in teaching foreign languages and translation. It explores the advantages and possible challenges of using such technologies in language education and provides practical examples. The article also discusses perspectives on the future development and use of interactive artificial intelligence tools in the field of language teaching and translation. The integration of artificial intelligence into higher education has ushered in a new era of transformation in educational processes, reforming various aspects of the educational experience. The advantages of introducing artificial intelligence into higher education are numerous, ranging from personalized learning paths to intelligent assessment tools. The tools are classified into categories for students,

Анотація

У статті досліджено потенціал технологій штучного інтелекту у навчанні іноземних мов та перекладу. Він досліджує переваги та можливі проблеми використання таких технологій у мовній освіті та надає практичні приклади. У статті також обговорюються перспективи майбутнього розвитку та використання інтерактивних засобів штучного інтелекту у сфері навчання мов та перекладу. Інтеграція штучного інтелекту у вищу освіту започаткувала нову еру трансформації в освітніх процесах, реформуючи різні аспекти освітнього досвіду. Переваги впровадження штучного інтелекту у вищу освіту численні, від персоналізованих шляхів навчання до інтелектуальних інструментів оцінювання. Інструменти класифіковано за категоріями для студентів, викладачів і системи освіти. Він

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teachers, and the education system. It identifies key results of such processes and examines various technologies, including Linguattech Learning Assistant, Linguattech Translation Tool, and Linguattech Language Lab, which help students improve their language and translation skills. The research examines the effectiveness of interactive tools in education, comparing their use in classroom and distance learning formats. The article's conclusions are significant for the development and improvement of language and translation education programs that use innovative artificial intelligence technologies.

Keywords: identity, ethnicity, societal ideal, state-building, national consciousness.

Introduction

Artificial intelligence is widely used in various sectors of society, including the economy, finance, marketing, medicine, industry, and education. Machine learning reflects linguistic intelligence in the context of artificial and human intelligence. It is often confused or equated with artificial intelligence. From a technical perspective, machine learning is a subfield of artificial intelligence. The primary objective of artificial intelligence is to enable computers to perform tasks that humans excel at, and learning is one of the most critical skills in this regard. Without the ability to learn, computers will not be able to surpass humans eventually. Learning enables the acquisition of new information, which is then transformed into knowledge, skills, and abilities. In conclusion, the highest manifestation of intelligence in both humans and machines is the ability to learn and acquire new knowledge. However, the question remains open as to how intelligent a machine can be compared to a human, and how this intelligence can be comparable or relative. Artificial intelligence is an automated system or program that can perform tasks characteristic of humans and make optimal decisions based on the analysis of input data. Artificial intelligence aims to computationally model human thinking processes by imitating cognitive functions of the human brain. The ultimate goal is to replicate these functions, creating a computational component capable of achieving predefined goals. Artificial intelligence can be classified into several types, including Artificial Narrow Intelligence (ANI), Artificial General Intelligence (AGI), and Artificial Super Intelligence (ASI). It is important to note that tools such as ChatGPT are being used to aid in learning English, providing students with access

визначає ключові результати таких процесів і вивчає різні технології, зокрема Linguattech Learning Assistant, Linguattech Translation Tool і Linguattech Language Lab, які допомагають учням покращити свої мовні та перекладацькі навички. Дослідження вивчає ефективність інтерактивних інструментів в освіті, порівнюючи їх використання в аудиторних і дистанційних форматах навчання. Висновки статті мають важливе значення для розробки та вдосконалення мовних і перекладацьких освітніх програм, які використовують інноваційні технології штучного інтелекту.

Ключові слова: ідентичність, етнічність, суспільний ідеал, державотворення, національна свідомість.

to information, interactive teaching methods, and individualization. The ASI, or Artificial Superintelligence, is a theoretical type of AI that is expected to possess exceptional intelligence and surpass human cognitive abilities in solving complex tasks. However, the creation of such a superintelligence may have unpredictable consequences, which is a topic of discussion among researchers. In addition, universities are exploring the impact of AI technologies on the learning process and student development. Interactive educational resources and virtual learning environments can aid in the development of students' creativity, independence, and learning efficiency. Some popular technologies for learning English include MyEnglishLab, Grammarly, Duolingo, Watson Education, Memrise, and others. The use of "speaking robots" provides ample opportunities for speaking practice and independent work with information resources, which can contribute to personal growth and development.

Literature review

Modern requirements for higher education students studying foreign languages, such as English, establish a multifaceted system of skills, including accurate pronunciation, grammar, vocabulary, and style (Essel et al., 2024). Students must be able to express their ideas effectively in both written and spoken forms, both online and offline. Learning a foreign language at higher education institutions requires advanced skills in understanding authentic speech, including monological and dialogical expressions (Hsu et al., 2023). Students should be able to read original fiction, scientific, and socio-political literature, interpret texts, and

participate in discussions on current topics from various spheres of life in the foreign language. Recent research and publications show a growing interest in the project method among researchers. The philosopher and educator John Dewey was the first to introduce this method (Mogadala et al., 2021). According to Dewey, project-based learning promotes creativity and independent thinking in students (Li et al., 2023). The project method is a relevant scientific direction for teaching foreign languages in both domestic and foreign methodological science. This topic has been studied by many Ukrainian and foreign scholars, including Klimova et al. (2023). The method encourages students to work semi-autonomously and culminates in the creation of real products or presentations. However, language education using traditional methods often encounters obstacles such as differences in individual learning pace and limited opportunities for practice and interaction between teachers and students (Saichyshyna et al., 2023). Artificial intelligence has become a crucial factor in providing customized solutions for individual students. AI-based tools can analyse complex texts and offer insights on grammar, vocabulary usage, and literary devices (Yadlapally et al., 2023). The focus is on interactive tools that enhance language learning and develop speaking skills. It is worth noting that interactive chatbots, online language learning platforms, progress tracking systems, automatic translation, and virtual assistants can create an educational environment that stimulates active learning and promotes language competence growth. Additionally, researchers are developing algorithms that can analyse complex literary works and offer students a more in-depth understanding of their “nuances” and cultural context. Projects that utilize artificial intelligence for foreign language and literature learning offer vast potential (Chen et al., 2020). They not only enhance students’ skills but also advance artificial intelligence technologies. However, it is important to consider major issues, such as the use of artificial intelligence for translation, which may impede students’ language competence development. Research projects that focus on using artificial intelligence for language learning have been shown to be productive. This is because the learning process becomes more individualized and adapted to each student’s needs (Hasyim et al., 2021). Such projects enable students to quickly understand the use of artificial intelligence without compromising their educational development. Collaboration between educators, linguists, artificial intelligence experts, and cultural experts is crucial for the further development and

integration of these technologies into language education (Chen et al., 2022). Studies attest to the relevance and promising nature of using the project method in teaching foreign languages, which contributes to the development of both general language skills and students’ professional competencies. Artificial intelligence tools can facilitate language development by providing students with personalized exercises and educational materials for learning languages online. These tools are classified based on various criteria and are significant for improving the processes of teaching and learning foreign languages (Alam, 2021). Voice assistants, such as Siri, Alexa, and Cortana, can be useful tools for educators. They allow students to interact more effectively with course materials and receive necessary information instantly (Yadlapally et al., 2023). These tools are innovative and allow for the replacement of traditional educational materials, making the learning process more individualized. For instance, Arizona State University has already implemented an approach that enables students to access necessary information independently at any convenient moment. This facilitates their learning and reduces pressure on educators, thereby enhancing the quality of education (Sun et al., 2021). Another tool that can be integrated into higher education foreign language classes is a chatbot. This program, based on machine learning technology, can simulate real conversation with the user and be used as an assistant or translator for lectures and practical materials for various audiences. ChatGPT, developed by OpenAI laboratory (Mashtalir & Nikolenko, 2023), is a popular artificial intelligence tool.

The use of interactive artificial intelligence tools in foreign language learning and translation has significant potential for improving the quality of education and increasing the effectiveness of the learning process. Here are some technologies that can be used in this field:

1. **Language chatbots:** Interactive chatbots based on artificial intelligence can provide students with opportunities to practice language in real or simulated communication situations. They can correct errors, provide explanations, and help students develop speaking and language comprehension skills.
2. **Online language learning platforms:** Platforms that use artificial intelligence can adapt educational material to each student’s needs, considering their level of knowledge, individual requirements, and learning pace.

- They can also provide feedback and recommendations for improving results.
3. Progress tracking systems: Artificial intelligence-based tools can analyse students' results in real-time, track their progress and weaknesses, and provide personalized recommendations for further learning.
 4. Automatic translation systems: Machine learning and deep learning technologies allow for the creation of increasingly accurate and fast automatic translation systems, such as DeepL, Grammarly, Instatext. These systems can be used for translating texts, audio, and video materials, facilitating understanding and mastery of foreign languages.
 5. Virtual language learning assistants: Virtual assistants based on artificial intelligence can provide interactive tasks, exercises, and games for language learning. They can also interact with students in dialogue form, promoting active learning and memorization of language constructs. These technologies not only make the language learning process more interesting and effective but also help make it more accessible and flexible for students with different needs and levels of learning.

Methodology

The research methods used in this study involved systematic and theoretical analysis of scientific literature and language learning practices for students. The approach included reviewing existing scientific works and publications related to the use of artificial intelligence (AI) in foreign language education, both in Ukraine and abroad. In addition, explanatory methods involved synthesizing and effectively using acquired knowledge to create and implement a research project into the process of learning a foreign language, using artificial intelligence. The custom project for language learning with the involvement of AI was developed within the Python environment.

To investigate the effectiveness of the Liguattech Learning Assistant app in learning

English, a random sample of 23 students was gathered, consisting of 14 females and 9 males. The participants either attended classroom sessions (11) or used the app (12).

The study aimed to evaluate the success of students depending on the learning format - in-class or distance. To achieve this, a teaching methodology with two levels - in-class and distance learning - was created. Four types of assessment were developed: quizzes, exams, oral, and final assessments, to evaluate students' knowledge.

The analysis used mixed-factor repeated measures with two factors: teaching method and assessment type. Paired samples t-tests were conducted to determine which assessment tools significantly differed between students learning in-class and those in distance format.

To evaluate the overall difference in the average success of students based on the teaching method, we used a third variable - the average grade point average (GPA) of the students - to conduct an independent t-test.

Results and discussions

Project title: LINGUATECH: Innovative tools for language teaching and translation. Description: LINGUATECH is an innovative project aimed at applying advanced artificial intelligence technologies in the process of foreign language teaching and translation. The project develops and implements interactive tools used by students, teachers and translators to improve the efficiency of learning and working with foreign languages.

Main components:

LINGUATECH Learning Assistant: An interactive mobile application for learning foreign languages. It uses artificial intelligence to individualize the learning process, adapting materials to the needs of each student, and provides feedback and recommendations for improving language skills.

```

python
class LiguattechLearningAssistant:
    def __init__(self, student_name, target_language):
        self.student_name = student_name
        self.target_language = target_language
        self.learning_progress = {} # dictionary to store the progress of each student
    def set_learning_progress(self, lesson, progress):
        self.learning_progress[lesson] = progress
    def get_learning_progress(self, lesson):
        return self.learning_progress.get(lesson, "Progress is undefined")
    def recommend_study_materials(self):
        # Get recommendations for study materials
        if self.target_language == 'English':
            # return "Recommended book: English Grammar in Use"
        elif self.target_language == 'Spanish':
            return "Recommended book: ¡Hola Amigos!"
# Example of use
assistant = LiguattechLearningAssistant("Elena", "English")
assistant.set_learning_progress("Grammar", "Improved")
assistant.set_learning_progress("Vocabulary", "Needs improvement")
print(f "Olena's progress in grammar: {assistant.get_learning_progress('Grammar')}")
print(assistant.recommend_study_materials())

```

Figure 1. Python code for the basic functionality of LINGUATECH Learning Assistant

This code creates a 'LiguattechLearningAssistant' class that can store students' progress in learning different lessons, as well as recommend learning materials based on the student's target language.

LINGUATECH Translation Tool: A web-based platform for translating texts using artificial intelligence. It uses neural networks and machine learning technologies to automatically translate texts of varying complexity and specificity.

```

python
class LiguattechTranslationTool:
    def __init__(self, source_language, target_language):
        self.source_language = source_language
        self.target_language = target_language
    def translate(self, text):
        # Logic of text translation
        translated_text = f"Текст '{text}' was translated from {self.source_language} into {self.target_language}"
        return translated_text
# Example of use
translator = LiguattechTranslationTool("English", "Ukrainian")
text_to_translate = "Hello, how are you?"
translation = translator.translate(text_to_translate)
print("Translation result:", translation)

```

Figure 2. Python code for the basic functionality of LINGUATECH Translation Tool.

This code creates the class 'LiguattechTranslationTool', which can translate text from the source language to the target language. The 'translate' function takes the text to be translated and returns the translation result in the specified language.

LINGUATECH Language Lab: An interactive multimedia classroom for practical language learning. It includes virtual communication scenarios, gaming tasks, and real exercises for developing language skills. Language Lab for implementing simple operations in Python language. Below is a general example.

```

```python
class LinguatechLanguageLab:
 def __init__(self, language):
 self.language = language
 self.vocab_list = {}
 self.quiz_scores = {}
 def add_vocab_word(self, word, definition):
 self.vocab_list[word] = definition
 def take_quiz(self, questions):
 score = 0
 for question in questions:
 print(question)
 user_answer = input("Your answer: ")
 if user_answer.lower() == questions[question].lower():
 print("Correct!")
 score += 1
 else:
 print("Incorrect.")
 self.quiz_scores[self.language] = score
 print(f"Your score: {score}/{len(questions)}")
Приклад використання
language_lab = LinguatechLanguageLab("Spanish")
language_lab.add_vocab_word("hola", "hello")
language_lab.add_vocab_word("adiós", "goodbye")
quiz_questions = {
 "1. What does 'hola' mean?": "hello",
 "2. What does 'adiós' mean?": "goodbye"
}
language_lab.take_quiz(quiz_questions)
```

```

Figure 3. The software code for the basic functionality of LINGUATECH

In this example, a class 'LinguatechLanguageLab' is created, which allows users to add words to the dictionary and take quizzes. The 'add_vocab_word' function adds words and their definitions to the dictionary, while 'take_quiz' allows users to take a quiz with questions and compares their answers with the correct ones.

LINGUATECH provides students, teachers, and translators with access to state-of-the-art language learning and work technologies. The platform's effectiveness is demonstrated by improvements in language proficiency, increased productivity, and enhanced translation quality.

The study presents the results of an effectiveness analysis of students' learning using traditional and interactive methods with a developed application. The results are presented in the form of mixed-factor repeated measures ANOVA with two factors: teaching method (traditional

classroom vs. application) and assessment type (quizzes, exams, oral, final).

The analysis revealed a significant main effect for assessment type ($F = 9.663$, $p = 0.000$), indicating the impact of the type of testing on student performance. Significant differences were identified among various types of assessment, including quizzes, exams, oral, and final (see Table 1).

Additionally, a significant main effect was observed for the teaching method ($F = 5.012$, $p = 0.031$), confirming its impact on student success. However, no interaction was found between assessment types and teaching method ($F = 1.232$, $p = 0.298$).

Additional analyses did not reveal a significant difference in performance between the traditional classroom and the distance learning group ($t = -1.515$, $p = 0.137$).

Table 1.
Average Student Performance Depending on the Teaching Method

| Nº | Assessment type | Audience | Extras | p |
|----|-----------------|----------|--------|--------|
| 1 | Quizzes | 78,250 | 76,125 | 0,0000 |
| 2 | Exams | 82,375 | 76,000 | 0,0005 |
| 3 | Oral | 75,875 | 70,625 | 0,0031 |
| 4 | Final | 80,750 | 81,750 | 0,0035 |

These findings indicate that both teaching methods can be effective in learning Spanish, but they may impact different types of assessment in varying ways.

The use of artificial intelligence tools for language learning can be an effective solution to address a range of issues, such as reducing classroom hours and preparing qualified professionals (Strobel et al., 2023). However, alongside the implementation of such innovations, it is important to develop certain cognitive processes, such as perception, logical thinking, memory, and imagination. There are various types of artificial intelligence tools that can be beneficial for language learning (Lytvyn et al., 2023). Training tools provide students with the opportunity to practice independently, check their level of knowledge and skills, as well as identify and correct their mistakes (Jackson et al., 2024). Diagnostic tools help teachers monitor and evaluate students' level of learning (Sabadash & Lysko, 2023). Communicative tools, including dialogue with computers, can assist students in overcoming communication barriers and developing their language skills (Vong et al., 2024). One way to improve students' language competence is the Content and Language Integrated Learning (CLIL) methodology, which is based on an integrated interdisciplinary approach. It promotes intercultural knowledge and creative thinking and develops professional and general language competencies (Kruger-Marais, 2024). An interesting tool in the context of developing intellectual linguistic resources is the translo- and glotodidactic e-learning system LISTiG13/LISST14 (Fiiialka et al., 2023). This intelligent tool was developed with the participation of various organizations, including university research units and recognized non-university units with an international reputation in the IT industry and linguistic tool development. The LISST/LISTiG system is a complex tool that combines translo- and glotodidactic methods of e-learning. It provides students with automatic feedback in response to the information they input, including song lyrics. After completing translation exercises, students receive detailed feedback on their translated

sentences. The system also automatically recognizes types of translation errors made and provides information to students, allowing them to correct mistakes. The instructor interface allows students to familiarize themselves with different translation options and associate error messages with specific language phenomena. The system also automatically evaluates inputted texts in terms of grammar and spelling, comparing them with correct translation variants and sample answers previously entered by instructors. Students receive automatic feedback messages indicating errors in their translations compared to sample answers. The system also compares individual sentence parts entered by students with corresponding information previously entered into the system by the instructor.

Tools that combine Translation Memory (TM) and Machine Translation (MT) are known for their high accuracy and effectiveness compared to using either machine translation or translation memory alone. These hybrid solutions are gaining popularity due to their ability to optimize translator workflow and improve translation quality. The combination of both translation support methods (TM+MT) leads to a significant increase in correct translation matches. An example of a hybrid approach is the Lilt program, which uses an Intelligent Translation Memory developed at Stanford University. The program is designed for editing machine translation and enhancing translation quality through systematic self-learning. It provides translators with specific advice based on their corrections, helping to improve machine translation with each new inputted text. Self-learning systems are gaining popularity and effectiveness in the field of translation. While most examples focus on written translation, it is worth noting the rise of intelligent speech recognition systems, particularly in the context of spoken language. Various tools, such as language bots, are capable of conversing at a human level using different strategies, including frequent topic changes and evading questions.

Implementing this methodology into university education may increase students' motivation to

learn English and focus their attention on intercultural communication. However, there are certain risks associated with using artificial intelligence in language learning. Some students may lack sufficient motivation and self-discipline for effective online learning with artificial intelligence. There is a risk that students may rely too heavily on artificial intelligence when completing tasks, which can hinder their skill development and independence. Therefore, it is important to develop verification tools that can identify whether tasks were completed by students independently or with the assistance of artificial intelligence.

Conclusions

The significance and potential of artificial intelligence technologies in foreign language learning and translation have been demonstrated. Research findings suggest that interactive AI tools, such as Linguatch Learning Assistant, Linguatch Translation Tool, and Linguatch Language Lab, have a significant impact on improving students' language skills and translation abilities. A crucial aspect of the study is comparing the effectiveness of these tools in both classroom and distance learning formats. The results indicate that both teaching methods can be effective. However, it is important to consider their influence on different types of assessment when developing and enhancing educational programs. The article provides compelling evidence of the effectiveness and potential of using interactive AI tools in foreign language teaching at Ukrainian higher education institutions. The integration of artificial intelligence in higher education presents new opportunities for improving educational processes and reforming various aspects of the educational experience. This research represents a significant step in the development and enhancement of language learning and translation programs through innovative artificial intelligence technologies.

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DOI: <https://doi.org/10.34069/AI/2024.74.02.26>

How to Cite:

Pryimak, M., Kalyta, L., Sokolov, M., Kaplun, V., & Krasnykov, Y. (2024). Innovative approaches to risk management in the field of public administration in Ukraine: prospects and limitations. *Amazonia Investiga*, 13(74), 308-322. <https://doi.org/10.34069/AI/2024.74.02.26>

Innovative approaches to risk management in the field of public administration in Ukraine: prospects and limitations

Enfoques innovadores para la gestión de riesgos en el ámbito de la administración pública en Ucrania: perspectivas y limitaciones

Received: January 3, 2024

Accepted: February 23, 2024

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Abstract

In the dynamic landscape of public administration in Ukraine, addressing risks through innovative approaches has become a critical imperative. The primary aim of this study is to assess the prospects and limitations of innovative approaches to risk management within the field of public administration in Ukraine. By scrutinizing current practices, the study aims to provide insights into the effectiveness and potential hurdles associated with integrating innovative strategies into the risk management framework. A comprehensive review of relevant literature and case studies related to risk management in public administration in Ukraine was conducted. The results of the study reveal a range of innovative approaches employed in Ukrainian public administration for risk management. These

Resumen

En el dinámico panorama de la administración pública en Ucrania, abordar los riesgos mediante enfoques innovadores se convertido en un imperativo crítico. El objetivo principal este estudio es evaluar las perspectivas y limitaciones enfoques innovadores de la gestión de riesgos ámbito la administración pública de Ucrania. Mediante el examen de las prácticas actuales, el estudio pretende aportar ideas sobre la eficacia y los posibles obstáculos asociados la integración de estrategias innovadoras en el marco gestión de riesgos. Se ha llevado cabo una revisión exhaustiva la bibliografía y los estudios de casos pertinentes relacionados con la gestión de riesgos en la administración pública de Ucrania. Los resultados del estudio revelan una serie enfoques innovadores empleados la administración pública ucraniana para la gestión de riesgos. También se identifican

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include technological solutions, data-driven decision-making processes, and adaptive governance strategies. It also identifies limitations such as bureaucratic impediments, resource constraints, and the need for enhanced legal frameworks. In conclusion, the findings underscore the importance of innovative risk management in Ukrainian public administration. The study advocates for a holistic approach, emphasizing the need for legal reforms, resource allocation, and fostering a culture of innovation within public administration entities. Therefore, the findings highlight the intricate balance between prospects and limitations in integrating innovative risk management approaches in Ukrainian public administration.

Keywords: public administrations, challenges, realization, Ukraine, digitalization.

Introduction

In recent years, the landscape of public administration in Ukraine has undergone significant transformations, marked by dynamic socio-political changes, economic challenges, and technological advancements. As the country strives to enhance governance effectiveness and foster sustainable development, the imperative for innovative approaches to risk management within the realm of public administration becomes increasingly apparent (Malachynska et al., 2022). This discourse explores the prospects and limitations associated with adopting novel methodologies in risk management, delving into the intricacies of their application within the Ukrainian public administration framework.

The relevance of this topic is underscored by the evolving nature of risks that confront public administration, ranging from political uncertainties and economic volatility to emerging threats in the digital realm. The traditional risk management paradigms may prove insufficient in addressing these contemporary challenges, necessitating a reevaluation of strategies and the infusion of innovative methodologies.

An analysis of existing studies reveals a critical gap in the exploration of avant-garde risk management practices tailored to the specific context of public administration in Ukraine (Samofatova et al., 2019; Strakhnitskyi, (2022). While conventional risk management has been extensively examined, the unique challenges and opportunities inherent in the Ukrainian administrative landscape call for a more nuanced and contextually informed approach (Tkachova

limitaciones como los impedimentos burocráticos, la escasez de recursos la necesidad de mejorar los marcos jurídicos. El estudio aboga por un enfoque holístico, haciendo hincapié necesidad de reformas jurídicas, la asignación de recursos el fomento de una cultura de la innovación en las entidades de administración pública. Por consiguiente, las conclusiones ponen de relieve intrincado equilibrio entre perspectivas y limitaciones a hora de integrar enfoques innovadores de gestión de riesgos administración pública ucraniana.

Palabras clave: administraciones públicas, retos, realización, Ucrania, digitalización.

et al., 2021; Vasynova, 2021). This study seeks to contribute to the existing body of knowledge by filling this void, offering insights into how innovative risk management strategies can be tailored to the Ukrainian public administration context.

The research problem at the heart of this investigation revolves around the identification of viable and effective innovative approaches to risk management within the Ukrainian public administration system. As Ukraine undergoes transformative changes, there is a pressing need to understand how these innovations can be harnessed to mitigate risks, enhance decision-making processes, and ultimately contribute to the resilience and efficiency of public administration. Important examples of innovative risk management approaches used in EU countries are the use of big data, social network analysis and artificial intelligence. These approaches are innovative, therefore, and recently began to be used in Ukraine.

The aim of this study is to provide a comprehensive examination of innovative approaches to risk management in the field of public administration in Ukraine, evaluating their potential prospects and acknowledging the inherent limitations. To achieve this aim, the research will be guided by the following tasks:

1. Conduct a thorough review of the current risk management landscape in Ukrainian public administration.

2. Identify and analyze innovative approaches to risk management implemented in other global contexts.
3. Examine the limitations and challenges associated with the integration of innovative risk management strategies in the Ukrainian context.

Through the accomplishment of these tasks, this study aspires to offer valuable insights that can inform policy decisions, enhance governance practices, and contribute to the overall resilience and adaptability of public administration in Ukraine. Thus, this research can have several important implications for both researchers and employees; in particular, an important contribution can be the justification of the need to reform the risk management system in Ukraine.

Literature review

In recent years, the field of public administration in Ukraine has experienced a notable surge in research exploring innovative approaches to tackle the evolving challenges of governance. Scholars have concentrated on diverse aspects, ranging from quality management in educational services to the role of project management in digital transformation. This literature review offers a succinct overview of key works contributing to our comprehension of innovative strategies within the context of public administration in Ukraine. For instance, Akhmedova, Avedyan, Gvazava, Shumska and Zilinska (2022) delved into innovative approaches in public administration to enhance the quality of educational services during transformative phases in Ukraine. Their work underscored the importance of adapting governance strategies to meet the dynamic needs of the education sector amidst societal transformations. However, the authors focused mainly on the local analysis, and did not discuss this problem in a wider (global) perspective. The work by Bannikov, Lobunets, Buriak, Maslyhan and Shevchuk (2022) examined the role of project management in the digital transformation of small and medium-sized businesses. Their research explored the essence and innovative potential of project management, emphasizing its significance in navigating the complexities of digital transformation within the business landscape. However, the shortcomings of this study are the local nature of the small businesses analyzed, it was worth doing a comparative analysis of them with large state institutions. Moreover, Blättler and Hunziker (2019) contributed to the understanding of public

administration risk management. Their work, as a part of the Global Encyclopedia of Public Administration, provided a comprehensive overview of risk management practices, offering insights into the conceptual frameworks, processes, and challenges associated with risk management in public administration. Bodemann (2018) explored considerations of risk and the developments in risk management within the global economy. The author analyzed challenges and advancements in risk management, particularly within the context of public administration, providing valuable insights into navigating risks in a rapidly changing global economic environment. Although this research provides an important foundational framework, it is general and does not always take into account local management problems. The study by Kish (2023) discussed ensuring transparency and responsibility in public administration, particularly by the State Bureau of Investigations. The research emphasized the importance of transparency measures in enhancing accountability within public administration entities.

Bučková (2015) focused on knowledge management in public administration institutions. The study highlighted the role of knowledge management practices in improving organizational efficiency within the public sector, emphasizing the importance of innovation in decision-making processes. The research by Colan, Vrabie, and Raducan (2019) discussed marketing mix approaches in educational services and public administration. Their work explored the interconnectedness of marketing strategies between educational services and the public administration domain, contributing to a nuanced understanding of how marketing principles can be applied to enhance effectiveness. Jurczak (2016) focused on intellectual capital risk management for knowledge-based organizations. The study explored strategies for managing intellectual capital risks, providing valuable insights into risk management practices within knowledge-intensive organizations.

In addition, Czerwińska (2016) investigated the impact of insurance companies' investment policies on risk management in the public sector. The study analyzed the complex relationship between financial strategies of insurance entities and their implications for risk management in public administration. Dooranov, Orozonova and Alamanova (2022) explored the economic basis for the training of specialists in personnel management, focusing on future prospects. Their

research provided insights into the economic considerations shaping the training of specialists, contributing to discussions on the future trajectory of personnel management in the economic landscape. The study by Kożuch and Sienkiewicz-Małyjurek (2016) explored the multidimensionality of risk in public safety management processes. Their research highlighted the diverse factors contributing to risks in public safety management, providing a comprehensive perspective on risk management strategies. Hanushchyn (2022) investigated the relationship between public management and administration, applying civilization and transformation approaches to social relations in Ukraine. The study explored the interplay of governance methodologies and societal transformations, offering insights into the dynamic nature of public administration in the Ukrainian context. However, the study mainly took into account the realities of Ukraine, and did not take into account the global context of the study. Furthermore, Ivanova (2021) delved into the mechanisms of public administration in the field of physical culture and sports in Ukraine. The research contributed to our understanding of the specific challenges and opportunities in managing public affairs related to sports and physical culture. Finally, Krok (2018) contributed insights into innovations in public administration. The study explored the evolving landscape of innovations within the field of public administration, emphasizing the importance of adapting to emerging trends and technological advancements.

To sum up, these works collectively contributed to the ongoing discourse on innovative approaches to risk management and public administration in Ukraine. The diverse range of topics, from education and project management to risk considerations and economic foundations, highlighted the multidimensional nature of challenges in the field and underscored the need for adaptive and innovative governance strategies. However, the topic of the main problems and perspectives on the way of introducing innovations into the management system still remains relevant and incompletely researched. In particular, an important direction is the comprehensive analysis of innovative approaches to risk management in the field of public administration.

Methodology

Research purpose and prerequisites

The main goal of this study is to characterize and analyze innovative approaches used in risk management practices in the sphere of public administration in Ukraine. The research is driven by the need to understand, evaluate and potentially improve the strategies and mechanisms used to manage risk in the public sector. The study will contribute to a broader discussion of effective governance, identify opportunities for improvement, and recognize constraints that may hinder the successful implementation of innovative risk management practices.

Type of research

This study uses a qualitative approach based on an analysis of the available scientific literature. Being a review article, the methodology focuses on synthesizing findings from relevant scientific sources to provide a comprehensive understanding of innovative risk management in the context of public administration in Ukraine.

Data collection

For the review article, which is based on the analysis of scientific sources, the selection of literature was based on the following aspects:

1. Sources of literature. Using authoritative academic databases, including but not limited to Google Scholar, Scopus, Ebsco, PubMet, DOAJ, IndexCopernicus Web of Science, to collect relevant scientific articles, books and reports. Data from special research platforms and libraries were also used, including AcademiaEdu, ResearchGate, and the Vernadskyi National Library.
2. Search keywords. The search is carried out using key terms such as “innovative risk management”, “innovation”, “risk”, “governance mechanisms”, “public administration”, “innovative methods”, “approaches” and “Ukraine” to ensure the inclusion of literature, relating to the objectives of the study.
3. Date range. The search covers a defined time frame (2015-2023), considering relevant literature published during the last decade to capture recent developments and trends.
4. Regional focus. The study focuses on the Ukrainian context, so regional limitations are set to include sources that specifically

relate to risk management practices in the Ukrainian public administration. However, general fundamental works were used as the methodological basis of the general concept of public administration.

Eliminating biases in the literature selection and analysis process is important to this study. Several methods are used for this. In particular, a comprehensive search strategy. The search for sources was systematic based on the use of

numerous databases and search tools. This helped to minimize the omission of relevant sources. Also, special criteria for the inclusion of literature were developed, which contributed to the management of the selection process. Thus, this study is based on various criteria for the inclusion of literature. Table 1 summarizes the main criteria for the inclusion of research literature, which are based on the principles of relevance, appropriateness of the topic, diversity, and the language criterion (See Table 1).

Table 1.
Literature inclusion criteria

| № | Inclusion criteria | Description |
|---|-----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Relevance to innovative risk Management | Selected literature must directly address or contribute insights into innovative approaches to risk management within the context of public administration. This includes studies, articles, and reports that discuss novel strategies, methods, or frameworks for identifying, assessing, and mitigating risks in the public sector. |
| 2 | Publication date | Literature selected for inclusion should be recent and up-to-date, with a focus on publications within the last ten years. This criterion ensures that the research reflects current trends, practices, and advancements in the field of risk management within the specified timeframe. |
| 3 | Methodological diversity | The inclusion criteria consider a diverse range of research methodologies, including qualitative, quantitative, and mixed-methods approaches. This criterion ensures a comprehensive understanding of innovative risk management practices from various methodological perspectives. |
| 4 | Peer-reviewed sources | Preference is given to literature published in peer-reviewed journals, conference proceedings, and reputable academic publishers. This criterion ensures the reliability and academic rigor of the selected sources, contributing to the overall quality of the literature review. |
| 5 | Thematic alignment | The selected literature should align with the overarching themes of the research, encompassing topics such as technological innovations in risk management, policy frameworks, organizational strategies, and the effectiveness of innovative approaches in the public administration domain. |
| 6 | Language | Literature published in Ukrainian, English or with available English translations is prioritized. This criterion facilitates accessibility for a wider audience and ensures that language barriers do not hinder the inclusion of valuable insights. |
| 7 | Diversity of authors and perspectives | The research values inclusivity and diverse perspectives. Therefore, literature authored by researchers from various backgrounds, including academia, government, and industry, is considered for inclusion. |

Source: Author's development

By adhering to these inclusion criteria, the literature selected for the research contribute substantively to the exploration of innovative risk management practices in the field of public administration in Ukraine, offering a well-rounded and insightful overview of the current landscape and future prospects. However, it is also worth highlighting certain limitations of this methodology, since the research is based on the analysis of literature, it is worth defining the subjectivism that may be present in the works.

Data analysis

Data analysis involves a thorough study of the selected literature to obtain key insights into

innovative risk management in public administration. This process includes thematic analysis, generalization of opinions and comparative analysis.

In particular, the thematic analysis enabled the identification of recurring themes, concepts and methodologies present in the literature to categorize and organize the results. The method of summarizing opinions has become important for the integration of information from different sources to build a coherent narrative about innovative risk management practices in the Ukrainian context of public administration. At the final stage, a comparative analysis was used, that is, a comprehensive comparison was made

between various studies, methodologies and results to identify patterns and variations in approaches to risk management.

Using these methods, the research aims to provide a comprehensive and detailed understanding of innovative strategies, prospects and limitations related to risk management in the sphere of public administration in Ukraine.

Results and discussion

Innovativeness in public administrations (PA) can be defined as the readiness and ability of administration to create, adopt, and implement solutions that contribute to improving both its internal processes and tasks carried out at the interface of administration and society (Akhmedova et al., 2022).

The criterion of scale of changes is usually closely related to the criterion of process stability. Thus, we can distinguish:

- radical innovations – causing breakthrough changes, involving a complete revolution in a given area; regarding process stability, such innovations are usually discontinuous;
- incremental innovations – involving the introduction of minor modifications to improve the current state; such innovations are typically continuous (Krok, 2018).

Considering the criterion of originality, or the degree of novelty:

- creative innovations, also known as pioneering or absolute innovations, which result from original solutions that have not yet been used;
- adaptive innovations, also known as imitative or replicative innovations, which replicate existing solutions but not in a negative sense. These are highly recommended for poorer countries that cannot afford extensive research on a large scale (Krok, 2018).

The classification according to the first three criteria largely overlaps with how innovations are applied in commercial firms. However, when it comes to the criterion of the object of innovation, innovations typical for public administration have been identified:

1. Service-related (new/improved public service), e.g., improving the quality of public transport (including its accessibility, frequency, environmental friendliness,

- punctuality, travel comfort, or reducing travel time), introducing city cards, making public bicycles available, creating industrial zones for entrepreneurs, developing incubators, establishing technological parks;
2. Process-related, technological (changes in the way of manufacturing/implementing/delivering services), related to the informatization of administration and the development of e-services;
3. Administrative (changes in procedural approaches, using new policy instruments), e.g., public consultations, citizen budgets;
4. Organizational (changes in the organizational structure of administration), e.g., quality management systems, formal solutions: communal associations – intermunicipal, inter-district, informal metropolitan networks (agglomerations);
5. Systemic (new way of interacting/cooperating with other organizations), e.g., public-private partnerships as an example of innovation in financial management (a private entity undertakes to implement a project for remuneration and to bear “all or part of the expenses for its implementation”; the public entity, in turn, undertakes to cooperate in achieving the goal of this project), cooperation with clusters (Mura, 2022; Krok, 2018).

Modern information society requires innovative methods of operation. The public sector is under increasing pressure to improve its organizations in terms of increasing efficiency, effectiveness, and raising the standard of services. One can observe the shaping of a specific culture of continuous improvement in the management of public institutions, using methods and tools applied in the private sector (Muliarevych, 2022; Savchuk et al., 2023). Aware of their rights, citizens are gradually raising the bar for public administration, demanding high quality, quickly delivered services, and full access to information.

In the literature, it has been discussed general perspectives on risk management in the public sector administration (Fedulova, 2019). Researchers have specifically addressed the risk associated with innovations in Public Service Organizations (PSOs) (Czerwińska, 2016; Ivanova, 2021). Similar to the commercial sector, innovations in the public sector involve investments and entail inherent risks. Both social and public innovations require resources for implementation, necessitating risk management (Tsekhmister et al., 2021a). The need for risk

management in the public sector stems from the focus of innovations on service profiles and delivery methods, which are crucial for society. Public risk arises when new services are created, existing ones are improved, or changes are made in service provision methods, customer

interactions, market expansion, or organizational adjustments for public service delivery. This indicates that public risk is inherent in such processes and is pervasive. PSOs may face different risks (See Table 2).

Table 2.
Risks, which PSOs may face with

| Risk | Description |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Technological innovations | Innovations such as improper integration and utilization of current technologies, inadequate adaptation of technologies to a specific PSO's needs, ineffective advanced IT and ICT processes, inadequate automation of routine processes, substandard service quality, unreliable IT support, inadequate delivery of ICT services, including online services in electronic communication, and a low level of quality control in public service performance) [i.e. technological risk, which arises from the deviations mentioned above in PSOs]. |
| Organizational innovations | It is including low internal effectiveness of the organization, ineffective and poorly organized combination of control and coordination processes, inadequate staff selection, low quality of human resources training and utilization, insufficient improvements in functional specializations, inadequate advisory support in management, ineffective management of a PSO, insufficient legal support and auditing, and low quality of HR services) [i.e. organizational risk, arising from the aforementioned deviations in PSOs] |
| Strategic innovations | Innovations such as inadequate flexibility, leading to a failure to adapt to a dynamic environment for a PSO, inadequate positioning of a PSO, insufficient defense against contradictory or non-compliant regulations, deficiencies in PSO management, inadequate online services, poor auditing and legal support, and ineffective marketing of services); [i.e. strategic risk, arising from the deviations mentioned above in PSOs]. |
| Operational innovations | It is including inadequate functional division of work, insufficient focus on PSO's key activities, neglect of PSO's operational capacity and image, inadequate language services, substandard courier services, poor quality of operational services, and inadequate security services, including lack of safety) etc. [i.e. operational risk, arising from the deviations mentioned above in PSOs]. |

Source: adapted from analysis Krok (2018); Akhmedova et al. (2022)

There are numerous other types of risks encountered when implementing innovations in public organizations, such as poor public relations. The significance of legal risk should be highlighted. Ignorance of the law is not an excuse, and all processes in PSOs require some form of legal support, especially concerning innovations. Legal errors can have specific consequences, including financial effects. Among the risks associated with innovations in public services, the focus should be on the risk of public service quality and cost (Kozuch & Sienkiewicz-Małyjurek, 2016). These are two primary components of innovation-related risks in public services. A third element to consider is the risk related to the time required to implement innovation processes in PSOs. All efforts to introduce innovations in PSOs aim to improve service quality. However, low quality of public services or service performance that fails to meet recipients' expectations should be seen as a fundamental type of risk (Raczkowski & Tworek, 2016).

Many post-socialist countries aspire to implement public administration reforms, but even those that have joined the EU have not achieved much success in a comprehensive reform of their PA systems to approach European standards. For example, Croatia has succeeded only in two areas, namely openness/transparency and regulatory policy. In the Czech Republic, the reforms that are needed are adopted formally without following up with substantive changes in public management. In Lithuania, the reform agendas have changed depending on the politically dominant parties, which have hindered overall progress. After 25 years of PA reform, Slovakia still lags behind the EU average level for most governance quality indicators due to path-dependency and excessive politicization (Mura, 2022).

By the middle of the 2010s, the Ukrainian public administration (PA) system had significantly deteriorated and was effectively destroyed, unable to ensure the well-being and security of

its citizens or even maintain statehood itself. Public institutions served the private interests of the ruling elite, which seized control of the most lucrative sectors of the national economy through state capture. This situation was not surprising, as Ukraine was among the post-socialist countries most resistant to PA reforms. This viewpoint was widely held among Ukrainian scholars, who attributed the nation's political, economic, and social development challenges to the outdated post-Soviet PA system, which was incapable of formulating adequate policies or implementing them efficiently in the face of volatile internal and external conditions.

The essence of management innovations in Ukraine encompasses the strategic implementation of novel approaches within the management system to enhance efficiency and effectiveness in achieving organizational goals. This is particularly crucial in the context of the country's ongoing reform programs, where the successful integration of management innovations aims to create and maintain sustainable competitive advantages, ultimately expanding the socio-economic capabilities of management objects and subjects (Portnoy, 2023). In the Ukrainian context, the development and implementation of innovative mechanisms are deemed essential for fostering a conducive environment for innovation, leveraging advanced scientific achievements, and

incorporating successful practices into the management activities of public authorities. These innovative mechanisms operate across various levels of economic management, contributing to the formulation of the state's innovative development strategy at the macro level. They play a pivotal role in creating a favorable innovation climate for the national economy and driving the implementation of state-led innovative projects.

At the regional level, similar tasks are performed, with a tailored approach that considers the distinctive characteristics of different regions within Ukraine. The importance of innovative mechanisms is particularly highlighted in the local context, especially with the decentralization of power (Fedulova, 2019).

At this level, innovative mechanisms become instrumental in resource utilization, strategy implementation, and the execution of development projects within united territorial communities (UTCs). In the micro-level landscape of Ukraine, innovative mechanisms play a vital role in providing favorable conditions for the development of creative thinking, research, and the successful implementation of innovations. Civil society's active participation becomes an integral component, emphasizing the importance of grassroots involvement in the innovation process (See Table 3).

Table 3.
A structured overview of how innovative mechanisms operate at different levels of economic management in Ukraine

| Level of Management | Key Functions of Innovative Mechanisms in Ukraine | Examples and Context |
|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Macro Level | Formulation of state's innovative development strategy, fostering a conducive innovation climate, and driving state-led innovative projects. | Implementation of the "Concept for the development of the digital economy and society of Ukraine0," integration into the EU Program Interoperability Solutions, participation in eCODEX and e-Invoicing projects. |
| Regional Level | Similar tasks performed, considering distinctive characteristics of different regions within Ukraine. | Tailoring digitalization initiatives to regional nuances, adapting strategies for innovation based on regional needs. |
| Local Level (Decentralized) | Innovative mechanisms become crucial in resource utilization, strategy implementation, and execution of development projects within united territorial communities (UTCs). | Implementing digital tools for local governance, utilizing innovative approaches in resource allocation, and community-driven development projects. |
| Micro Level | Providing favorable conditions for the development of creative thinking, research, and the successful implementation of innovations with active participation from civil society. | Encouraging local innovation hubs, supporting community-driven initiatives, and involving citizens in decision-making processes. |

Source: Fedulova (2019).

Therefore, the deployment of innovative mechanisms in Ukraine operates at various levels

of economic management, tailoring strategies to regional and local dynamics. These mechanisms

actively involve the micro-level, promoting community-driven innovation and fostering an environment that encourages creativity (Akhmedova et al., 2022). In the Ukrainian context, innovative mechanisms not only adapt to the evolving landscape but also proactively shape and drive the trajectory of management practices, ensuring continual progression and competitiveness in alignment with the country's socio-economic goals.

In the realm of public management of Ukraine, the pursuit of innovation is paramount for addressing contemporary challenges and fostering sustainable development. The practical application of innovative approaches in public administration encompasses a spectrum of key issues that are central to advancing governance and enhancing the quality of public services. The most pertinent issues in the field of public management innovation in Ukraine include:

1. Formation of an innovative model of city development.

Knowledge economy foundation. The emphasis lies in establishing a city development model grounded in the principles of the knowledge economy. This involves leveraging intellectual capital, fostering research and development initiatives, and promoting educational advancements to drive economic growth (Fedulova, 2019).

2. Search for investments in innovative entrepreneurial areas.

Attraction of foreign investments. A critical aspect is the active pursuit of investments for innovative entrepreneurial activities. This extends to the proactive engagement with foreign investors to fuel local and regional development, thereby stimulating economic growth through innovative ventures (Fedulova, 2019; Bannikov et al., 2022).

3. Development of a network of innovative structures.

Establishment of Business Centers and Startups.

To cultivate innovation, the focus is on creating a network of innovative structures, such as business centers and startup companies. This initiative is aimed at fostering entrepreneurship, providing a supportive ecosystem for startups, and promoting a culture of continuous innovation (Bannikov et al., 2022; Tsekhmister et al., 2021b).

4. Management of Quality Services through ISO 9001:2000.

International Standards Implementation. A critical facet involves the management of the quality of public services through the adoption of the International Organization for Standardization (ISO) 9001:2000. This international standard serves as a framework for ensuring the effectiveness and efficiency of administrative services.

5. Institutional development of analytical centers (Fedulova, 2019)

Integration of Knowledge into Local Governance. An essential component is the institutional development of analytical centers and consulting structures. These entities serve as instruments for injecting knowledge into the activities of local self-government bodies, enhancing informed decision-making and policy formulation (Bučková, 2015; Tsekhmister et al., 2021b).

6. Cultural and Economic Regionalization.

Localization of Cultural Industries. Another key consideration is the cultural and economic regionalization strategy. This involves the localization of models for the development of cultural (creative) industries, thereby contributing to the formation of an innovative capacity within the social environment (Fedulova, 2019).

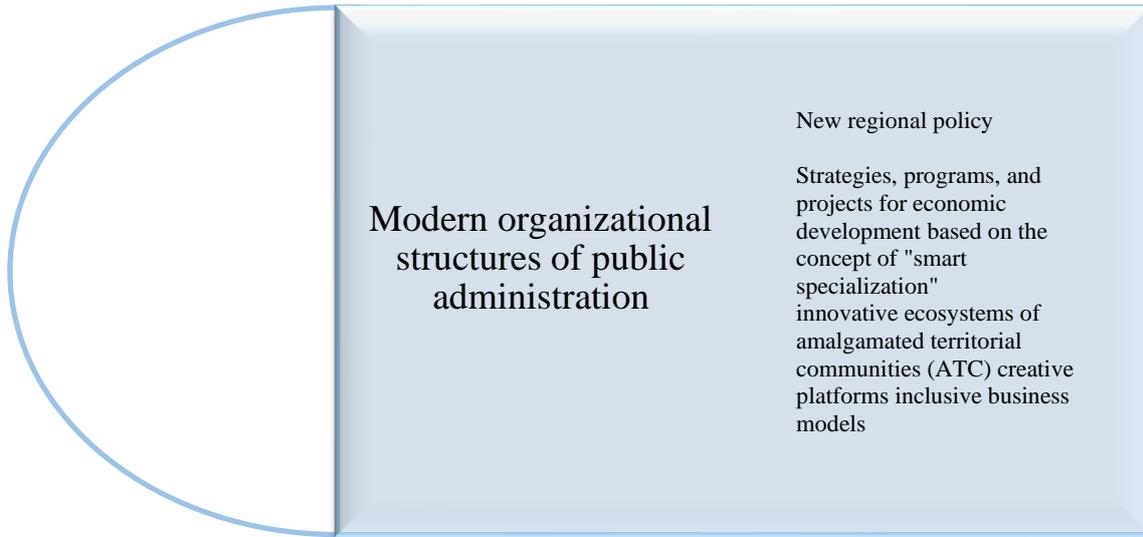


Figure 1. Modern organizational structures of public administration.
Source: based on Fedulova (2019)

In Ukraine, the government's operational agenda has explicitly outlined the digitalization of the country as a pivotal innovative approach, as outlined in the priorities. This strategic emphasis on digitalization aligns with overarching goals that encompass the comprehensive transformation of public services, widespread digital literacy training for a minimum of 6 million Ukrainians, and the ambitious target of integrating up to 10% of the IT sector into the country's gross domestic product (Kostenyuk et al., 2021). The strategic roadmap for digitization prioritizes specific sectors crucial to the nation's development, including customs, tax administration, urban planning, land protection, healthcare, education, social protection, pension provision, judicial proceedings, and information security (Digital Agenda of Ukraine-2020, 2016). The overarching aim is to enhance the efficiency, transparency, and accessibility of these sectors through the strategic application of digital technologies (HITECH office, 2016). Digital technologies, as the cornerstone of the state's digital development policy, are envisioned to uphold fundamental principles. These principles include default digitization, ensuring openness, reusability of data, technology neutrality, and portability of information, citizen-centricity, inclusiveness, accessibility, safety, and privacy (Portnoy, 2023). The adoption of these principles by executive authorities is not merely a procedural formality; rather, it marks a pivotal shift, creating a point of no return from analog elements in administrative and management decision-making processes. The commitment to digitalization reflects a transformative agenda where the government seeks to harness the full potential of technology

to streamline public services, empower citizens through digital literacy, and integrate the IT sector as a driving force in the national economy. This strategic focus not only propels Ukraine towards the digital future but also underscores a fundamental shift in governance philosophy towards a more transparent, efficient, and citizen-centric paradigm (Kostenyuk et al., 2021).

Acknowledging the prevailing global trends in digital advancements within the realm of public administration, Ukraine has positioned itself to embrace a forward-looking approach. This commitment is exemplified by the enactment of the Cabinet of Ministers of Ukraine's Decree No. 67 on January 17, 2018, which formally approved the "Concept for the development of the digital economy and society of Ukraine for 2018-2020 (Order, 2018)." This strategic framework envisions a synergistic integration of social, mobile, cloud technologies, data analytics, and the Internet of Things. The collective application of these technologies is anticipated to catalyze transformative shifts in public administration, rendering the sector more effective, responsive, and valuable to the citizenry. Aligned with the provisions outlined in the Concept, Ukraine embarked on a comprehensive digitalization initiative across three key areas during the period 2018–2023, harmonizing with European legislation standards (Order No 167, 2021). The first strategic thrust revolves around interoperability (Interoperability) and electronic services (eServices). Ukraine actively participated in the EU Program Interoperability Solutions for European Public Administrations 2, engaged in

projects such as eCODEX and e-Invoicing, and contributed to the Single Digital Gateway initiative (Order No. 649, 2017). These initiatives aim to enhance collaboration, streamline services, and foster interoperability between Ukraine and European counterparts. The second strategic focus area is open data, marked by the establishment of the state open data web portal (data.gov.ua). This portal was seamlessly integrated into the central European open data portal europeandataportal.eu and data.europa.eu (Kostenyuk et al., 2021). The objective is to boost the transparency, openness, and efficiency of governmental operations, laying the groundwork for the burgeoning open data industry. The third crucial facet of the digitalization strategy is electronic identification (eID), aligning with the implementation of Regulation No. 910 (eIDAS) adopted by the EU in 2014 (EDICOM, s.f). The overarching objective of this regulation is to set uniform standards for electronic identification development, provision of electronic trust services within EU countries, and the facilitation of cross-border e-identification (Resolution No.

56., 2019). This project is oriented towards standardizing electronic identification in realms such as e-medicine, electronic public services, and e-banking. The ultimate goal is to contribute to the development of the EU Digital Single Market, promote cross-border collaboration, enhance the mobility of EU citizens and businesses, and reinforce the digital infrastructure. Ukraine's strategic pursuits in the digitalization landscape reflect not only an alignment with international best practices but also a commitment to fostering innovation, transparency, and efficiency within its public administration (Kostenyuk et al., 2021). The outlined initiatives underscore Ukraine's proactive stance in embracing digital transformations to propel the nation into a more connected and technologically advanced future. On the other hand, in the context of Ukraine, several constraints impede the seamless digitalization of public administration. These limitations stem from various factors, including technological, infrastructural, regulatory, and socio-economic aspects (See Table 4).

Table 4.
Description of constraints on public administration digitalization in Ukraine

| Infrastructure Challenges | |
|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Example | Limited broadband access in rural areas hinders the widespread adoption of digital services, as citizens may face difficulties accessing online platforms. |
| Technological Gaps | |
| Example | Outdated hardware and software in some government agencies may result in compatibility issues, slowing down the overall digitalization process. |
| Cybersecurity Concerns | |
| Example | Heightened vulnerability to cyber threats poses a challenge, as inadequate cybersecurity measures may compromise the integrity and security of digital systems. |
| Limited Digital Literacy | |
| Example | A significant portion of the population lacks sufficient digital literacy skills, hindering their ability to fully engage with online public services. |
| Bureaucratic Inertia | |
| Example | Resistance to change within bureaucratic structures may impede the swift implementation of digital solutions, as officials may be reluctant to adopt new technologies. |
| Resource Constraints | |
| Example | Limited financial resources allocated to digitalization initiatives may slow down progress, preventing the acquisition of advanced technologies or the hiring of skilled personnel. |
| Legal and Regulatory Framework | |
| Example | Complex and outdated regulatory frameworks may create legal uncertainties and impede the development of clear guidelines for digital initiatives. |
| Interoperability Challenges | |
| Example | Lack of standardized systems across government agencies may lead to interoperability issues, hindering seamless data exchange and collaboration. |
| Data Privacy Concerns | |
| Example | Stringent data protection regulations may limit the scope of digital initiatives, as concerns over privacy may result in cautious implementation. |
| Educational System Challenges | |
| Example | Insufficient integration of digital skills into the education system may result in a workforce that lacks the necessary skills for effective digital participation. |

Source: Author's development

Ukraine has shown a commitment to embracing digital advancements in public administration, as seen in the approval of the “Concept of the development of digital competences and the approval of the plan of measures for its implementation” (Order No 167, 2021) This strategic framework aims to integrate technologies such as social, mobile, cloud, data analytics, and the Internet of Things to enhance public administration effectiveness. Initiatives such as interoperability, open data, and electronic identification align with European standards and aim to boost transparency, efficiency, and collaboration. Despite these efforts, Ukraine faces constraints in digitalization, including technological, infrastructural, regulatory, and socio-economic factors.

The results obtained during the study confirm the conclusions of other scientists. In particular, it is important to agree with the conclusions of Sayed (2023) regarding the use of certain business practices in modern public administration, which is provided by state authorities. Similarly, the proposed study confirmed the results of Volokhova & Evseenko (2016). Volokhova & Evseenko (2016) offer new definitions of vectors for the development of innovative methodological approaches to the study of social responsibility in the field of risk management. On the basis of the obtained results, it is possible to confirm the hypothesis of the specified researchers that, under modern circumstances, an important renewal of the public administration system is taking place in Ukraine. At the same time, if they emphasized the digitalization of such management as a deep prospect, it is evident in the proposed study that such prospects did not require a long time to be realized. It is worth agreeing with the general concepts of Jurczak (2016), who believed that the use of intellectual capital is an important factor in the provision of qualified administrative services. As indicated in the study, despite the numerous challenges, one of the ways of further improvement is the involvement of high-level specialists with relevant skills and knowledge not only in the professional field, but also in the ability to communicate with service users. By the way, similar conclusions were also reached by other scientists who identified the importance of training and training of personnel as important elements of the further reform of public administration (Bodemann, 2018; Kish, 2023). Instead, the conclusions of Razumei and Razumei (2021), which suggest prematurely turning to the experience of leading countries and abandoning the paper circulation of documentation, seem premature. Under the

current conditions in Ukrainian realities, such initiatives look premature against the background of not only the usual risks proposed in the article, but also due to the armed aggression of the Russian regime.

It is important to understand the limitations of such a methodology. For example, limited availability of data on corporate social responsibility and risk management practices are big issues for further discussions. Another limitation is complexity in measuring corporate social responsibility and the impact of risk management on this metric. The third one is heterogeneity of approaches to defining corporate social responsibility and risk management across different countries and industries. In summary, innovative research methodologies for studying social responsibility in the field of risk management highlighted the intersection of these two areas and offering new perspectives for analysis and evaluation.

Conclusions

During the research analysis, it was determined that innovative approaches in the management of public affairs in Ukraine are key to achieving strategic goals. It has been proven that the development and implementation of innovative mechanisms are of decisive importance for creating a favorable environment for innovation and the implementation of advanced scientific achievements in the activities of public bodies.

These innovative mechanisms operating at different levels – macro-, regional, and micro-levels — contribute to the formulation of the state's innovation development strategy, the creation of a favorable climate for innovation in the national economy, and the implementation of state innovation projects. It is proven that these mechanisms are important for adaptation to various characteristics of regions at the regional level and are key in the conditions of decentralization of power at the local level, ensuring optimal use of resources and implementation of development projects of united territorial communities.

At the micro level, innovation mechanisms are catalysts for the development of creative thinking, research and successful implementation of innovations, with the active participation of civil society, which emphasizes the importance of their participation in the innovation process.

However, it is important to determine that there are certain limitations on the way to the successful implementation of innovations in the management of public affairs in Ukraine. First of all, this includes the need to overcome administrative bureaucratic obstacles, improve the legal framework and provide financial support for the implementation of innovative projects. In addition, it is important to ensure openness and transparency in management processes, as well as to actively involve citizens in management decisions to ensure greater legitimacy and support for innovation in society. Besides, it is important to appreciate the limitations of the research methodology. For example, limited availability of data on corporate social responsibility and risk management practices are big issues for further discussions. In addition, other limitations of the chosen methodology should also be taken into account. Since the research is based on the analysis of literature, subjectivism is possible in the selected works.

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DOI: <https://doi.org/10.34069/AI/2024.74.02.27>

How to Cite:

Yarmoliuk, O., Abramov, A., Mulyk, T., Smirnova, N., & Ponomarova, N. (2024). Digital technologies in accounting and reporting: benefits, limitations, and possible risks. *Amazonia Investiga*, 13(74), 323-333. <https://doi.org/10.34069/AI/2024.74.02.27>

Digital technologies in accounting and reporting: benefits, limitations, and possible risks

Las tecnologías digitales en la contabilidad y la elaboración de informes: ventajas, limitaciones y posibles riesgos

Received: January 5, 2024

Accepted: February 23, 2024

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Abstract

Digital technologies are the need of the hour in the accounting field in the current 4th industrial revolution. Digital transformation positively and negatively affects all areas of business. The new technologies are disrupting the accounting field. Digital transformation is pressuring accounting practitioners and graduates to learn digital skills but despite the emergence of new technologies in the accounting field, it is unfortunate that not much is known concerning the impact of digital technologies in the accounting field. This paper critically examines the contribution of digital technologies in accounting and reporting focusing on its advantages, limitations, and possible risks. A systematic literature review methodology, inductive approach and thematic analysis was adopted. Despite the limitations of digital technologies in accounting like poor data governance systems, cyber-attacks, and

Resumen

Las tecnologías digitales son la necesidad del momento en el campo de la contabilidad en la actual 4ª revolución industrial. La transformación digital afecta positiva y negativamente a todos los ámbitos de la empresa. Las nuevas tecnologías están perturbando el campo de la contabilidad. La transformación digital está presionando a los profesionales de la contabilidad y a los licenciados en contabilidad para que aprendan competencias digitales. Se adoptó una metodología de revisión sistemática de la literatura, un enfoque inductivo y un análisis temático. A pesar de las limitaciones de las tecnologías digitales en la contabilidad, como los sistemas deficientes de gobernanza de datos, los ciberataques y la violación la privacidad, se puso de manifiesto tecnologías digitales desempeñan un papel importante el suministro de datos e información contables en tiempo real, la automatización de las actividades contables

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infringement of privacy, it emerged that digital technologies play a significant role in the provision of real-time accounting data and information, automation of routine accounting activities, visualization of accounting information, augmenting big data analysis, and eliminating errors as well as improving efficiency in accounting. Digital technologies are transforming the accounting arena by boosting efficiency and effectiveness. We recommend accounting professionals, practitioners and policy makers should invest in new digital technologies.

Keywords: Accounting practices, digital technologies advantages, limitations, risks.

Introduction

Modern digital technologies like Artificial Intelligence (AI) and Industry 4.0 have revolutionised the accounting and auditing profession tremendously (Munoko et al., 2020; Al-Sayyed et al., 2021; Han et al., 2023;) as confirmed by surmountable antecedent literature evidence (Lasi et al., 2014; Tjahjono et al., 2017; Loureiro et al., 2021; Jamwal et al., 2021; Polak, 2021; Enholm et al., 2022). In the current 4th industrial revolution, digitalisation of the accounting process, like what social capital is to institutional change (Hrytsaienko et al., 2022), is the trending topic that demands that accounting professionals acquire digital skills and knowledge. Digitalisation has transformed all the elements of the value chain and accounting is not an exception (Odat et al., 2023; Ramayani et al., 2023). Despite the acknowledged benefits of digitalization in accounting, from the antecedent literature point of view, there remains a significant gap in understanding its holistic impact on accounting accuracy, efficiency, and the role and relevancy of accountants in a digitized environment. Also, there still exist a void in extant literature particularly on providing a compressive environmental scanning of strengths, weaknesses, opportunities, and threats (SWOT) analysis of digital technologies in the accounting field using systematic literature review approach. As we are living in an interconnected world dominated by artificial intelligence, robots, deep learning, and machine learning, it is no surprise that these technologies are automating the accounting processes of both small and big companies around the world (Sanakuiev, 2022). It is within this context that advanced technologies are forcing accounting professionals to move away from manual routine tasks to automated processes (Kumala et al., 2021; Odat et al., 2023). Digital technologies like

rutinarias, la visualización de la información contable, el aumento del análisis de macrodatos eliminación de errores, así como la mejora de la eficiencia en la contabilidad. Las tecnologías digitales están transformando el ámbito de la contabilidad al impulsar la eficiencia eficaz. Recomendamos a los profesionales de la contabilidad, a los profesionales y a los responsables políticos que inviertan en nuevas tecnologías digitales contables.

Palabras clave: Prácticas contables, tecnologías digitales ventajas, limitaciones, riesgos.

macroeconomics variables (Gunanto, 2023) have a potential of increasing profitability of accounting firms and their clients.

The paper-based accounting has been associated with myriad of challenges and limitations such as errors. In modern accounting, it is deemed necessary for organizations to digitalise their accounting process so as to speed up the dissemination of accounting information in an organization. Digitisation of accounting profession perform wonder similar to what post-socialist transformation did to the EU and Polish economy (Ladonko et al., 2022). This study specifically focuses on the adoption of AI, robots and machine learning in automating accounting tasks and its consequent effect on the productivity, efficiency and accuracy of financial reporting. In light of the above, it is necessary to automate routine accounting activities whereby the invoices are digitalized. Like what AI does to does to study and research tasks (Sanakuiev, 2022), with the adoption of automated accounting workflows, there is assurance of better accounting record management (Yigitbasioglu et al., 2023). Accounting field has undergone tremendous changes over a period of time. Starting from a pre-computer epoch to a period of modern accounting which is anchored on tech-savvy society. Gone are the days in which bookkeepers depended on manual accounting. In this modern era, digitalized accounting eliminates human errors and then boosts productivity (Ratmono et al., 2023). By definition, accounting is the process of collecting, analyzing, interpreting, and reporting financial-related information. With the adoption of artificial intelligence, accountants are changing the way they analyze data and make evidence-based decisions.

With increasing competition, globalization, and technological development, the accounting profession is changing drastically (Hilali et al., 2020; Ratmono et al., 2023). Similar to what neuromarketing does to brand engagement and marketing profession (Hurzhyi et al., 2023), for accountancy professions, there is a big risk of automation which can lead to high unemployment for accountants as compared to other professions. However, the auditors' work has not been tremendously affected by the emerging digital technology, but the technologies only affected how they communicate and document accounting information (Kumala et al., 2021; Saad et al., 2022). It is with this context that auditors' efficiency has significantly improved due to their anti-crisis management and abilities to offer solution and prospect to morden organisational challenges in real time (Rybalchenko et al., 2022; Hurzhyi et al., 2023; Sembiyeva et al., 2023). These highlights related to the accounting profession concurs with evidence that adoption of digital technologies like what mortgage lending does to the construction industry (Abdullayeva & Ataeva, 2022), is a double-edged sword (Gutsalenko et al., 2018; Vdovichena et al., 2022; Otonne et al., 2023). Confirming evidence from the medical field (Sofilkanych et al., 2023), despite the emergence of new technologies in the accounting field, it is unfortunate that not much is known concerning the impact of digital technologies in the accounting field. Furthermore, studies that applied the SWOT analysis to assess the role of digital technologies in revolutionising the accounting profession using systematic literature review approach are sparse. Therefore, this paper is an attempt to critically examine the contribution of digital technologies in accounting and reporting with a special focus on its advantages, limitations, and possible risks using environmental scanning lenses (SWOT analysis). Thus, the aim of this research is to critically analyze the impact of digitalization, particularly AI and Industry 4.0 technologies, on the efficiency, accuracy, and roles within the accounting profession.

In light of the main research aim, the specific research question that the study seeks to answer are:

1. What are the implications of digital technologies on the accuracy of financial reporting?
2. How does digitalization affect the role and skills requirements of accounting professionals?

The paper starts firstly provides a comprehensive literature review overview to the highlighted study gap with the aim of answering the specific study questions. Secondly, the research methodology used to achieve the research objectives will be provided, third, the findings on the advantages, weaknesses, and limitation of digitation on the accounting profession will be reported and analysed. lastly, conclusion and policy implication arising from the study will be proffered.

Theoretical framework or literature review

This study is informed by the Technology Acceptance Model. This model was developed by Davis et al. (1989). This model was anchored on the need for the application of technology in the 1980s by the Massachusetts Institute of Technology and BM Canada. This model is used as the theoretical lens with which to assess the acceptance of new technologies as proposed by Davis et al. (1989). It is within this context that accounting history has evolved owing to the emergence of digitalized information and communication technology (Ramayani et al., 2023). With the emergence of digitalized technologies and tools, the transformation of the accounting field has been witnessed whereby timely and relevant accounting information is shared with internal and external stakeholders instantly.

Drawing from the insights of the Technology Acceptance Model, it is not surprising to note that digitalized information and communication technologies offer more responsiveness in terms of recording accounting data and information (AlNasrallah, & Saleem, 2022; Ramayani et al., 2023). The acceptance of digital technologies like artificial intelligence and deep learning has improved the quality of accounting information and also augmented the level of disclosure and transparency. The adoption of digital technologies in the accountancy profession has ensured efficiency in the provision and dissemination of accounting information.

More interestingly, small and medium enterprises are also adopting e-accounting in line with the digitalization paradigm shift of the 21st century (Kumala et al., 2021). E-accounting offers a solution for the disclosure and transparency of financial information. Despite the importance of e-accounting to small and medium enterprises, it is evident that they have to consider many factors before adopting digital technologies in the accounting field. These factors are the availability of digital skills and

competencies, the cost of the e-accounting system, the culture of the organization, and the limitations of e-accounting software.

Extensive literature evidence from existing studies have shown that digital technologies are useful to efficiency, effective service delivery and customer satisfaction (Demirkan et al., 2016; Tekbas & Nonwoven, 2018). For example, Kozarkiewicz (2020) find that digital technologies enable organizations to keep abreast with ever changing customer needs, overcome threats by creating new and better competitiveness opportunities which brings value for future sustainability. Moreover, financial sustainability of accounting firms is increased by digitisation of core business functions and abandonment of cumbersome and demanding manual processes towards operations automation due to increased speed, accuracy, and cost-effectiveness of performance and boosting audit quality and efficiency (Payne & Curtis, 2017; Al-Htaybat et al., 2017; Clohessy et al., 2017; Hilali et al., 2020; Verhoef et al., 2021). These benefits accrue due to new avenues opened by digital transformation like cloud computing, which allows firms to use latest accounting software and infrastructure (Trigo et al., 2014; Pedrosa & Costa, (2014, 2020) as well reduced forecasting errors Bin-Abbas & Bakry, 2014; Tsai et al., 2015; Rezaee et al., 2002; Manita et al., 2020; Erasmus & Marnewick, 2021; Papagiannidis et al., 2023). Accounting information production cost are significantly reduced by digital technology usage and ensures its timeous and continuous availability (Correia et al., 2019; Sofilkanych et al., 2023), enabling easy storage, processing, and analysis of large volume of data critical for decision-making (Maciejewski, 2017; Rippa & Secundo, 2019; Sheng et al., 2020). Though the way auditors communicate, and document accounting information is adversely affected by the emergency of digital technology (Kumala et al. (2021) in contrast, efficiency and accuracy of tasks, information reporting and interpretation, is enhanced since all transactions are conducted in an electronic environment (Begum, 2019; Phornlaphatrachakorn & Kalasindhu, 2021) and real-time accounting automated enable firms to efficiently review their processes and procedures and address loophole promptly. For example, Begum (2019) finds that the use of blockchain technology ensures the immutability of shared records via decentralization of the digital ledger.

Additionally, evidence have shown that the appetite to adopt digital accounting information system, financial reports quality, and the

effectiveness of strategic decision-making is much dependent on the speed of digital transformation (Phornlaphatrachakorn & Nakalasinghu, 2021; Al-Htaybat et al., 2017). Digital technologies hae also a darker side. The first risk is vulnerability to internet hackers which endangers the whole organizations, clients and individuals' employees' private and confidential financial information and also compromising the reliability of source data and financial statements (Barta, 2018; Thottoli, 2021). Cloud computing-based technology for example enforces certain threats like inadequate data protection and confidentiality (Chou, 2015), another risk include increase in structural unemployment of accounting professionals due to their perfect substitutability with digital technologies which are much efficient, more reliable, more precise and cost effective. Interestingly, like evidence from the medical field (Sofilkanych et al., 2023) and neuromarketing (Hurzhyi et al., 2023), despite the emergence of new technologies in the accounting field, it is unfortunate that not much is known concerning the quantifiable (monetary value) of losses, unemployment compensation claims and number of new jobs created due to risks caused by digital technologies risks in the accounting firms which have adopted AI, robots, softwares and machine learning. This is suggested as the new direction further studies should pursue.

In conclusion, the digital transformation is a catalyst for efficiency, accuracy, and innovation in accounting. It enhances the role of accountants, allowing them to focus on more creative, non-routine tasks. For auditors, it contributes to precise planning, analytical review procedures, relative importance assessments, internal control evaluations, and continuity decisions (Herbert et al., 2016; Gulin et al., 2019). The adoption of digital technologies is not only beneficial for organizations but also revolutionizes the roles and responsibilities of accountants and auditors in the ever-evolving digital landscape. But it also has a darker side. Thus, in light of the SWOT analysis, digitisation of accounting field has strength, weaknesses, creates opportunities and threats. Surprisingly, studies that applied the SWOT analysis to assess the role of digital technologies in revolutionising the accounting profession using systematic literature review approach are sparse. Thus, this study seeks to close this extant literature gap.

Methodology

General background

The research is grounded in technological acceptance theory, addressing a gap in the literature concerning the impact of digital technologies in the accounting field, and seeks to contribute to the field by attempting to critically examine the contribution of digital technologies in accounting and reporting with a special focus on its advantages, limitations, and possible risks. The study adopted a series of scientific method to answer the research questions.

Like similar studies Nurgaliyeva et al. (2022) Sofilkanych et al. (2023), the study applies the critical realism philosophy, induction, methods of logical and structural analysis, deduction narrative enquiry, systematic literature review, comparison as well as concretisation and formalisation. Guided by the technological acceptance theoretical model and the study was done considering the priority principles of conducting comprehensive research, using a systematic approach. Detailed procedure followed to accomplish the task, as well as the inclusion and exclusion criteria are addresses in the section.

Instrument and procedures

The selection process was aided by bibliometrics software, ensuring a thorough and replicable

search strategy. The review followed four fundamental steps in line with the review protocol adopted similar studies (Vdovichena et al., 2022; Enhholm et al., (2022) and Nurgaliyeva et al. (2022). Firstly, framing the research question and the search criteria for articles to be reviewed (identification stage). Secondly, the searching for relevant articles using search criteria (Screening stage). The search terms used are “advantages, risks and limitations of AI, robots and machine learning in accounting and reporting”. Thirdly, assessing the articles for relevance to the study in line with inclusion and exclusion criteria (eligibility stage). The inclusion criteria were based on relevant literature searches of global databases on the research topic in professional journals, monographs, and materials of scientific conferences using the search words from step 2. The searched data bases are Scopus, IBSS, Google Sholar, Science Direct, and Web of Science. Lastly, summarising the outcomes from the review and interpreting the findings (inclusion stage). The exclusion criteria employed is exclusion of grey literature and studies which that used other digital technologies other than AI, robots and machine learning. The analysis of the review findings was presented using thematic analysis. The review process is expanded in Figure 1. For example, Figure 1 illustrates the step-by-step process of our systematic and inductive literature review, detailing each stage from identification to inclusion.

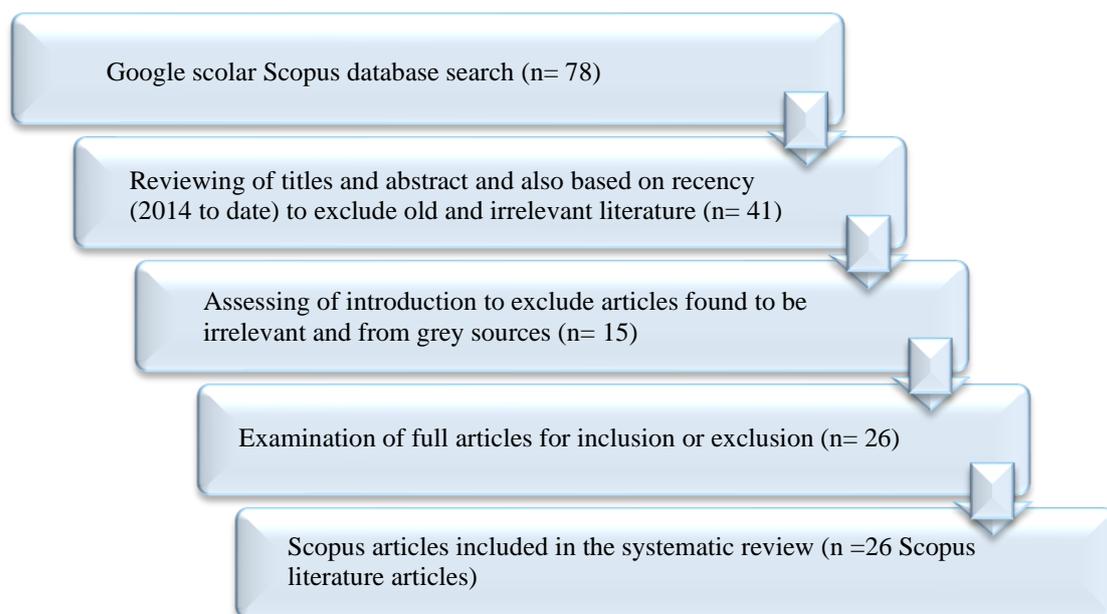


Figure 1. Systematic, deductive and inductive literature review process.

Source: authors' own development

Data analysis

The study applies the thematic analysis analysis on three emerging themes from the four-step systematic, deductive and inductive process. The three emerging themes emanates from the search words are “advantages of using AI, robots and machine learning on accounting and practice”, limitations of using AI, robots and machine learning on accounting and practice” and “risks of using AI, robots and machine learning on accounting and practice”. There results will be reported through the narrative and use of tables approach as per the three emerging issues. Since this is a qualitative study, we check for trustworthiness of the systematic literature reviewed by only using verifiable and articles from accredited international referred journals and exclude grey literature as well as data

triangulation. The methodology is not free from shortfalls. For example, it does no segregate advantaged and risks of digital technologies of developing, developed and emerging economies differently which require a case study approach as well as quantitative design. Moreover, given that it’s a qualitative study it cannot show the extent of the impact of digitisation on accounting profession based on hypothesis testing.

Results and discussion

The systematic, inductive, and thematic literature review evidence on advantages, risks and limitation of digital technologies on accounting and reporting are summarised in Table 1. The detailed narration in the context of body of knowledge of the study finding follows the table.

Table 1.
Advantages, risks, and limitations of Digital technologies on accounting and practice

| Themes | |
|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Advantages | <ul style="list-style-type: none"> * Digital technologies like leveraging AI, cloud computing, big data analytics, and deep learning advancements can improve accounting and auditing practices. * Digital technologies like artificial intelligence (AI) boosting audit quality and efficiency. * Digital technologies also lead to time saving in audit tasks and allows auditors to allocate their time and effort effectively. * Digital technologies reduced audit costs and enhanced productivity and dependability in accounting and reporting profession. * Digital technologies foster accuracy, precision, and data quality leading to better financial reporting and analysis. |
| Risks | <ul style="list-style-type: none"> * Cyber-security risk – digital technologies are vulnerable to internet hackers which endangers the whole organizations, clients and individuals employees private and confidential financial information and also compromising the reliability of source data and financial statements. * Cloud computing-based technology like Gutsalenko et al. (2018) observed enforces certain threats such as inadequate data protection and confidentiality. * Digital technologies lead to high structural unemployment of accounting professionals due to their perfect substitutability with digital technologies which are much efficient, more reliable, more precise and cost effective. * Shortages of technologically competent and experienced accounting professionals like auditors in the job market. * Environmental factors like poor macroeconomic performance which affect the size of a client's business since digital technologies yield economies of scale and scope on a larger accounting clients and tasks. |
| Limitations | <ul style="list-style-type: none"> * Exorbitant cost of digital accounting softwares to perform computer-assisted auditing tools and techniques (CAATs) hinders digital technologies in accounting profession. For example, Pedrosa and Costa, (2014, 2020) find that computer-assisted data mining techniques are still neglected or used by only a few practicing accounting professionals. * Unavailability of generalized audit software (GAS) in a variety of languages as hinderances of digital technologies on effectiveness of accounting and reporting. * Inadequate computerised auditing training as well as limited understanding of special functions of audit software by audit assistants. * Unreliable digital technologies complements like reliable internet connectivity and electricity especially in developing economies |

Source: authors' own development

Theme 1. Advantages of digitisation on accounting and reporting

Evidence from extant literature evidence show that digital technologies like leveraging AI, cloud computing, big data analytics, and deep learning advancements can improve accounting and auditing practices (Clohessy et al., 2017; Verhoef et al., 2021) by boosting audit quality and efficiency (Payne & Curtis, 2017; Hilali et al., 2020). Similarly, Yigitbasioglu et al. (2023) find the adoption of automated accounting workflows results in better accounting record management and Jain (2023) observes green innovation do to catalyse investment perception and firm performance. Digital technologies also lead to time saving in audit tasks, which allows auditors to allocate their time and effort effectively (Thottoli et al., 2022), reduced audit costs and enhanced productivity and dependability (Correia et al., 2019; Sofilkanych et al., 2023) as well as improving management effectiveness (Hilali et al., 2020), accuracy, precision and data quality (Bin-Abbas & Bakry, 2014; Tsai et al., 2015; Rezaee et al., 2002; Manita et al., 2020; Erasmus & Marnewick, 2021; Papagiannidis et al., 2023). However, Kumala et al. (2021) find the auditors' work has not been tremendously affected by the emerging digital technology, but the technologies only affected how they communicate and document accounting information. Thus, there is further which exact aspects of accounting information and documentations which were affected more.

However, the auditors' work has not been tremendously affected by the emerging digital technology, but the technologies only affected how they communicate and document accounting information (Kumala et al., 2021). It is with this context that auditors' efficiency in these areas of accounting has significantly improved, due to anti-crisis abilities and offer solution and prospect to modern organisational challenges (Rybalchenko et al., 2022; Hurzhyi et al., 2023; Sembiyeva et al., 2023). Like evidence from the medical field (Sofilkanych et al., 2023), despite the emergence of new technologies in the accounting field, it is unfortunate that not much is known concerning the impact of digital technologies in the accounting field.

Theme 2. Risks of Digital technologies on accounting and reporting

Literature review evidence shows that like similar in professions such as marketing (Hurzhyi et al., 2023), medical science (Sofilkanych et al., 2023), government department (Odat, 2023) and green energy sector

(Sembiyeva, et al., 2023), digitisation poses dangers to accounting and reporting profession. This concur with evidence that adoption of digital technologies like what mortgage lending is to the construction industry (Abdullayeva & Ataeva, 2022), is a double-edged sword (Gutsalenko et al., 2018; Vdovichenina et al., 2022; Otonne et al., 2023). The first risk is vulnerability to internet hackers which endangers the whole organizations, clients and individuals' employees' private and confidential financial information and also compromising the reliability of source data and financial statements (Barta, 2018; Thottoli, 2021). Cloud computing-based technology for example enforces certain threats like inadequate data protection and confidentiality (Chou, 2015), another risk include increase in structural unemployment of accounting professionals due to their perfect substitutability with digital technologies which are much efficient, more reliable, more precise and cost effective. Interestingly, like evidence from the medical field (Sofilkanych et al., 2023) and neuromarketing (Hurzhyi et al., 2023), despite the emergence of new technologies in the accounting field, it is unfortunate that not much is known concerning the quantifiable (monetary value) of losses, unemployment compensation claims and number of new jobs created due to risks caused by digital technologies risks in the accounting firms which have adopted AI, robots, softwares and machine learning. This is suggested as the new direction further studies should pursue.

Theme 3. Limitations of digital technologies on accounting and reporting

Thematic analysis finds the limitations of digital technologies on accounting and reporting are unreliable internet speed and connectivity as well as reliable power supply especially in developing countries. Environmental factors and availability of technically competent accounting profession also act as limitation to the effectiveness of digital technologies on accounting and reporting (Thottoli et al., 2022). The main constraints towards adoption of emerging digital technology tools for audit software in the audit process are observed are inadequate computerised auditing training as well as limited understanding of special functions of audit software by audit assistants (Abou-El-Sood et al., 2015; Thottoli, 2021) For example, Widuri et al., (2016) observe shortage of technologically competent and experienced auditors in the job market, environmental factors, expectations, the size of a client's business, and the unavailability of generalized audit software

(GAS) in a variety of languages as hinderances of digital technologies on effectiveness of accounting and reporting. The cost of digital accounting softwares to perform computer-assisted auditing tools and techniques (CAATs) is another limitation towards adoption of digital technologies in accounting profession. For example, Pedrosa and Costa, (2014, 2020) find that computer-assisted data mining techniques are still neglected or used by only a few practicing accounting professionals. despite the emergence this limitation it is unfortunate that not much is known concerning the minimum accounting firm size which can adopt these technologies without imposing a heavy financial burden on the firm and the comparative values the firm will gain visa viz losses incurred it adopts digital technologies like AI, robots, softwares and machine learning. This is suggested as the new direction further studies should pursue.

Conclusions

The study seeks to identify advantages, risks and limitations pf digital technologies on accounting and reporting. It was found that digital technologies are a double aged sword. It has both the bright and darks sides. The bright side of digital technology is improvement of accuracy, speedy and efficiency of accounting and reporting. It also reduces auditing costs and enhance efficiency, dependability, and productivity accounting professionals. In contrast, digital technology's darker side includes vulnerability of organisations, employees, and client's confidential financial information through risks like hacking, which also compromise the reliability of financial statements. It also leads to structural unemployment when accounting professional are substituted by digital accounting information systems. Lastly, there are limitations to application of digital technologies to accounting and reporting. such limitations include inadequate training and preparedness of accounting professionals to use digital technologies. It is recommended that accounting professionals and practitioners as well as policy makers should massively invest in new accounting digital technologies in the current 4th industrial revolution. Also, more training of accounting professionals is required for the to keep abreast with highly evolving digital accounting technologies. Lastly, cyber security and firewalls of digital accounting system needs to be upgraded to curb cyber threats like hacking. Looking, forward, digitisation align well to the philosophy of creation by destruction, where

some accounting roles will face extinction while new ones are created. Overall, digitisation of accounting profession has more strengths, create more opportunities, is associated with weakness and threats.

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How to Cite:

Wang, Q., Melnyk, H., Lishchynska-Kravets, H., Shpaliarenko, Y., & Tomashevskva, M. (2024). Flipped learning in higher school: theory and practice. *Amazonia Investiga*, 13(74), 334-343. <https://doi.org/10.34069/AI/2024.74.02.28>

Flipped learning in higher school: theory and practice

Перевернуте навчання у вищій школі: теорія і практика

Received: January 7, 2024

Accepted: February 26, 2024

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Abstract

The article clarifies the essence of the technology of "flipped learning" and reveals the main stages of the educational process during the application of this technology, models of "flipped learning" for the educational process are taken into account, and the advantages of the technology of "flipped learning" are highlighted, which are taken into account when training specialists in institutes. Having disclosed the content of the main elements of the "flipped learning" technology and proposing an algorithm for conducting classes using this technology, we experimentally proved that the use of "flipped learning" technology is an actual technique in the formation of independent educational work and is necessary for the educational process. The purpose of the study was to determine the criteria for comparing the results of traditional training and training using the "flipped learning" technology. EG respondents noted that using the "flipped learning" method, it is easy for them to learn the material; they are more active in class; can process more educational material, they are attracted by the independence in processing new information, the

Анотація

У статті з'ясовано сутність технології «перевернутого навчання» та розкрито головні етапи освітнього процесу під час застосування цієї технології, враховано моделі «перевернутого навчання» для освітнього процесу, виокремлено переваги технології «перевернутого навчання», які враховано при підготовці фахівців у закладах вищої освіти. Розкривши зміст основних елементів технології «перевернутого навчання», та запропонувавши алгоритм проведення заняття з використанням саме такої технології, нами експериментально доведено, що застосування технології «перевернутого навчання» є ефективним прийомом у формуванні самостійної навчальної роботи та є необхідним при освітньому процесі у закладі вищої освіти. Метою дослідження було визначення критеріїв порівняння результатів традиційного навчання та навчання за технологією «перевернуте навчання». Респонденти ЕГ відмітили, що за методикою «перевернуте навчання» їм легко засвоювати матеріал; вони більш активні на занятті; можуть опрацювати більше навчального матеріалу, їх

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availability of electronic educational materials, the opportunity to study educational materials at their own pace, anywhere, at a convenient time.

Keywords: "flipped learning" technology, institution of higher education, formation of professional competencies, students of higher education, advantages of "flipped learning" technology.

Introduction

Modern society is impossible without public communications and the virtualization of life activities. Information and communication technologies have deeply penetrated our everyday lives and changed our communication, our behavior, our way of life, and our approaches to recreation and work (Riabukha et al., 2020).

In the circumstances of active changes, in connection with the intensive implementation of updated requirements for the enactment of pedagogical interaction in the educational process, the modern development of society, the special conditions of the organization, and the functioning of educational processes during the pandemic, teachers are reorienting the informative content of educational events in the institution of higher education (Ridkodubskya, 2021).

Currently, large-scale changes are taking place in the education system, which requires the starter of new pedagogical technologies in the training of qualified specialists, leading to an increase in the role of knowledge and the need to bring it into line with the new challenges of social life, focused on individual personality development, the ability to clearly solve tasks, development skills of continuous learning and independent education, etc. This requires in the educational process the constant introduction of alternative modern forms of educational technologies, which include "flipped learning" (Chuchmii et al., 2020). Therefore, it is expedient to investigate the peculiarities and advantages of implementing the technology of "flipped learning" in higher education in the preparation of future competitive specialists.

Literature review

Many theoreticians and practitioners have researched and are researching the theoretical and practical basics of the outline of blended learning into the education system and the

приваблює самостійність в опрацюванні нової інформації, доступність електронних навчальних матеріалів, можливість у власному темпі, у будь-якому місці опрацювати у зручний час навчальні матеріали.

Ключові слова: технологія «перевернутого навчання», заклад вищої освіти, формування фахових компетентностей, здобувачі вищої освіти, переваги технології «перевернутого навчання».

technology of "flipped learning" as its component.

O. Honcharuk, L. Shust, & V. Datsiuk (2021) considered the technology of "flipped learning" in primary school and substantiated the possibilities of its use. The term "flipped learning" is interpreted by the authors as "a form of active learning, the essence of which is the assimilation of new material by students at home, i.e. familiarization with the educational material before the next lesson takes place independently, and the time of classroom work is used for understanding and applying knowledge, skills, and abilities, i.e. for practical tasks". The advantages of this form of work are determined. Features of the use of innovative interactive technologies in educational activities, in particular, the technology of "flipped learning" in higher education were defined by H. Ridkodubskya (2021). The teacher presented a description of the main ways of implementing interactive innovative technologies during the study of the educational discipline "Project Management in Education", which will improve the quality of professional training of future specialists in modern conditions. The essence of the "flipped learning" technology ("which consists in a radical reorganization of the educational process – changing the distribution of the time spent by the teacher on explaining new material and practicing it, which makes it possible to use classroom hours effectively") and the possibility of introducing the discipline "Foreign Language" into teaching is considered of this technology by such scientists as T. Riabukha, N. Hostishcheva, L. Kulykova, & T. Kharchenko (2020). The advantages of its use are highlighted for both teachers and students. It has been proven that this technology enables the formation of the foreign language competence of the future specialist and the opportunity to achieve high results in the study of a foreign language. The methodology of using the "flipped learning" technology by N. Dobrovolska (2020) was considered. It has been proven that the

technology of "flipped learning" includes other pedagogical technologies, to activate the cognitive activity of students of higher education, enabling them to work at a convenient time, and encouraging the development of research skills. The main advantages and disadvantages of introducing the "flipped learning" technology into the educational process of a higher educational institution are revealed.

L. Konoplianyk, & K. Melnykova (2019) examines the actual issues of introducing the "flipped classroom" technology into the educational process. The general features of the technology are characterized; by the advantages are highlighted. The same problem is investigated in the process of professional training of social workers by O. Kolomiets, & T. Demydenko (2022), attention is focused on the features of using the "flipped class" technology during online learning, its advantages and disadvantages are determined, and a comparison is made with traditional learning technologies in institutions of higher education at training of future social workers. Also, the advantages and disadvantages of the innovative teaching model "flipped class" by N. Honchar, O. Zadorina, & N. Lopatynska (2022), which can recover the excellence of pedagogical education and teaching in general, are determined. To rise the productivity of the educational process, practical tools for the implementation of the flipped class model in pedagogical institutions of higher education are proposed.

O. Klekho, & T. Chetverykova (2023) improve the same questions, highlight the essence, and note the rewards of this didactic skill. Scientists noted that "the use of this technology in a modern school is an integral component of the organization of the educational process, which determines the relevance of the formation of teachers' skills to effectively use modern methods for preparing classes, organizing remote interaction and communication between participants in the educational process."

In the trainings of experts, attention is focused on the importance, shortcomings, and fundamental differences of the "flipped learning" technology in the organization of the educational process from others. Aspects of the work of students of higher education using the "flipped classroom" technology are highlighted. But it is value noting that, despite a significant sum of meaningful and original works by scientists on the studied issues, there are practically no studies devoted to the problems of the influence of "flipped learning" on the level of mastery of knowledge by students

of higher education institutions, which remains relevant today.

The purpose of the research was to investigate the features and advantages of implementing the "flipped learning" technology in higher education in the preparation of future competitive specialists; study the influence of the "flipped learning" technology on the formation of professional competencies of higher education students; determination of criteria for comparing the results of traditional training and training using the "flipped learning" technology.

Methodology

In order to realize the purpose, means of scientific knowledge were used: theoretical – analysis of psychological-pedagogical, philosophical, methodical literature – to outline the conceptual boundaries of the studied phenomenon; classification, logical-systemic analysis, induction, analogy, deduction, generalization of practical data and scientific and theoretical data – to determine the aspects of the work of students of higher education using the "flipped learning" technology; modeling – clarification of various models of "flipped learning" in the organization of the educational process; comparison of the received data – to clarify the connections, dependencies, fundamental differences of the "flipped learning" technology in the organization of the educational process from others; empirical – observations, surveys, conversations, tests – to find out and check the effectiveness of the implementation of the "flipped learning" technology in the organization of the educational process; pedagogical experiment – in order to study the influence of the "flipped learning" technology on the formation of professional competences of students of higher education, a comparative analysis of the educational achievements of students was carried out; quantitative and qualitative analysis of research results to verify the results of the experiment using methods of mathematical statistics (non-parametric Pearson test χ^2).

To study the influence of the technology "flipped learning" on the formation of professional competencies of students of higher education, a comparative analysis of the educational achievements of students was carried out:

48 students of higher education took part in the study:

- 26 respondents of the control group (CG), where learning by the "flipped learning" technology was not used;
- 22 respondents of the experimental group (EG), where training took place using the "flipped learning" technology.

The purpose of the study was to regulate the criteria for comparing the results of traditional training and training using the "flipped learning" technology.

The survey showed that respondents of EG have a more positive attitude to learning than students of CG. Since the emotional attitude of students of higher education to study affects their motivation, the levels of study motives of the respondents of the experimental group and the control group were diagnosed.

The results of the survey indicated the ease of assimilation of the material by EG higher education students, showing that EG students are more active in classes and interested in the forms and content of the educational material.

EG respondents noted that using the "flipped learning" method, it is easy for them to learn the material; they are more active in class; can process more educational material (94.7%), they are attracted by the independence in processing new information (63.2%), the availability of electronic educational materials, the opportunity to study educational materials at their own pace, anywhere at a convenient time (100%).

Research, and implementation of the technology "flipped learning" showed that this technology, taking into account the specifics of professional training, contributes to the development of not only the skills of creating professional electronic products but also ICT competencies.

Results and discussion

1. The essence of the "flipped learning" technology

A purposeful process of partial change is the innovation of education. Such changes lead to the version of the education process to new necessities; modification of the goal, forms of education, methods, contented of the educational process, and teaching (Kuchai, 2014). "Innovations in education are a natural phenomenon, dynamic in nature and developmental in results, their introduction allows to resolve contradictions between the traditional system and the needs for qualitatively

new education. An essential feature of innovation is its ability to influence the general level of the teacher's professional activity, to expand the innovative field of the educational environment in the educational institution, region" (Stratan-Artyshkova, 2022).

Such an innovation in the educational process is the organization of flipped learning, a complex process that requires proper methodical support and thorough preparation. Therefore, if the content of the course is carefully planned, the training methods are selected, and the appropriate technical means are used, the effectiveness of such training is achieved. There are various ways to "overturn" learning during the organization of the educational process. Such a technique can be applied not to the entire course, but to individual classes, on certain topics (Konoplianyk & Melnykova, 2019).

2. The main stages of the educational process when applying the "flipped learning" technology and the "flipped learning" model

The heart of the technology of "flipped learning" – classroom and homework – lies in the radical rearrangement of the main stages of the educational process. Everything happens differently, that is, the opposite of traditional education:

- classroom work, classes at home,
- homework – in class (Reyes-Ruiz, 2022).

Let us describe the main stages of the educational process throughout the request of the "flipped learning" technology:

- 1) work in the classroom involves discussions, interactive tasks, cases, role-playing games, web quests, projects, etc., that is, interaction and cooperation;
- 2) work at home consists of independent familiarization of students of higher education with new educational material: working with presentations, watching video lectures, working with recommended literature, working with materials from recommended sites;
- 3) implementation by the teacher of feedback, observation, monitoring, and evaluation.

There are many approaches to the implementation of "flipped learning", but all approaches are based on the main single principle: classroom work is aimed at the practical application of the acquired knowledge, and familiarization with new material takes place outside the classroom (Cueva & Inga, 2022).

Let's reflect the most actual models of "flipped learning", which should be used in the educational process of a higher school.

1. "Classic" model of "flipped learning". It is this model that provides the student of higher education with a preliminary introduction to the theoretical material of the future course. For the preparation of students of higher education, data can be provided in the form of a paragraph of a textbook, materials of a reference outline of lectures, in the form of video and audio documents, slides, etc.

In the classroom, the teacher uses interactive teaching methods, arranges a conversation of self-learned material, describes hard points that are unclear to students and answers questions. Even though the educational process is partly carried out remotely, this model has a translational character and resembles a traditional education system: first, concepts, theories, and models are considered, and then their real request. However, they are all based on a basic single principle: learning is realized directly outside the classroom, while the learning time is devoted to the application of the acquired knowledge in a practical dimension.

2. "Advanced" model of "flipped learning". Such a model provides for the expansion of types of activities and the gradual complication of the level of tasks. It has two stages: classroom and outside classroom. In the process of preliminary preparation, students of higher education read articles, individually search for material on a given subject, watch videos, individually or in mini-groups prepare theses that will be presented in the audience, questions for a round table or debate. Students of higher education post the results of their work on a common electronic platform so that the teacher and other students of higher education can better prepare for the class and familiarize themselves with them in advance.
3. "Combined" or "systemic" model of "flipped learning". Its essence consists in rearranging the key components of the educational process, and not in changing the place of performance of a certain type of activity.

In the classroom, under the guidance of the teacher, students analyze the tasks, present the sources and information found, compare the advantages of the proposed solutions, and highlight the shortcomings. After that, there is a remote stage again: students of higher education study the experience of activities related to the specified problem, and find out the theoretical foundations of the issue. At the final stage in the classroom, the learned material is consolidated,

summaries of the topic are drawn up; and the possibility of applying the developed model to other situations is analyzed.

Therefore, during "flipped education", every student of higher education receives the most targeted and relevant help when he needs it the most – at the stage of the practical application of the acquired knowledge. And the usual classroom system of the educational process at the time of traditional homework leaves the student of higher education "alone", which requires the application of the theoretical knowledge acquired in the classroom in practice (Riabukha et al., 2020).

3. Advantages of flipped learning technology

Let's highlight the advantages of the "flipped learning" technology:

- 1) rational use of classroom time;
- 2) conscious integration of the quantifiable by students of higher education;
- 3) activation of interaction "student"- "student", "teacher"- "student";
- 4) strengthening of the autonomous position of the student of higher education;
- 5) optimization of creativity among students, development of critical thinking, and transformation into an integrative part of the educational process (Prykhodkina, 2015).
- 6) a personalized approach to each student;
- 7) the opportunity to work at their own pace for each student of higher education;
- 8) the opportunity to make up missed classes;
- 9) a more comfortable and friendly atmosphere in the auditorium;
- 10) permanent possibility of archiving the material;
- 11) interactive nature of the organization of work in the lesson;
- 12) positive transformation of the role relations of the student and the teacher (teacher – adviser, guide, assistant) (Riabukha et al., 2020).

4. Basic elements of flipped learning technology

The main elements of flipped learning technology are individual protection of one's practical work, concise coverage of the topic for independent study, brief explanations of new educational material during online meetings on videoconferences, preliminary familiarization of higher education students at a convenient time and outside the classroom with new educational material, permission to use information materials

by higher education students during work, assessment of knowledge and skills of higher education students during practical work, introduction of means of disadvantage and impossibility of write-offs (Shetelya et al., 2023). The technology of "flipped learning" makes it possible to significantly improve success rates. However, the effectiveness of its application in practice depends on the teacher because the implementation of the "flipped learning" technology requires creativity, knowledge of ICT, time investment, deepening of knowledge, and the ability to build meaningful and interesting lessons (Dobrovolska, 2020).

The use of the technology of "flipped learning" is an effective technique in the formation of independent educational work. "Educational independent works are tasks that are offered to students of education for independent assimilation of new material" (Leão et al., 2023).

The success of independent assimilation of new material depends on the ability to analyze, generalize, compare, and draw conclusions and the level of formation of the skill of conscious, correct, and rapid assimilation of material. This form of work serves to ensure that each student of higher education reaches his or her own level of development through an individual pace of work, freeing up study time in classes to clarify specific unclear questions, for practical work, to activate the cognitive activity of students of higher education who are interested in working with gadgets, which serves to increase their interest in acquiring knowledge (Slushnyi, 2016). The teacher has wider opportunities for an individual approach, becomes a consultant for a student of higher education, better understands the gaps in the skills and knowledge of each individual, and therefore more effectively corrects them in their educational activities, applying various types of work. At the same time, the teacher is faced with several difficulties, in particular, the need for a high level of ICT proficiency, more time spent on recording videos, etc., predicting possible difficulties for students during independent work, lack of control during the performance of tasks according to the level of independence (Honcharuk et al., 2021).

5. Algorithm for conducting classes using the "flipped learning" technology

When conducting a class using the "flipped learning" technology, the teacher:

- records an explanation of new material on video;
- posts videos on YouTube, distributes videos to students of higher education, etc.;
- as homework, students receive links to educational resources and an educational video;
- students perform tasks online;
- the teacher in the class involves all students in the work;
- the lesson begins with repetition and a short discussion based on materials from electronic resources or videos;
- analysis and review of online assignments by students of higher education;
- a survey of higher education seekers to activate their attention;
- monitoring of educational achievements of students (da Silva, 2021).

Types of "flipped learning". In practical use, the next types of flipped learning are most significant:

1. The Standard Flipped Classroom. By viewing text materials or video lectures, students study the material of a practical lesson or an upcoming lecture. Conducting classes in the "virtual classroom", the teacher has additional time for individual work with each student of higher education;
2. The Discussion-Oriented Flipped Classroom. Students receive the task of processing materials from Internet resources or certain videos, and the teacher organizes a discussion of the received information in class;
3. The Demonstration-Focused Flipped Classroom. Students of higher education perceive and analyze the necessary activities that the teacher demonstrates to them, and then independently perform the tasks set before them;
4. The FauxFlipped Classroom. It will be appropriate to use this form if there is no certainty that the higher education students will prepare at home on their own. The model allows students of higher education to watch a video in class, and after that to complete the corresponding tasks;
5. The Group-Based Flipped Classroom. The model encourages students of higher education to get the right answers in the process of interactive interaction, to learn from each other, to find effective ways of conducting scientific research and ways of obtaining information, etc.
6. The Virtual Flipped Classroom. Organizes the work of students of higher education so

that the entire education process takes place remotely: the teacher offers material for students of higher education to review, consults online, uploads practical tasks, and assigns final scores by conducting testing. Independent processing of the relevant material takes place as it happens according to the principles of the "flipped class";

7. Flipping The Teacher involves doing all the work, not necessarily by the teacher. His task is to form practical tasks, advise, search for or prepare video materials, and check works. Students of higher education can perform certain types of work, and the teacher will monitor the organization of the learning process, and the presentation of information and, if necessary, will provide assistance (Kovtun & Krykun, 2019).

It is most appropriate to use Lourdes Morán's (2022) definition of the essence of "flipped learning" technology:

- at the organizational level: determine the place, time – general conditions;
- at the substantive level: develop a general education plan and individual programs;
- at the methodical level: find a means of learning that advances the student of higher education forward;
- at the social level: define such goals, establish rules, create working conditions, organize cooperation, conduct classes, develop a plan for continuous education;
- at the personal level: establish student-student and teacher-student relationship models.

6. An experimental study of the influence of the "flipped learning" technology on the formation of professional competencies of higher education students; comparison of the results of determining the criteria of traditional training and training using the "flipped learning" technology

Having clarified the essence of the technology of "flipped learning" and revealed the main stages of the educational process and taking into account the models of "flipped learning", we singled out the advantages of the technology of "flipped learning", which are taken into account in the training of specialists.

Having disclosed the content of the main elements of the "flipped learning" technology and proposing an algorithm for conducting classes using this technology, we experimentally proved that the use of "flipped learning"

technology is an effective technique in the formation of independent educational work.

To study the influence of the "flipped learning" technology on the formation of professional competencies of students, a comparative analysis of the educational achievements of students was carried out:

- 48 students participated in the study.
- 26 respondents of the control group (CG), where learning by the "flipped learning" technology was not used;
- 22 respondents of the experimental group (EG), where training took place using the "flipped learning" technology.

The resolution of the study was to control the criteria for comparing the results of traditional training and training using the "flipped learning" technology:

- 1) motivation of higher education seekers to study;
- 2) emotional attitude of students of higher education towards studies;
- 3) difficulty (ease) of assimilation of the material by students;
- 4) passivity (activity) of students of higher education in class;
- 5) academic achievements of higher education applicants.

The survey showed that respondents of EG have a more positive attitude to learning than students of CG. Since the emotional attitude of students of higher education to study affects their motivation, the levels of study motives of the respondents of the experimental group and the control group were diagnosed, namely:

- connected to the content of didactic activities: educational and cognitive;
- related to forms of education: educational;
- communicative activity in class, affirmation of personality in the student body: communicative;
- the importance of educational activities for mastering a specialist's future profession: self-improvement, and professional skills.

The outcomes of the review indicated the ease of assimilation of the material by EG higher education students, and showed that EG students are more active in classes and interested in the forms and content of the educational material:

- pronounced interest and ease of learning the material – 26.3%,

- expressed interest and ease of learning the material – 68.4%,
- weakly expressed interest and ease of learning the material – 5.3%,

than among students of CG:

- pronounced interest and ease of learning the material – 12.5%,
- expressed interest and ease of learning the material – 56.3%,
- weakly expressed interest and ease of assimilation of the material – 31.2%.

EG respondents noted that using the "flipped learning" method, it is easy for them to learn the material; they are more active in class; can process more educational material (94.7%), they are attracted by the independence in processing new information (63.2%), the availability of electronic educational materials, the opportunity to study educational materials at their own pace, anywhere at a convenient time (100%).

These factors affect the emotional satisfaction of higher education students, their intellectual satisfaction with the process of education using the "flipped learning" method, and learning outcomes.

EG respondents showed three times more communicative activity (188 additions and complete answers) than CG respondents (67 additions and complete answers), which was recorded in classes by the number of student performances (30 hours allocated to classroom classes).

In the research process, the "Motivation to Success" test was used to identify the self-improvement and professional motives of CG and EG respondents.

The results of testing according to this method showed that the number of EG students with a high level of motivation (by 23.2%) and an excessively high level of motivation (by 17.6%) increased before achieving success and the intended goals. There were no significant changes in the motivation levels of higher education students who were part of the CG.

Interesting forms of work during the educational process using the "flipped learning" technology stimulated future specialists' desire for self-realization. 79.4% of EG respondents received high scores for their own developments, in contrast to CG – 12.7%.

As the survey showed, the respondents of the experimental group spent more intellectual effort and time on tasks than the respondents of the control group. As a result, the educational achievements of EG respondents were higher than those of CG respondents (according to academic journals).

The application of the "flipped learning" technology meets the demands and wishes of the student youth of the modern world, which provides superior training of competitive specialists and is focused on direct work with electronic sources of information.

Research, and implementation of the technology "flipped learning" showed that this technology, taking into version the specifics of qualified training, contributes to the development of not only the skills of creating professional electronic products but also ICT competencies. Just as the process of education of competitive specialists is not limited to paper media, the knowledge of the teacher, this technology increases the cognitive interests of students of higher education, creates an opportunity for independent processing of additional information in a short period, promotes motivation of students to achieve success and set goals.

We will present the obtained average values of the indicator we singled out as one of the main reflective and creative components of the use of the "flipped learning" technology.

At the beginning of the experiment, there was no significant difference (10.46 ± 0.22 points) between the average value of the indicator of the respondents of the experimental group and the average value of the indicator of mastery of skills (respectively 11.01 ± 0.23 points) for the reflective-creative component of respondents of the CG. After using the "flipped learning" technology, the average values of the indicator for the reflective-creative component, we observe a significant difference (respectively 10.46 ± 0.22 points) between the average value of the indicator of mastering the skills of EG respondents at the beginning of the experiment and the average value for the reflective-creative component indicator of skill mastery (respectively 13.21 ± 0.19 points) of EG respondents at the end of the experiment.

The results of the analysis show that there is a difference in the reflective-creative component between the average value of the indicator of mastering the skills of the respondents of the CG (respectively 11.01 ± 0.23 points) at the

beginning of the experiment and the average value of the indicator of the respondents of the control group (respectively 12.4 ± 0.19 points) at the end of the experiment. At the end of the experiment, there is a difference between the average value of the reflexive-creative component of the indicator of mastering the skills of the respondents of the experimental group (respectively 13.21 ± 0.19 points) and the average value (respectively 12.4 ± 0.19 points) of the indicator of mastering the skills of the respondents of the CG. At the end of the experiment, there are differences between the average value of the reflexive-creative component of the indicator of mastery of skills by future specialists in both EG and CG respondents. At the analysis stage, each respondent determined the purpose of further work, taking into account the possibilities of using the acquired knowledge in practice; recommendations, topics, and tasks for further work at home were marked.

Conclusions

Having clarified the essence of the technology of "flipped learning" and revealed the main stages of this technology and taking into account the models of "flipped learning", we singled out the advantages of the technology of "flipped learning", which are taken into account in the training of specialists.

Having disclosed the content of the main elements of the "flipped learning" technology and proposing an algorithm for conducting classes using this technology, we experimentally proved that the use of "flipped learning" technology is an effective technique in the formation of independent educational work and is necessary for the educational process.

The purpose of the study was to determine the criteria for comparing the results of traditional training and training using the "flipped learning" technology.

The survey showed that respondents of EG have a more positive attitude to learning than students of CG. Since the emotional attitude of students of higher education to study affects their motivation, the levels of study motives of the respondents of the experimental group and the control group were diagnosed.

The results of the survey indicated the ease of assimilation of the material by EG higher education students, showing that EG students

are more active in classes and interested in the forms and content of the educational material.

EG respondents noted that using the "flipped learning" method, it is easy for them to learn the material; they are more active in class; can process more educational material, they are attracted by the independence in processing new information, the availability of electronic educational materials, the opportunity to study educational materials at their own pace, anywhere, at a convenient time.

Research, and implementation of the technology "flipped learning" showed that this technology, taking into account the specifics of professional training, contributes to the development of not only the skills of creating professional electronic products but also ICT competencies.

The educational sector needs further research into the issues of activating the cognitive activity of students of higher education.

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DOI: <https://doi.org/10.34069/AI/2024.74.02.29>

How to Cite:

Plakhotnik, O., Syladii, I., Kubitskyi, S., Koycheva, T., & Krulko, L. (2024). Formation of an effective management system in the educational space of higher education institutions. *Amazonia Investiga*, 13(74), 344-360. <https://doi.org/10.34069/AI/2024.74.02.29>

Formation of an effective management system in the educational space of higher education institutions

Формування ефективної системи управління в освітньому просторі закладів вищої освіти

Received: January 7, 2024

Accepted: February 26, 2024

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Abstract

The article shows the importance of reforming the education system at the current stage of society's development to create an effective management system in the educational space. The role of an innovative university in creating an effective management system in the educational space is revealed; the principle provisions of the new management paradigm are highlighted; the formation of an effective management system in the educational space of higher education institutions is proposed. The main mechanisms and functions of control for carrying out reforms to form an effective management system in the educational space of a higher education institution are revealed; the main types of management activities are described. The main functions for controlling the management system are highlighted; the

Анотація

У статті показано важливість реформування системи освіти на сучасному етапі розвитку суспільства з метою створення ефективної системи управління в освітньому просторі. Розкрито роль інноваційного університету у створенні ефективної системи управління в освітньому просторі; виокремлено принципові положення нової управлінської парадигми; запропоновано формування ефективної системи управління в освітньому просторі закладів вищої освіти. Розкрито основні механізми та функції контролю для проведення реформ з метою формування ефективної системи управління в освітньому просторі закладу вищої освіти; описано основні види управлінської діяльності. Виокремлено основні функції для контролю системи управління; принципи розвитку системи управління в

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principles of the development of the management system in the educational space of higher education institutions and the task of an innovative research university by the peculiarities of the organization of the management system in the educational space is proposed. An experimental study was conducted during which we investigated the importance of an innovative management system in the educational space, the professional development of heads of higher education institutions, and the level of quality of higher education in higher education institutions.

Keywords: innovative management system, higher education, innovative university, control mechanisms and functions, higher education institutions.

Introduction

The innovative activity of the educational sector has led the world community to a new, higher level of development. The objective historical process today is the constant innovative renewal of society, which is determined by the systemic regularity of the development and growth of any socio-economic system. Innovative processes begin in certain fields of science, causing progressive changes in society, which culminate in the sphere of production. One of the strategic priorities of any country is the innovative orientation of the higher education system, which is implemented through the activation of research activities, increasing the level of computerization of educational institutions, and the formation of innovative structures in higher education institutions. An effective system of educational space emphasizes the role of education and this is confirmed by the fact that the most important indicator of the country's development, the guarantee of its stability and prosperity is the average level of literacy of the adult population. The definition of the human development index is based on the state's educational potential and determines the country's place in world rankings. The renewal of knowledge on the planet used to take place every 20-30 years, and today's development of society has accelerated the renewal of knowledge by 20% per year, that is, we observe a complete rethinking of knowledge every five years, and in some fields of science, this process occurs even faster.

The last decade highlights the following main world trends in the system of higher education: globalization of the sphere of higher education and its internationalization; rejection of mass unified higher education; fierce international

освітньому просторі закладів вищої освіти та запропоновано завдання інноваційного дослідницького університету відповідно до особливостей організації діяльності системи управління в освітньому просторі. Проведено експериментальне дослідження під час якого ми досліджували вагомість інноваційної системи управління в освітньому просторі, професійного розвитку керівників закладів вищої освіти, рівня якості вищої освіти у закладах вищої освіти.

Ключові слова: інноваційна система управління, вища освіта, інноваційний університет, механізми та функції контролю, заклади вищої освіти.

competition in the field of education; growth of trade in educational services at the international level; reduction of the "life cycle" of skills, abilities, and knowledge; rapidly growing flow of information (Boltianska & Boltiansky, 2020), which occurs due to the formation of an effective management system in the educational space.

The relevance of the research problem of the formation of an effective management system in the educational space is due to: the need to establish effective relations between local, regional, and state education management bodies; the need to reform the education system at all its levels; the ever-growing role of education as a field that has a powerful potential for the formation and development of the future of the state; implementing the ideas of a democratic society; increasing the efficiency of state administration.

Literature review

Scientists and practitioners from all countries of the world pay attention to the analysis of the current state of development of the education system and modernization of the sphere of education. A. Kuzminskyi, I. Oros, T. Kuchai, K. Shovsh, I. Siladiy, & O. Bida (2022) considered the first theories of scientific management and highlighted the qualities that a manager should possess for his activities to be effective. In the historical perspective, modern concepts that differentiate the leadership style, which is presented as situational and flexible, are highlighted. The process of forming a team of teachers is shown, as the creation of a coherent, unified team of teachers that can effectively

achieve the goals of a specific project. The socio-pedagogical conditions and specifics of the reasons for creating a conflict-free educational environment in educational institutions and the possibility of solving the problem of formation of conflict-related competence in future education managers are shown. The organization of control and diagnostic activities, according to which management decisions are made to regulate the object, is revealed.

The state of personnel provision of the education system was characterized by V. Bobrytska (2015). The issue of the educational sector is considered based on modern monitoring studies on the investigated issue; the approaches that will ensure the European dimension in the formation of the state personnel policy of any country in the training of employees for the education system are highlighted.

O. Shamanska's (2022) research is interesting, where the use of innovative technologies in education is analyzed in modern conditions of social development. The theoretical essence of the concept of "education", its features, meaning, and main components are defined; the importance of using innovative technologies in education is outlined. It is practically proven that it is innovative forms of educational space that will develop and reveal the intellectual potential of an individual, and stimulate him to acquire new knowledge. The need to use the "Case method" in education as one of the effective tools in education – the use of effective innovative technologies has been proven.

Comparative studies are of great importance for clarifying the effectiveness of the management system in the educational space. In particular, S. Moroz (2019) analyzed China's experience not only to identify ways to ensure the development of the educational sector but also to justify the possibility of their use in the management system of the development of the quality of higher education; the main stages were considered and the priority development vectors of China's education system were determined, the institutionalization of the norms of the educational sector was emphasized; the role and place of education in ensuring socio-economic and socio-political transformations is defined; summarized the results of reforms carried out by the Chinese government; conclusions were made regarding the areas of improvement of practice and the content of the use of quality management mechanisms of higher education.

The same problem is investigated by N.

Boltianska and O. Boltiansky (2020). Scientists described the characteristics of an innovative university and showed its role in integration into the European scientific and educational space and developed a model of the organization of a scientific research innovative university.

Authors R. Bretaña, D. Chávez, N. Fernández, N. Hincapié & M. Bonilla (2022) observed that the implementation of a management system contributes to the achievement of the institutional objectives and the satisfaction of the interested parties, likewise, it must incorporate the requirements established in the accreditation models in higher education.

Scientists J. Morales-Piñero, D. Niño-Muñoz & D. Lesmes-Cardenas (2022) describe problems with Public or private management of universities: Which is the most efficient option for a public policy in higher education in Colombia?

In the article, scientists A. Valencia Celis, G. Rosas Patiño & V. Sánchez Castillo (2023) highlight problems in identifying students' state of knowledge and learning in the first cycle of Higher Secondary Education of an educational institution regarding Natural Sciences.

So, the analysis of literary sources allows seeing the current state of development of the education system, and modernization of the education sphere. An analysis of the problem of formation of the managerial culture of the head of an educational institution was made from socio-pedagogical positions and the model of the system of formation of the managerial culture of the head of an educational institution was substantiated; the state of personnel provision of the education system was considered, the possibilities of applying innovative technologies in education were analyzed. Comparative studies are valuable and are of great importance for clarifying the effectiveness of the management system in the educational space. Scientists and practitioners have shown insufficient effectiveness of the management system in the educational space.

Therefore, the **purpose of our research** is to consider an effective management system in the educational space of higher education institutions.

Methodology

The methodological and theoretical basis of our research is the dialectical and generally scientific

methods of scientific knowledge: comparative and logical analysis (to identify the features of an effective management system in the educational space); system analysis of management in education (to form a holistic view of the management system in the educational space and self-governance in the education system; statistical method and analysis method (to assess the state of education development); sociological methods (to identify the state of the management system in the educational space from the point of view of social groups and subjects of the educational process) and others.

The theoretical basis of the research is literary and scientific sources, works of foreign and domestic scientists, scientific research in the field of educational policy, self-governance, management of educational systems at various levels, best domestic and European practices in the functioning of educational systems, development of an effective management system in the educational space, management of institutions and educational institutions.

Empirical research included – conducting research and experimental work; analysis of the results of an effective management system in the educational space; surveys, questionnaires of respondents; expert assessment; monitoring the activities of management and higher education students; statistical – for qualitative and quantitative analysis of the results of the experimental study, the processing of the obtained experimental data was carried out.

A survey was conducted, which was aimed at identifying the level of relevance of various content areas in the innovative management system in the educational space. The results of the questionnaire survey analysis showed that 78% of the respondents positively evaluated the format and content of the proposed program of the innovative management system in the educational space.

The main wishes and comments of the participants in the study of the effectiveness of the innovative management system in the educational space related to increasing interactivity in the process of expanding opportunities for sharing experiences and learning.

Among the questions of the questionnaire offered to the respondents were those whose content direction is related to determining the level of quality of higher education in higher education institutions. 452 students of higher education

took part in the survey. We are not talking about the fact that the conducted survey is representative because it cannot be considered a selective population that reproduces the characteristics of the general population. We believe that according to certain characteristics, the deviations of the sample population from the general population are not significant, which means that we claim that the obtained results for working out generalizations regarding the level of development and the formation of an idea about the subject of scientific attention can be considered at the level of the informational basis.

The implementation of the pedagogical experiment was carried out in three stages: preparatory, main, and final.

At the preparatory stage, the purpose and tasks of the research were determined, the experimental plan was developed, methods of measurement and processing of results were selected, control and experimental groups were selected, and their homogeneity was checked.

At the main stage, an experiment was conducted.

At the final stage, the results of the experiment were analyzed, their reliability was confirmed, and conclusions were drawn about the pedagogical effect of the experiment.

The reliability and validity of the obtained results, and the objectivity of their assessment were ensured by the methodological soundness of the initial positions and the qualitative mechanism for evaluating the quality under study, the use of a complex of complementary research methods, and the involvement of a group of respondents from a higher educational institution in the analysis of its results.

To assess the homogeneity of experimental and control data, statistical processing was performed using MS Excel and SPSS (Statistical Package for Social Science).

Research relies heavily on the accuracy and reliability of the data. In the framework of research work, the quality of data collection and analysis not only adds weight to the research but also contributes to the formation of sound conclusions, which is the key to academic success.

The following digital data collection tools were useful in the study:

– Google Forms – a simple tool for creating

surveys that allows you to collect data from respondents, create different types of questions, and collect answers in spreadsheets.

- SurveyMonkey – a modern survey tool that offers a wide range of customization options and analytical tools for analyzing the collected data.
- JSTOR, Google Scholar, and other academic search engines provide access to scholarly articles, books, and other academic resources that may be useful for literature review and theoretical data collection.
- Zotero or Mendeley – bibliography management programs that help organize research materials, store references, and format bibliographies and citations according to different citation styles.
- Microsoft Excel or Google Sheets – spreadsheets are useful for organizing and analyzing collected data when working with quantitative data.
- SPSS, R, or Python for more advanced data analysis, statistical analysis, and processing of volumes of data.

When determining the sample of subjects, the general specificity of the research subject was taken into account. The total volume of the sample is 100 subjects. When forming the sample, the criteria of meaningfulness, representativeness, and equivalence were taken into account. The sample was formed by random selection using the technical procedure for calculating the selection step.

The results of the experimental study confirmed the applicability, optimality, and effectiveness of the proposed pedagogical conditions for the formation of an environmental culture of an ecologist in the process of professional training.

Results and discussion

Reforming the education system to create an effective management system in the educational space. The key task and the main problem of reforming the education system is changing the principles of management in general and an effective management system in the educational space, in particular, the introduction of the mechanisms of the educational model and self-governance of students of higher education. As European practice shows, during the "shift of management emphasis from state to public in the transition to a systemic, corporate character, a powerful stimulus for development, consistent harmonization of state-public management, enrichment of public potential in management,

development of new approaches to management, which act as a source reforming the education system" (Oseredchuk et al., 2022).

The global trends of modernization and reform of the entire education system present the world education system with tasks of a completely new level. This is the creation and use of an effective model for the formation of an effective management system in the educational space, namely a competitive education system, which takes place without breaking away from the processes of formation and constant improvement of the single European space of higher education. The vector of development of such a system of higher education with an effective system of management in the educational space is set by the Sorbonne Declaration and the Bologna Process, which were put into effect in May 1998 by the ministers of Great Britain, Germany, and France. The Sorbonne Declaration forms the main criteria for improving the quality of education. These criteria are aimed at promoting the mobility of teachers, students, and researchers, recognizing qualifications by approaching the qualifications framework of the European Higher Education Area, gradually harmonizing training cycles, improving the international transparency of educational courses, developing programs for postgraduate and higher education, and the general system of degrees.

The role of an innovative university in creating an effective management system in the educational space. The innovative approach to the formation of an effective management system in the educational space is facilitated by an innovative university, an institution that ensures sustainable development, with a developed infrastructure, and deep integration of educational, scientific, and innovative activities that ensure sustainable development, ensures the demand and quality of scientific research and higher professional education. The innovative university maintains an academic component, works in three interrelated directions – scientific research, education, and innovation and is characterized by an innovative infrastructure formed by centers of innovative consulting, technology transfer, small innovative companies, business incubators, science parks, etc. An innovative university is an entrepreneurial institution. The main activities for him are educational and scientific activities based on management principles and innovative approaches. In the innovative university, the main goal of innovation is the formation of an effective management system in the educational

space, increasing competitiveness in the corresponding market segment.

Innovative management (innovative principles of management) of such a university complex presupposes the implementation of an innovative educational cycle: from the acquisition of knowledge to its implementation on the specialized market.

In the innovative university, measures aimed at reducing the impact of negative changes are implemented, constant analysis of changes in the internal and external environment is carried out, and positive trends in the development of education are used. The innovative research university provides conditions for scientific results and the process of performing experimental, applied, research and development work to be used for the organization of targeted and basic training of specialists, retraining of personnel, as well as for the development of new innovative technologies (Boltianska & Boltiansky, 2020).

Principles of the new management paradigm.

Key points of the modern system of views on an innovative research university, and its management, that is, the "new management paradigm", are the following principles:

1. Abandoning the managerial rationalism of classical educational and management institutions, when the success of the entire enterprise system is determined primarily by the rational organization of production, the influence on internal management factors, the development of specialization, and cost reduction. Instead, the main place is occupied by the problem of adaptation and flexibility of the organization to constant changes in the external environment (a set of variables outside its boundaries).
2. Application of the means of the situational approach in the management process, according to which the central moment of the organization within the enterprise is the situation, a specific set of circumstances that affect the work of the enterprise in this period.
3. The use in the practice of management of the achievements of the theory of systems is inextricably linked with the outside world, which facilitates the unity of the task of considering the organization of its components. The success of the enterprise depends on the limits of transparency, and openness in the external environment.

4. Today, the orientation towards new factors of social development and conditions is reflected in the principles of modern management, which indicate the growing role of the entire organization of the system between people, human professionalism, and personal qualities.
5. Recognition of the social responsibility of management to the circle of people working in the organization and to society.
6. The implementation of new innovative principles of management requires a radical revision of production and culture, management personnel, growth and strengthening of their personal and professional potential, the entire philosophy of modern business, changes in the psychology of working people, significant improvement of their qualifications (Kuzminskyi et al., 2022).

Formation of an effective management system in the educational space of higher education institutions.

The effectiveness of the modernization of the education system, the formation of an effective management system in the educational space, and professional training will largely depend on the extent to which the higher school turns its face to the future and frees itself from the patterns of old ideas (Tverezovska et al., 2022).

To form an effective management system in the educational space, higher education institutions should, with the participation of the European University Association (EUA), European Students' Union (ESU), and European Association of Institutions in Higher Education (EURASHE), be guided by recommendations for the development of standards, procedures and quality assurance directives developed by the European Network for Quality Assurance in Higher Education (ENQA) – an independent body, the most authoritative European organization, which includes European accreditation and quality assurance agencies, which, by the requirements of the Bologna Declaration, coordinates work on the creation of a system of quality assurance in higher education.

The policy of ensuring professional training, the quality of higher education, and certification of specialists with an effective management system in the educational space is aimed at achieving the optimal level of organizing pedagogical activities in the innovative university, taking into account the social, personal, state, economic interests and

needs of the shareholders of education. To determine the sufficient competence of specialists, innovative educational institutions should develop methods that are involved in the educational process. Such methods for external verification should be available and recorded in reports (Oseredchuk et al., 2022).

When forming an effective management system in the educational space, it is necessary to proceed from the fact that motivated and highly qualified employees are the most important factor of the organization, the main capital. That is, one of the most important resources of the organization is the personnel, which is considered necessary to achieve all goals. With such an approach, changes must occur in the consciousness, personnel policy, and university administration, in every employee and student of higher education of the university, in their value orientations, views, and business relationships. These changes should be implemented and supported by the entire innovative university team.

The formation of an effective management system in the educational space is aimed in the field of the quality of the provision of educational services to achieve results by the goals, to satisfy the expectations, various needs, and requirements of society and the state, individuals, as well as institutions of higher education, which are interested independent parties.

The approach to the development and implementation of an effective management system in the educational space includes several components:

- definition of expectations and needs of consumers (interested parties);
- definition of responsibility and procedures necessary in the field of quality to achieve goals;
- development of the goals of the organization and its policy on quality assurance;
- determination of resources that are important, necessary and their provision in the field of quality of achievement of goals;
- development of methods for evaluating the effectiveness of each process and effectiveness;
- application of the results of these measurements to determine the effectiveness and efficiency of each process;
- identification of means that are important and necessary not only to prevent non-conformities but also to eliminate their causes;

- development of ways of continuous improvement of the management system in the educational space, and application of quality management measures (Parente et al., 2021).

The main mechanisms and functions of control for carrying out reforms to form an effective management system in the educational space of a higher education institution.

To carry out reforms in the education system to form an effective management system in the educational space of a higher education institution, the following basic mechanisms should be applied:

- raising the social status of scientists and teachers;
- debureaucratization of the education management system, increasing the role of public management in the education system;
- introduction of independent assessment of teachers' qualifications, and results of their educational activities;
- provision of academic freedoms for scientific and pedagogical workers;
- expansion of autonomous rights for educational institutions;
- introduction of economic stimulation for quality educational activities (reform of the system of state financing of education);
- development of the National system of qualifications;
- bringing the education structure and education classification into line with international (Chyzhevskiy, 2014).

It is quite obvious that for the formation of an effective management system in the educational space of a higher education institution, it is necessary to ensure the quality control of educational services, to combine the efforts of the community and the state in creating strategies for reforming the educational sector as equal partners, to strengthen social protection for all participants in the educational process, and to improve innovativeness in training competitive personnel, which can provide a comprehensive and comprehensive solution to management problems in the field of education.

Without public support, legislative support for educational activities will remain ineffective. Therefore, education management should be state-public. The problem of forming an effective management system in the educational space of a higher education institution, involving the public

in the development and adoption of management decisions, implementation and creation of its mechanisms, about changing the content, methodological approaches, technologies of education of higher education seekers to successful professional activity by modern needs is the most important in the current transformations of the entire society (Suprun, 2020).

Types of management activities.

The basis of an effective management system is the control and diagnostic activity of the head of the educational institution, who occupies a leading position in the institution. We observe two types of management activity here:

- a perceptive type of management activity provides an opportunity to collect information about the development of the educational process and its course, through direct perception of the pedagogical activity, provides for a comparison of the state of affairs, which is effective with the standard;
- communicative, provides an opportunity to create a communication network through which the information necessary for communication of the manager, management of the pedagogical process, and interaction with deputy teachers, and students of higher education flows. Therefore, it is necessary to pay great attention to the organization of control and diagnostic activities, because it is during such activities that innovative management decisions are made to control and regulate the object.

When organizing the control of an effective management system in the educational space of higher education institutions, it is worth starting from the following provisions:

- goal-directedness and specificity of control, objectivity, taking into account all the basic regularities of the study of the educational process;
- systematicity and systemativity of control based on the determination of the optimal terms for the organization of inspections, the selection of the most expedient types for a given period, and consideration of time;
- a dialectical approach to the analysis and study of the content of the specialists' work.

During the control process, it is necessary to define specific tasks for each member of the teaching staff, to systematically cover all areas of

the educational process, and to outline the ways of their implementation; day-to-day verification of the execution of decisions, orders, and orders.

Functions for controlling the management system in the educational space of higher education institutions.

The following functions are extremely important for management control:

- diagnostic (shows the real state of the quality of education in the educational institution);
- informational (creates an array of information in the institution of higher education for quality education);
- corrective (minimizes the influence of negative factors in the educational process);
- evaluative (based on a certain set of indicators and criteria, it provides a quantitative and qualitative assessment of the objects of the educational process in a higher education institution);
- prognostic (forms the tactics and strategy of the development of higher education in the educational institution);
- communication (to perform the diagnostic function, provide information, enable feedback);
- management (monitors the results of the developed programs and the effectiveness of the decisions made);
- preventive (reveals prevention of negative consequences and undesirable deviations).

Control functions are closely related to each other and are implemented with the help of their subjects; creating feedback and direct communication between subordinates and the manager (Kuzminskyi et al., 2022).

Principles of development of the management system in the educational space of higher education institutions.

"Among the global Sustainable Development Goals, which determine the prospects for the development of humanity until 2030, the provision of inclusive and equitable quality education and the promotion of lifelong learning opportunities for all are defined". By the content of this strategy, a purposeful, flexible, effective system of education management is necessary, which ensures the quality of education and its intensive development, its focus on individual requests, meeting the needs of the country, provides for the decentralization of education management, optimization of state management structures; redistribution of functions and powers

between educational establishments and institutions and local self-government bodies; regional and central education management bodies; development of the system of autonomy of institutions and educational institutions, measures to implement decentralization of management, expansion of their opportunities and rights regarding financial independence; transition to programmatic management, etc. (Shetelya et al., 2023).

Let's name the main principles of the development of the management system in the educational space of higher education institutions. These are openness, democracy, joint participation in the implementation of educational, production, and educational processes, interaction, coordination, mutual control, and joint management.

As a socio-cultural center, a higher education institution is a place of interest of both the community and the state, it is both an element of the structure and a part of social life that is subject to state control. In the conditions of the development of the expansion of the practice of co-management and democracy, higher education institutions rely on communities and public organizations, which helps to complete the transition from state dominance, and the policy of patronage over the public to their interaction and constructive partnership. "The direct management of an educational institution is carried out by the founders or a body authorized by them, the head of the educational institution, the collegial management body of the educational institution. The basis of education management is the state educational policy, which is fixed in the current legislation and appropriately guides management activities. At the same time, in the conditions of modernization transformations, the development of the educational sector may imply certain changes in the principles and mechanisms of state management of education" (Suprun, 2020).

Tasks of an innovative research university by the peculiarities of the organization of the management system in the educational space.

By the peculiarities of the organization of the management system in the educational space of higher education institutions, an innovative research university must ensure:

- administrative and structural component; financial and economic regulatory and legal, material and technical, scientific and methodological support; based on

innovative principles of management and organization – the unity of scientific and educational activities;

- active formation and forecasting in the field of science-intensive technologies, educational services, and labor markets, in the region with the aim of anticipatory staffing and scientific and technical support of priority industries;
- implementation of research and design developments, fundamental and applied research in priority areas of education and science, and critical technologies at the federal level;
- provision of a wide range of services of different levels, variable educational programs, content, and forms, including training through the participation of higher education seekers in development and research;
- the relationship between applied developments and the balance of the stages of exploratory and fundamental research, the demand for the results of innovative technologies and their implementation in production, and personnel support;
- in the field of education and science, protection of rights to intellectual property objects for all participants in educational, scientific, innovative activities, and their commercially profitable use;
- adequate consideration of the needs of infrastructure and structure development, external conditions and innovative activities, active participation of the higher education institution in the field of education and science, in the development of small entrepreneurship;
- deep integration of innovative, educational, scientific, and technical activities with scientific organizations and specialized industrial enterprises;
- availability of resource management systems, quality management, management of the results of educational and research activities, implementation, and evaluation of their innovative potential (Illiashenko, 2015).

This approach makes it possible to formulate the main tasks of the development of an innovative university:

- ensuring the unity of scientific, educational, and innovative processes and their focus on the training of highly qualified specialists of the new generation;
- promotion to the market of new technologies developed based on the commercialization

of scientific knowledge and inventions in the institution of higher education in conditions of effective protection of rights and objects of intellectual property using new financial and economic mechanisms;

- creation of conditions for the use of innovative activities of higher education institutions, involvement of teachers, scientists, students of higher education, and graduate students in the innovation process, to improve the quality of specialist training and strengthen the role of higher education institutions as a center for the development of innovative activities;
- creation of a system of quality management of innovative, educational, and scientific activities in a higher education institution based on a single information space of a higher education institution, which unites innovative, educational, and scientific blocks of a higher education institution with the organization of automated document flow (Boltianska & Boltiansky, 2020).

In an innovative research university, due to the peculiarities of the organization of the management system in the educational space, every management decision must be aimed at achieving the institution's main goal.

In a higher education institution, management of innovation processes is one of the functions of a modern manager. To a large extent, the success of this activity depends on the personality of the manager, who takes into account trends in the development of education, can see prospects, objectively assesses the personnel and material and technical capabilities of the institution, is aware of possible risks, is oriented to cooperation with the heads of other state and educational institutions, parents, organizations, public figures, and most importantly, he directs his efforts to the professional development of his colleagues and strives for continuous self-development (Nemchenko et al., 2022).

Experimental research.

During the experimental study, we relied on the research of scientists who studied the professional development of heads of higher education institutions in the innovative management system in the educational space (Viteri Intriago et al., 2020).

More than 100 representatives of higher education institutions (provosts and heads of departments) became participants in the study.

A survey was conducted, which was aimed at identifying the level of relevance of various content areas in the innovative management system in the educational space.

The survey showed the following distribution: measurement of learning outcomes and competence approach – 23%; innovative learning technologies in the innovative management system in the educational space – 22%; the labor market provided by higher education and – 21%; ensuring the quality of the innovative management system in the educational space – 20%; joint and double diplomas – 18%; mobility of teachers and students in the educational space – 17%; implementation of the Bologna process in the educational space – 14%; staff development in the innovative management system in the educational space – 13%; governance and autonomy in higher education – 12%; internationalization in the innovative management system in the educational space – 10%; in the innovative management system in the educational space of positive image formation – 9%; in the innovative management system in the educational space of forming a student-centered environment – 9%; integration of research, education, innovation in higher education – 7%; organizational development of educational space – 6%; social dimension of educational space 3%.

The following served as additional guidelines for the heads of higher education institutions when forming the content of the innovative management system in the educational space:

- the members of the expert team carried out an expert assessment of the relevance of substantive areas;
- data from the study of educational needs of heads of higher education institutions in European countries "Mapping the Field: Report on the Needs and the Supply of Higher Education Leadership and Management Training in Europe Report on the Needs and the Supply of Higher Education Leadership and Management Training in Europe" – research by Peter Maassen and Atilla Pausits (Maassen & Pausits, 2012).

The following data were obtained: strategic management was noted by 74% of respondents; innovative development strategies – 57% of respondents; development of human resources of the innovative management system in the educational space – 56% of respondents; research development strategies – 43% of

respondents; organizational culture – 42% of respondents; the policy of internationalization of the innovative management system in the educational space – 36% of respondents; the policy of ensuring the quality of the innovative management system in the educational space – 32% of respondents.

The priorities for the development of the European Higher Education Area (EHEA) (2012), specified in the Bucharest Communiqué "Making the Most of Our Potential: Consolidation the European Higher Education Area". It:

- strengthening the mobility of the innovative management system in the educational space (professional and academic recognition, joint programs and degrees, balanced mobility);
- creation of quality of higher education and accessibility (social dimension of higher education, integration of research and learning, widening of access for all who wish to study, student-centered learning, recommendations for quality assurance in the European Higher Education Institution, European standards, governance in higher education and funding);
- tools of the Bologna process (ECTS, three-cycle system, supplement to the diploma, study monitoring);
- improving the employability of graduates of higher education institutions through the introduction of an innovative management system in the educational space (European research space: "research – teaching – learning", professional qualifications, the framework of qualifications, learning outcomes).

At the end of the first stage of the program of the innovative management system in the educational space, to find out the attitude, evaluation, and wishes of the applicants of higher education and management of the institution to improve the quality and efficiency of such activities, respondents were offered a questionnaire.

The results of the questionnaire survey analysis showed that 78% of the respondents positively evaluated the format and content of the proposed program of the innovative management system in the educational space.

The research methodology involved the use of both quantitative and qualitative methods.

We have integrated different data types by combining elements of the same data type, that is, those belonging to a homogeneous data type. More formally, such an approach can be defined as an ordered collection of elements of a certain type, which are addressed using one or more indices. Different types of data were classified by the number of array dimensions (one-dimensional arrays (vectors), two-dimensional (matrices), and multidimensional (three, four, or more)).

The main wishes and comments of the participants in the study of the effectiveness of the innovative management system in the educational space related to increasing interactivity in the process of expanding opportunities for sharing experiences and learning.

Among the questions of the questionnaire offered to the respondents were those whose content direction is related to determining the level of quality of higher education in higher education institutions.

452 students of higher education took part in the survey.

We are not talking about the fact that the conducted survey is representative because it cannot be considered a selective population that reproduces the characteristics of the general population. We believe that according to certain characteristics, the deviations of the sample population from the general population are not significant, which means that we claim that the obtained results for working out generalizations regarding the level of development and the formation of an idea about the subject of scientific attention can be considered at the level of the informational basis.

At the beginning of the survey, the respondents were explained the scale for evaluating the innovative management system in the educational space and the phenomenon of the quality of higher education (10 points correspond to the maximum possible level of quality of higher education, and 1 point corresponds to the minimum possible level of quality of higher education).

To positively evaluate the innovative management system, we collected and analyzed research data.

Collecting and measuring information about the given variables made it possible to answer relevant questions and evaluate the results. The purpose of all data collection was to select qualitative data that would then be translated into the analysis of all the data and allow for the creation of convincing and valid answers to the questions that were asked. A survey was conducted, which was aimed at identifying the level of relevance of various content areas in the innovative management system in the educational space. Among the questions of the questionnaire offered to the respondents were those whose content direction is related to determining the level of quality of higher education in higher education institutions.

According to the results of the analysis of the answers of higher education seekers regarding the assessment of the quality of higher education and the innovative management system in the educational space at the university and state levels, we can state that:

1. The majority of respondents believe that the level of innovative management systems in the educational space and the quality of higher education are quite satisfactory (52% of respondents rated these indicators at the level of 4 to 8 points out of 10).

During the study, 28% of the respondents claimed a very high level of innovative management system in the educational space and the quality of higher education was unexpected. We explain this assessment by the respondents' ignorance of the innovative management system in the educational space and the level of quality of higher education in other countries, as well as the low level of training of those seeking higher education.

We used the selective interview method to understand the choice of higher education applicants, during which the correctness of the first and second of the above assumptions was clarified. We can state that the vast majority of higher education students have no idea about the level of the innovative management system in the educational space the quality of higher education in general and the provision of quality educational activities by foreign institutions of higher education, in particular.

2. Every fifth respondent considers the quality of higher education in Ukraine to be low. Such a result was obtained based on the results of the analysis of the answers of the students of higher education at the university level. Such results testify to the objectivity of the assessment because it was this assessment based on fairly close, but non-identical criteria in terms of the content of scientific attention that turned out to be the same).

Let us draw attention to the fact that 20% of respondents rated the innovative management system in the educational space and the quality of higher education in general at a low level (for comparison, we cite examples of respondents from other countries regarding the feasibility of introducing an innovative management system in the educational space, only 7% of Latvian higher education graduates and 3% of Chinese students rated the level of innovative management system in the educational space and the quality of higher education in their country at a low level). Therefore, we are talking about the fact that the functioning of quality systems of higher education in general and internal and external quality assurance of educational activities, in particular, today have low efficiency and also lack of perfection of the innovative management system in the educational space.

3. The vast majority of respondents assessed the innovativeness of the management system in the educational space and the quality of education at their university at the "very high" and "high" levels (68% – total). This assessment can be explained by the fact that the majority of higher education seekers who were interviewed, get their higher education in such universities that have national status and offer a high level of education services. It was this effective indicator that was obtained at the state level according to the relevant direction of assessment. The difference between the results of the assessment at the state and university levels lies in the different values of the individual components of the final assessment: at the state level, the result was obtained in 30% of the "high level" group (from 7 to 8 points), while at the university level – 20%; in the "very high level" group (from 9 to 10 points) at the university level – 38%, and at the state level the result was 28%.

The system of ensuring management in the educational space and the quality of education in

universities that have national status clearly and well fulfills its functions.

4. Within the "adequate level" and "low level" groups at the state and university levels, comparing the results of the answers of higher education applicants, we have completely identical results – 20 and 22%, respectively.

That is, 44% of higher education students assessed the innovativeness of the management system in the educational space and the quality of education at their university of education at the university and state levels within the "sufficient level" and "low level" groups. At the level of the lowest criterion group, the assessment of experts does not have significant differences between the macro and micro levels) and this indicates the existence of problems in the functioning of the innovative management system in the educational space and the quality assurance system of higher education.

In the proposed questionnaire, the respondents were asked questions about determining the level of satisfaction of higher education seekers with the quality of higher education offered by higher education institutions. Let's analyze the answers of students of higher education:

- 76% of respondents of Ukrainian higher education institutions are satisfied with the quality of higher education offered by universities – this is the total number of answers that were identified at the level of statements "completely satisfied", "generally satisfied", "rather satisfied". For comparison, we will present the results of Chinese and Latvian students: among Chinese and Latvian students, the corresponding share of satisfaction was 70 and 72%, respectively;
- 34% of respondents, this is the total number of answers that were identified at the level of statements "rather not satisfied" and "not satisfied" – almost every fourth respondent is not satisfied with the quality of higher education. Above, we drew attention to the fact that 20% of students rated the quality of higher education, both at the university and state levels, at a low level.

This fact suggests that students have information about the quality of higher education in other countries (in the EU countries) – the existence of a basis for comparing the innovative management system in the educational space and the quality of education or about the awareness

of higher education seekers about the needs of the international labor market.

During an experimental study that investigated the importance of an innovative management system, the professional development of heads of higher education institutions, and the level of quality of higher education, we chose a statistical criterion to test the research hypothesis. We needed to answer the following questions:

- What acts as independent and dependent variables in the study?
- In what scales are the variables measured?
- How many groups are there in the experimental design?
- What are these groups (correlated or independent)?

Before choosing a statistical criterion for analyzing the research data, we defined the independent and dependent variables. An independent variable is something that the researcher manipulates. The dependent variable is the result of manipulating the independent variable. That is, the independent variable is a factor, and the dependent variable is a consequence. We are trying to explain the effect of the dependent variable that arose due to the manipulation of the independent variable.

After identifying the independent and dependent variables, our next step in choosing a statistical criterion for the analysis of experimental data is to determine in which scales these variables are measured. The measurement scale of the dependent variable helped us determine which group of statistical criteria we should apply (non-parametric or parametric). Nonparametric criteria were used to analyze nominal and ordinal data (Pearson's χ^2 test).

Choosing the necessary among these criteria, we determined the number of groups in the experimental study and the nature of these groups (independent or dependent (correlated)). Parametric criteria were used to analyze data measured in interval and ratio scales. Choosing among these criteria necessary for a specific study, we determined the number of groups in the experimental study and the nature of these groups (independent or dependent).

Methodological recommendations for the implementation of the project of the innovative research university by the peculiarities of the organization of the activity

of the management system in the educational space.

As a result of the implementation of the innovative research university project, by the peculiarities of the organization of the management system in the educational space, it is planned to create an environment to support scientific and educational processes within the higher education institution based on the use of modern telecommunications and information technologies, which will ensure:

- management of user groups and users, access rights;
- rationing and monitoring of all types of educational workload, calculation of the number of rates for the contingent of higher education applicants by specified state norms;
- modernization and formation in automatic mode, automated development of educational programs by specializations, directions, and specialties;
- calculation of the educational load of teachers, departments of the institution of higher education, and the distribution of the components of the educational load among several departments, calculation of the number of rates;
- support of remote, electronic, and mobile modes of work of higher education applicants;
- generation of the available teaching staff, the schedule of classes taking into account the contingent of higher education applicants and the classroom fund of the higher education institution;
- feedback from the teacher to the student, individual dialogue of the student through the information base of the system;
- statistical processing of the results of various types of control: semester, current, entrance, modular, knowledge retention control, state certification, practices, and course design; visualization of results in the form of graphs, charts, and tables;
- complex automation of technological processes for carrying out various types of evaluation of educational activities of higher education applicants, monitoring, as well as processing of their results;
- maintaining an archive of information, forming reporting documentation on the functioning of educational and scientific units of higher education institutions;
- support for management of the educational process, document flow between units of

higher education institutions that manage and control the educational process;

- support for decision-making regarding the motivation of educational activities of those seeking higher education, directions for improving the quality of the educational work of teachers, and improvement of methodological systems of education in various disciplines in the context of the implementation of the principles of the Bologna Declaration and the credit-module system of education in higher education;
- determination of the levels of success and success of higher education applicants: individual, by streams, groups, institutes, higher education institution as a whole, by areas of training, educational fields, specialties;
- maintaining a database with the results of various types of monitoring of educational activities, control tasks, a database of tests from various types of control, examination tickets, a database of higher education graduates and teachers.

We agree with the opinion of scientists that the development and implementation of innovative automated systems for managing the educational process of a higher education institution "will contribute to the wider use of ICT in higher education, the creation of a single informational educational environment for all subjects that are part of the university community, democratization and openness of higher education, as well as the integration of the institution of higher education into the European and global information spaces" (Plakhotnik et al., 2023).

The research methodology involved the use of the following methods:

- comparative and logical analysis to identify the features of an effective management system in the educational space. The basis of an effective management system is the control and diagnostic activity of the head of the educational institution, who occupies a leading position in the institution. Here we analyze two types of managerial activity: perceptive type of managerial activity and communicative;
- systemic analysis of management in education – to form a holistic view of the management system in the educational space and self-governance in the education system and to create an effective management system in the educational space, the importance of reforming the education

system at the current stage of society's development is shown; the role of an innovative university in creating an effective management system in the educational space is revealed; the principle provisions of the new management paradigm are highlighted; the formation of an effective management system in the educational space of higher education institutions is proposed;

- statistical method and method of analysis – to assess the state of education development, the main mechanisms and functions of control for carrying out reforms to form an effective management system in the educational space of a higher education institution were revealed; the main types of management activities are described; the principles of development of the management system in the educational space of higher education institutions and the proposed task of an innovative research university by the peculiarities of the organization of the management system in the educational space;
- sociological methods – to identify the state of the management system in the educational space from the point of view of social groups and subjects of the educational process, during which we investigated the importance of the innovative management system in the educational space, the importance of professional development of heads of higher education institutions, the level of quality of higher education in institutions higher education.

Conclusions

The global trends of modernization and reform of the entire education system present the world education system with tasks of a completely new level. Therefore, the article shows the importance of reforming the education system at the current stage of society's development to create an effective management system in the educational space. The role of an innovative university in creating an effective management system in the educational space is revealed; the principle provisions of the new management paradigm are highlighted; the formation of an effective management system in the educational space of higher education institutions is proposed.

The main mechanisms and functions of control for carrying out reforms to form an effective management system in the educational space of a higher education institution are revealed; the main types of management activities are

described.

The basis of an effective management system is the control and diagnostic activity of the head of the educational institution, who occupies a leading position in the institution. We observe here two types of managerial activity: perceptive type of managerial activity and communicative.

The main functions for controlling the management system are highlighted; the principles of the development of the management system in the educational space of higher education institutions and the task of an innovative research university by the peculiarities of the organization of the management system in the educational space is proposed.

An experimental study was conducted during which we investigated the importance of an innovative management system in the educational space, the professional development of heads of higher education institutions, and the level of quality of higher education in higher education institutions.

More than 100 representatives of higher education institutions (provosts and heads of departments) became participants in the study. A survey was conducted, which was aimed at identifying the level of relevance of various content areas in the innovative management system in the educational space. The results of the questionnaire survey analysis showed that 78% of the respondents positively evaluated the format and content of the proposed program of the innovative management system in the educational space.

Among the questions of the questionnaire offered to the respondents were those whose content direction is related to determining the level of quality of higher education in higher education institutions. 452 students of higher education took part in the survey. We are not talking about the fact that the conducted survey is representative because it cannot be considered a selective population that reproduces the characteristics of the general population. We believe that according to certain characteristics, the deviations of the sample population from the general population are not significant, which means that we claim that the obtained results for working out generalizations regarding the level of development and the formation of an idea about the subject of scientific attention can be

considered at the level of the informational basis.

Methodological recommendations for the implementation of the project of an innovative research university by the peculiarities of the organization of the management system in the educational space are offered.

We see the prospects for further scientific research in the study of the conflict-related competence of future education managers.

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DOI: <https://doi.org/10.34069/AI/2024.74.02.30>

How to Cite:

Dichek, N., & Kravchenko, O. (2024). Social and psychological assistance to children under martial law. *Amazonia Investiga*, 13(74), 361-372. <https://doi.org/10.34069/AI/2024.74.02.30>

Social and psychological assistance to children under martial law

Соціально-психологічна допомога дітям в умовах воєнного стану

Received: January 5, 2024

Accepted: February 25, 2024

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Abstract

The purpose of the study is to identify the main psycho-emotional states and factors affecting the physical and mental well-being of schoolchildren, including during distance learning and in relationships with family members, as well as to develop areas of psychosocial assistance to children under martial law. To achieve the research purpose, an appropriate questionnaire was developed with multiple-choice questions about: dominant emotions and feelings, attitudes towards distance learning, reactions to external stimuli, the impact of martial law on the comfort of life, relationships with peers and parents, etc. A survey was conducted among 1303 schoolchildren aged 6–17, including 515 boys and 788 girls, 11 of whom live outside Ukraine. The survey found that the physical and psycho-emotional well-being of Ukrainian schoolchildren was characterised by sleep disturbances, agitation, fear, rapid mood changes, severe fatigue, sadness, longing, indignation, irritation, anger, increased conflicts (especially with parents), etc. An additional factor in the increased level of anxiety under martial law was distance learning, which makes it difficult for students to concentrate due to the difficulty of communication, shifted daily routines, worries about family and friends, changes in responsibilities and other distractions. The main directions of psycho-correctional work and recommendations for the use of psychosocial

Анотація

Мета дослідження полягає у визначенні основних психоемоційних станів та факторів впливу на фізичне та психічне благополуччя школярів, у тому числі під час дистанційного навчання та у відносинах з членами сім'ї, а також у розробці напрямів психосоціальної допомоги дітям в умовах воєнного стану. Для досягнення мети було розроблено відповідну анкету, в якій сформовано питання з варіантами відповідей щодо: домінуючих емоцій та почуттів, ставлення до дистанційного навчання, реакції на зовнішні подразники, впливу воєнного стану на комфортність життя, стосунки з однолітками та батьками тощо. Проведене опитування 1303 школярів віком 6–17 років, у тому числі 515 хлопців та 788 дівчат, з яких 11 проживає закордоном. За результатами опитування встановлено, що фізичне та психоемоційне самопочуття українських школярів характеризувалося порушенням сну, збудженням, страхом, швидкими змінами настрою, сильною втомою, смутком, тугою, обуренням, роздратуванням, гнівом, зростанням конфліктів (особливо з батьками) тощо. Додатковим фактором підвищеного рівня тривожності в умовах воєнного стану стало дистанційне навчання, за якого учням важко сконцентруватися внаслідок складності спілкування, зміщеного розпорядку дня, переживання за рідних і близьких, зміни обов'язків та інших відволікаючих факторів. Розроблено основні

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assistance technologies have been developed, which will allow children to assess their current life situation, identify their strengths (resources), which will ensure their self-healing and increase their resilience.

Keywords: schoolchildren, emotions and feelings, traumatic experience, distance learning, resource, coping strategies.

Introduction

In the context of the new socio-political realities caused by the outbreak of a large-scale war in Ukraine, the most vulnerable categories of citizens, including children, need special support. It is believed that the sooner children are helped to cope with the consequences of a traumatic event, the lower the risk of future problems. A traumatic event is defined as an unexpected, unexpected, overwhelming event that goes beyond the normal human experience (Prorok (ed.), 2018, p. 24).

Thus, the primary task is to provide comprehensive psychological assistance to children, especially those who have experienced violence (against themselves and/or other people), loss (directly/indirectly), direct hostilities (explosions, fires, sirens), etc.

The purpose of the study is to identify the key psycho-emotional states and factors that affect the physical and mental health of schoolchildren, in particular in the context of distance learning, in interaction with family members, during a full-scale invasion. In addition, *the purpose* of the article is to develop strategies for psychosocial support for children under martial law.

To achieve this goal, the following tasks were solved:

- questionnaires were developed to identify the main psycho-emotional states and factors influencing the physical and mental well-being of schoolchildren;
- a survey of selected respondents was conducted on the questions of the developed questionnaire;
- collecting, processing and grouping of respondents' answers, drawing conclusions;
- taking into account the results of the survey, recommendations were developed on the use of psychosocial assistance technology for psychologists working with children who have experienced traumatic experiences as a result of military operations.

напрями психокорекційної роботи та рекомендації щодо використання технологій психосоціальної допомоги, які дозволять дітям оцінити поточну життєву ситуацію, виявити свої сильні сторони (ресурси), що забезпечить їх самоцілення та підвищення життєстійкості.

Ключові слова: школярі, емоції та почуття, травматичний досвід, дистанційне навчання, ресурс, копінг-стратегії.

Literature review

The study of the basics of psychological assistance in the conditions of military conflict was carried out by leading scientists, including K. Miller, & A. Rasmussen (2010), J. Cuartas Ricaurte, L. Karim, M. Martínez Botero, & P. Hessel (2019). N. Singh et al. (2021), N. Jain et al. (2022). An in-depth study of the phenomenon of personal psychotrauma, its nature and consequences of exposure is covered in the works of I. Keynan (2015), T. Molendijk, E. Kramer, & D. Verweij (2016), Z. Kisarchuk (ed.) (2020), B. Palamar et al. (2023). They systematized the latest experience in overcoming the consequences of psychotrauma, studied the phenomenon of post-traumatic stress disorder in the national context, taking into account the age, psychological, social and socio-cultural characteristics of victims and the characteristics of specialists and the specifics of their practice (Kisarchuk (ed.), 2020, p. 6).

M. Costello, L. Phelps, & F. Wilczenski (1994), M. Wessells (1998), T. Betancourt, & K. Khan (2008), L. Meiqari, M. Hoetjes, L. Baxter, & A. Lenglet (2017), A. Kadir, S. Shenoda, J. Goldhagen, & S. Pitterman, (2018), J. Michalek et al. (2022), T. Kostenko, K. Dovhopola, O. Nabochenko, V. Kurinna, & V. Mykhaylyuk (2022), and others studied the peculiarities of post-crisis psychological diagnosis and rehabilitation of children.

The general conditions for social and psychological assistance to children under martial law, proposed by the above-mentioned authors, are: creating a safe environment for children at home and in educational institutions; communication, discussion of problems and expression of support; openness and honesty in communication with children about war and its threats; mandatory family support; psychological assistance, both group and individual, as well as social protection of children affected by war.

The main limitations of using the results of these studies in practice are their focus on specific

cases, which take into account the factors and circumstances of the analysed military conflicts only. That is why they need to be adapted to the realities of the Russian-Ukrainian full-scale war, and not used as a basis for use. And such adaptation is impossible without taking into account the contexts, specifics and consequences of military threats on the mental health of Ukrainian children.

Despite the fundamental works of these researchers, the issue of rehabilitation of schoolchildren under martial law has received extremely little attention. Given the specifics of the problem, as well as its focus on the most vulnerable category of the population, this topic requires going beyond previous studies.

Methodology

A questionnaire has been developed that combines the following information: demographic indicators, place of residence before the outbreak of hostilities, leading activities under martial law, dominant emotions and feelings, attitude to distance learning, the impact of the consequences of an unfavorable socio-political situation on the relationship between students and their peers, resource potential of the individual, the most common coping strategies of students and their parents.

Respondents: Schoolchildren aged 6–17. Below is a Figure 1 that provides a general idea of the ratio of the number of survey participants by age.

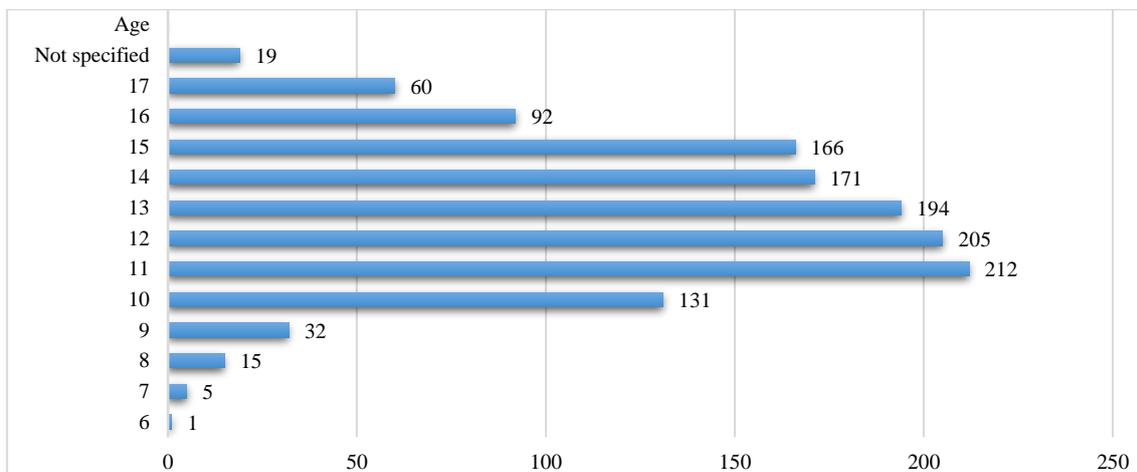


Fig. 1. Age of respondents.

Source: Results of a survey conducted by the authors.

The gender distribution (Figure 2) of the survey participants was as follows: female (60.5%) and male (39.5%).

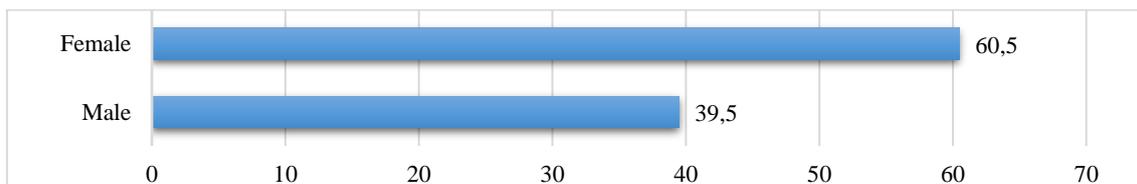


Fig. 2. Gender of survey participants.

Source: Results of a survey conducted by the authors.

The survey found that most of the respondents lived in Uman (84.04%) and Uman district (5.6%) before the hostilities. The survey was conducted among schoolchildren in Kyiv and its

region, as well as in Kirovohrad, Kharkiv, Luhansk, Vinnytsia, Donetsk, Chernihiv, Zaporizhzhia, and Zakarpattia regions (Figure 3).

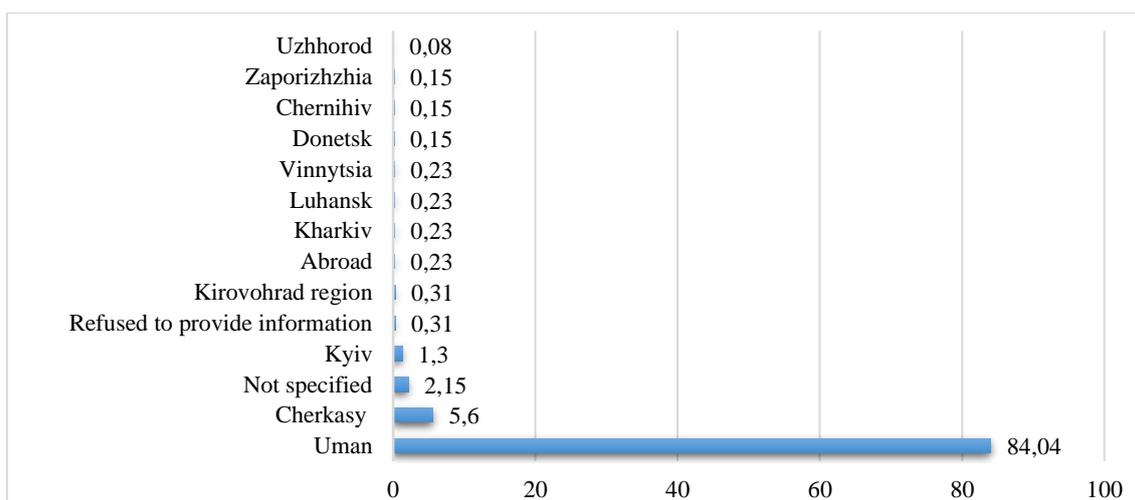


Fig. 3. Place of residence before military actions.
Source: Results of a survey conducted by the authors.

Results and discussion

In his work “Psychological War Trauma and Society: Like a Hidden Wound”, the Israeli scientist I. Keynan emphasizes that symptoms of post-traumatic stress disorder can be expressed even in people who were not in the immediate vicinity of the place of a terrorist attack or military operations (Keynan, 2015, p. 161).

Thus, a large number of people, including children, can be traumatized regardless of their location.

The question “What is the most uncomfortable thing about martial law?” provides information on what factors contribute to the deterioration of children’s psycho-emotional state and increase their experience of crisis situations (Figure 4).

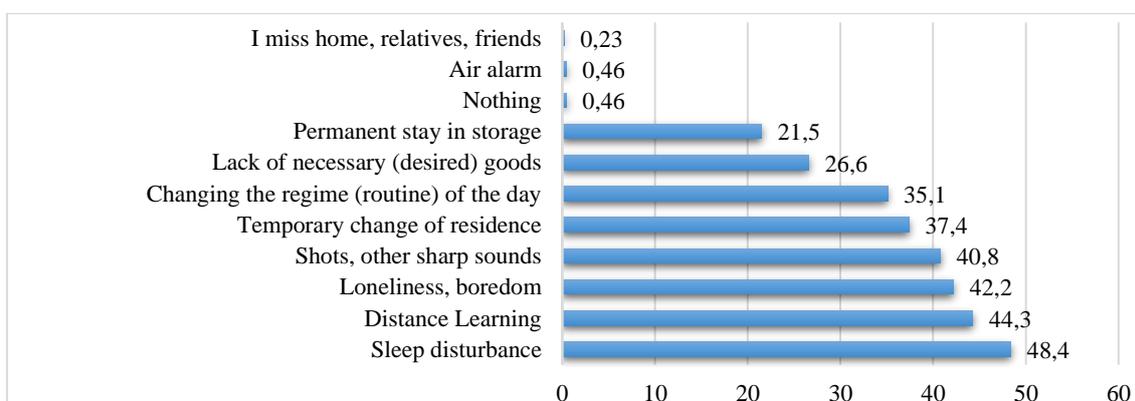


Fig. 4. What is the most uncomfortable under martial law?
Source: Results of a survey conducted by the authors.

The most uncomfortable things about martial law, according to students, are “sleep disturbances” (48.4%), “distance learning” (44.3%), “monotony, boredom” (42.2%), “shots, other sharp sounds” (40.8%).

Obviously, under martial law, physical and mental well-being is affected by any situation of uncertainty and risk, when special responsibility is required in relation to one’s own life, decision-making in stressful situations, and management of one’s own emotions and feelings. An additional factor in increasing anxiety during this

period is distance learning, in which students cannot concentrate due to:

- difficulties in connecting (Internet speed, availability of appropriate equipment);
- shifted daily routine (sleep disturbance, appetite, increased fatigue), which depends on the situation in a particular region (which leads to interruption or postponement of the lesson(s) to another day, a large amount of material for independent study);
- worrying about family, friends and relatives;
- changes in responsibilities (helping parents, volunteering, territorial defense);

- other distractions (the atmosphere at home, thoughts and feelings about the current situation) (Bezliudniy et al., 2022; Kravchenko et al., 2022).

It is noteworthy that 0.23% of students chose their own option, stating that they “miss home, family and friends.” Most of these children were forced to leave for a safer place for a while. The total number of displaced students is 37.4%.

It was found that the most uncomfortable options, in the opinion of children, were mostly those that most clearly illustrate the violation of certain needs that are crucial (Kravchenko,

Koliada, Isachenko, & Honchar, 2021): physiological needs (sleep, necessary goods), safety needs (sharp sounds, including shots, explosions, air raid sirens, uncertainty), social needs, as well as the need for recognition (change of residence, distance learning), the need for self-expression and self-realization (constant stay in a shelter (or at home in a safe place), monotony).

The question “What did you do during the air raid?” is driven by the need to determine the level of awareness of children about the seriousness of the situation, as well as to identify activities that help relieve excessive tension in stressful conditions (Figure 5).

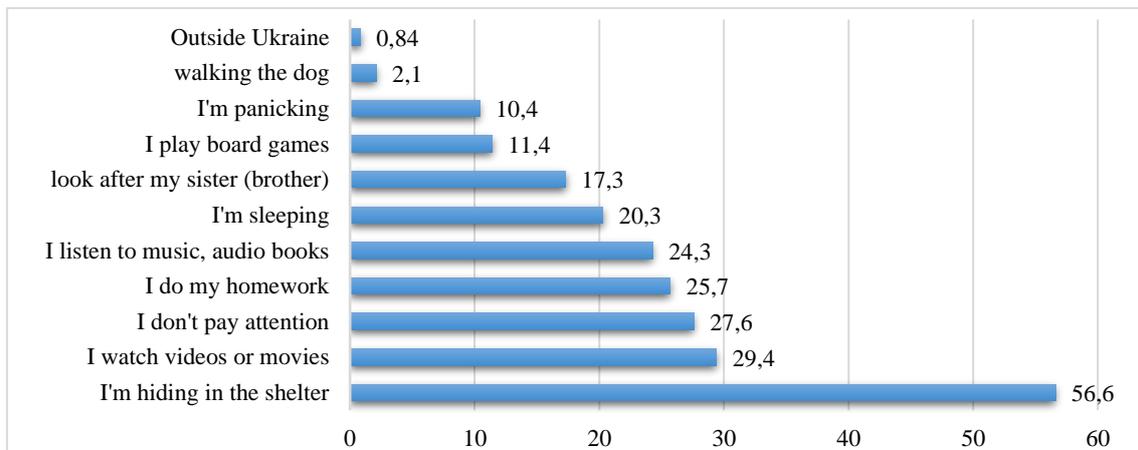


Fig. 5. What did you do during the air raid?
Source: Results of a survey conducted by the authors.

Let’s identify the types of activities that serve as a distraction for children when they feel inner tension during air rage: “watching videos and movies” (29.4%), “doing homework” (25.7%), “listening to music, audiobooks” (24.3%), and “extra hours of sleep” (20.3%).

It is worth emphasizing that 56.6% of schoolchildren “hide in a shelter,” which indicates a high level of parental awareness of life safety, and this, in turn, shapes the child’s attitude. Air raid alerts are ignored by 27.6% of students, which suggests that they have a low level of awareness of the situation in the country and an indifferent attitude to their own safety. The number of respondents currently live outside of Ukraine is 0.84%.

The question “What emotions and feelings prevail?” allows us to determine the presence of

dominant emotions and diagnose the psycho-emotional state of a person (Figure 6).

The dominant emotions can be conditionally divided into two types: positively and negatively tinged. The first option includes the following answers: “excitement” (54.2%), “fear” (40%), “fast mood changes” (36.7%), “feeling very tired” (33.3%), “trembling, especially from loud sounds” (29.2%), “sadness, longing” (28%), “indignation irritation” (23.9%), “anger” (22.6%), “terrible dreams (nightmares)” (18%), “indifference, lack of interest in what I used to like” (16.6%), uncertainty (16.5%), “feeling of loneliness” (15.1%), “resentment” (12.9%), “indifference” (0.69%), “aggression” (0.31%). Let’s contrast the above with positively tinged emotions and feelings, which include the following: “hope that it will end quickly” (67.2%), “compassion” (20.3%), “love of life” (17.2%), “pity” (10.3%).

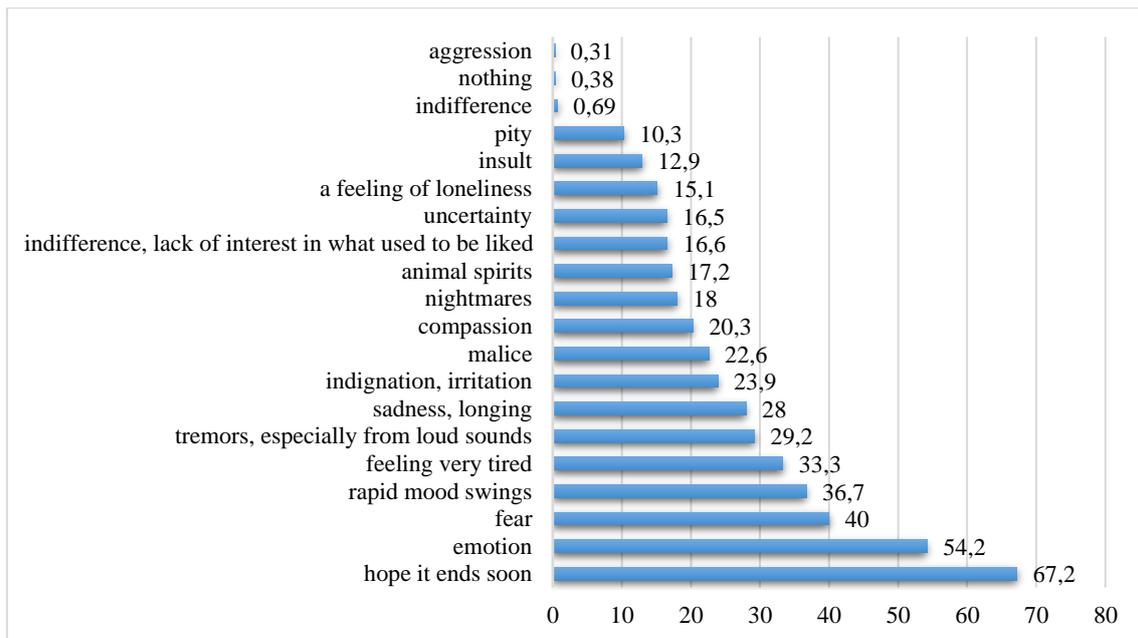


Fig. 6. What emotions and feelings prevail?

Source: Results of a survey conducted by the authors.

Although the largest number of options belong to negatively directed emotions and feelings, in terms of percentage, it is the positive ones that cover a significant majority of students – 67.2%. In addition, given the situation of uncertainty and risk, any of these options are quite natural and even predictable.

Under martial law, distance learning has become one of the main ways for teachers and students to interact. The question “What is most annoying about distance learning?” allows us to determine the attitude of students to the educational process under martial law (Figure 7).

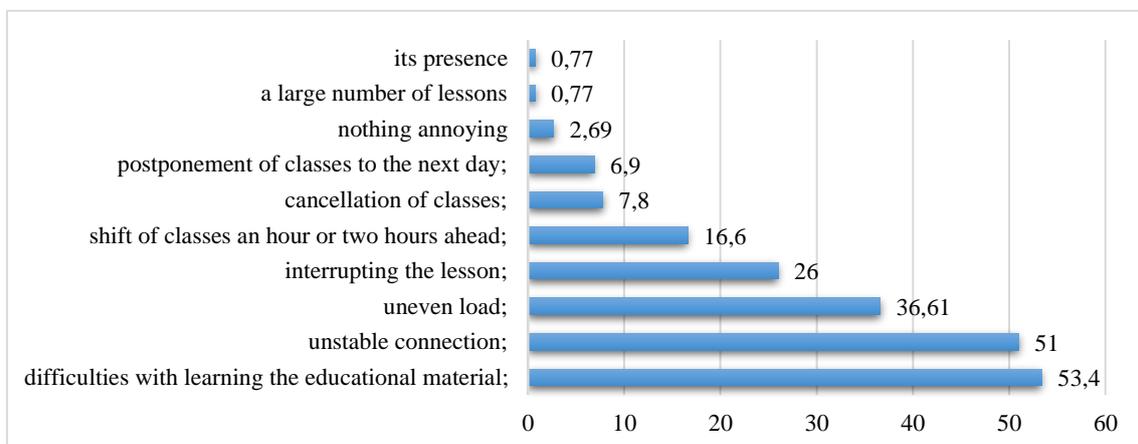


Fig. 7. What is most annoying about distance learning?

Source: Results of a survey conducted by the authors.

Distance learning is a relatively new trend that enables students to realize their constitutional right to education. However, difficulties in organizing system and technical support, lack of resources for children to fully implement distance learning are the reasons why children find it difficult to learn the material (53.4%).

Martial law education contributes to the suppression of students’ cognitive activity. The

main reasons for this phenomenon, according to students, are “unstable connection” (51%), “uneven workload” (36.6%), “interruption of the lesson” (26%), “shifting classes one to two hours ahead” (16.6%), “canceling classes” (7.8%), “postponing classes to the next day” (6.9%).

Fully satisfied with the quality of distance learning are 2.7% of respondents, while 0.77% do not understand the need for distance learning.

This suggests that most students consciously attend classes, understand the need to launch distance learning in Ukraine, but have comments and recommendations to improve students' learning of the curriculum.

The question "Do you observe any changes in communication with your friends?" allows us to determine the impact of the effects of martial law on students' relationships with their peers and changes in values and priorities at the social level (Figure 8).

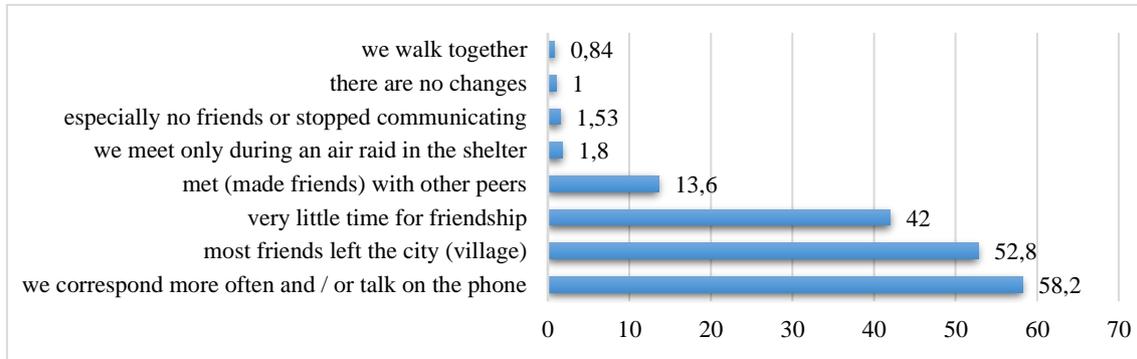


Fig. 8. Do you observe any changes in communication with your friends?

Source: Results of a survey conducted by the authors.

Communication is a necessary component of mental health. During the period of martial law, a large number of children faced certain problems related to personal communication. Under such conditions, students "write and/or talk on the phone more often" (58.2%), complain that "most of their friends have left the city (village)" (52.8%), and do not find "time for friendship" (42%). An important ability is the ability to establish connections with other peers (13.6%). It was found that children who interacted on social media with Russian friends lost their endurance to engage in conflictual discussions and stopped communicating altogether.

Some students (1.53%) concluded that in stressful, non-standard conditions, those traits or behaviors that make it impossible to continue communicating with former friends are best noticed. Children note that they no longer understand those whom they used to consider close, and interpersonal communication with them has come to naught. However, on the other hand, the current situation allows them to identify those in their immediate environment who value them, are sincerely interested in their lives, and deserve to be trusted. Thus, students are more conscious about choosing people who will have a significant impact on their future development.

It is interesting that a condition for the emergence of friendly sympathy is territorial proximity, which makes it more accessible to establish and maintain contact with a person. That is why various situations of uncertainty and risk

contributed to the emergence of opportunities for students to "meet (make friends) with other peers" (13.6%). Sharing traumatic experiences allows children to feel kinship and mutual understanding, which can increase stress resistance and the ability to effectively regulate their emotions.

Thus, in addition to the difficult social, economic and political situation in the country, children face interpersonal problems, the solution of which allows them to increase reflexivity, critical thinking, independence, and resistance to manipulation. Identifying the factors of emotional discomfort that a child experiences when interacting with his or her immediate environment allows them to analyze the causes and consequences of interpersonal dependence, which thereby serves as a resource for redirecting internal tension, uncertainty, and fear of making a mistake to increase their own importance and self-worth.

The question "For what reason did you most often have quarrels with your parents?" allows us to study the peculiarities of child-parent relations under martial law (Figure 9).

Conflicts are an integral part of our lives. During martial law, a significant number of the country's population is under stress. As it accumulates, stress seeks a way out of the body, which leads to increased levels of aggression, hostility, frustration, anxiety, etc. Accordingly, we can see an increase in the frequency of conflicts (especially family conflicts) (Kravchenko, 2021).

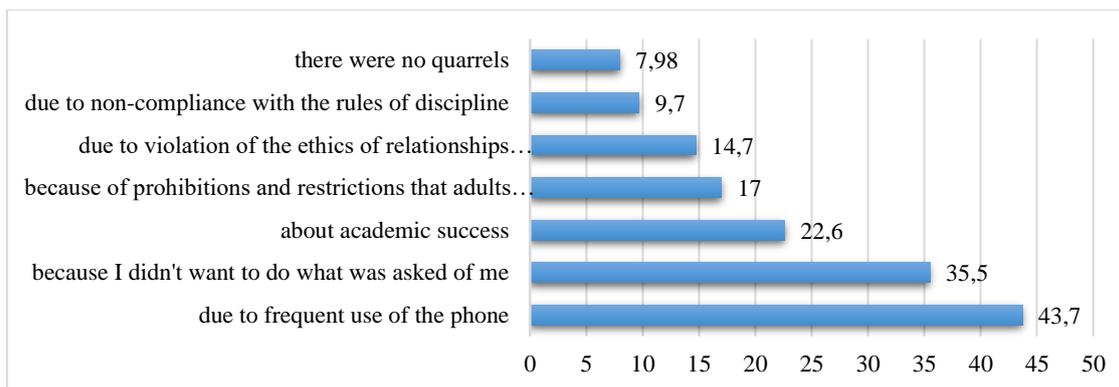


Fig. 9. For what reason did you most often have quarrels with your parents?

Source: Results of a survey conducted by the authors.

It was determined that most conflicts occurred “because of frequent use of the phone” (43.7%), “because I did not want to do what was required of me” (35.5%), “because of academic performance” (22.6%), “because of prohibitions and restrictions imposed by adults” (17%), because of violation of ethics of relationships (14.7%), and because of non-compliance with discipline rules (9.7%). Only 8% of pupils did not have quarrels with their parents.

Thus, in the context of martial law, conflicts are an additional factor in the deterioration of general well-being, disharmonization of the interaction of the individual with himself or herself and others.

The question “What helped me the most to survive this time?” allows us to determine the range of different types of activities aimed at meeting the basic needs of the individual, to get to know the specifics of how students fill their free time (Figure 10).

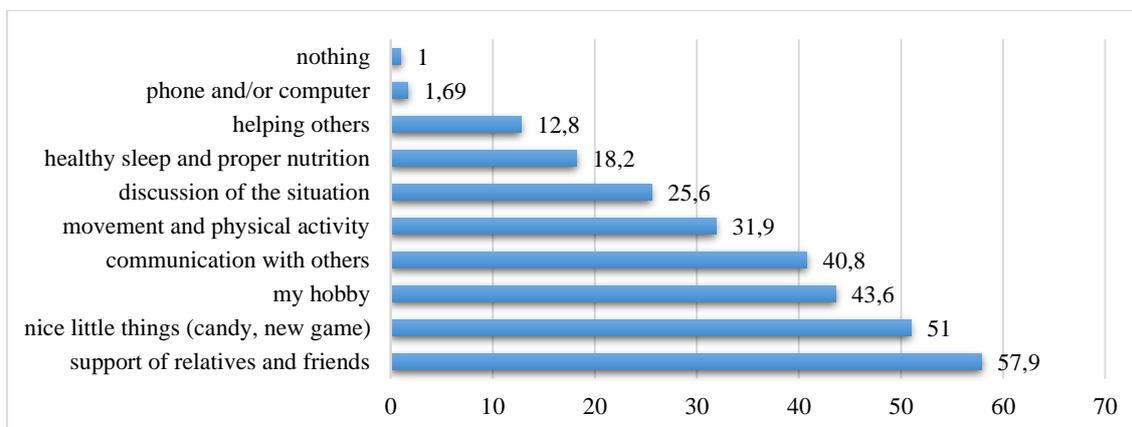


Fig. 10. What helped me the most to survive this time?

Source: Results of a survey conducted by the authors.

According to children, the best anti-stress factors are “support from family and friends” (57.9%), “nice little things” (51%), “my hobby” (43.6%), “communication with others” (40.8%), “movement and physical activity” (31.9%). According to students, in difficult life conditions, “a telephone and/or computer” (1.7%), helping others (12.8%), “healthy sleep and healthy eating” (18.2%), and discussing the situation (25.6%) help to relieve psychological stress. The survey results show that children successfully

realize themselves in sports, creative, and volunteer activities, take care of their health and well-being, and establish positive social interaction.

With the question “What did I do most often during martial law?” we can explore the resource potential of the individual, which will help optimize the adaptive capabilities of schoolchildren (Figure 11).

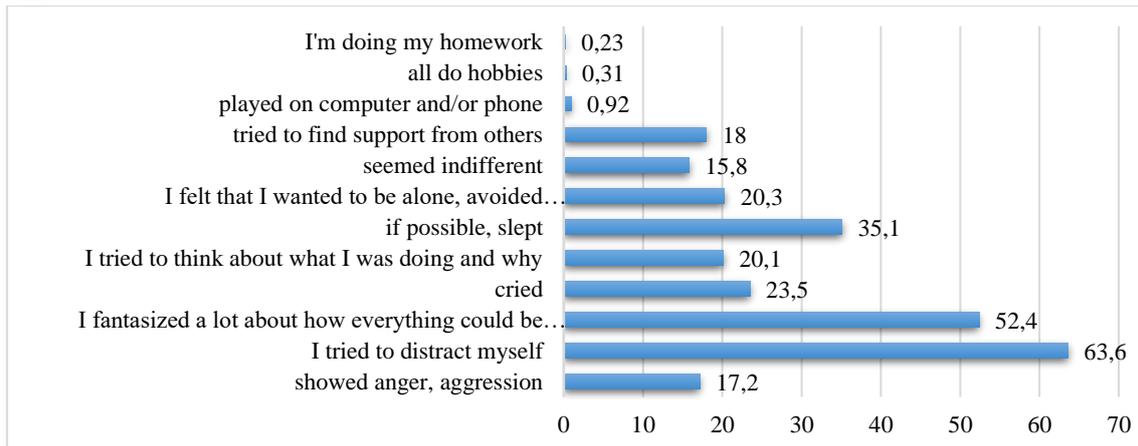


Fig. 11. What did I do most often during martial law?
Source: Results of a survey conducted by the authors.

The internal resource of adults that helps them successfully cope with life's difficulties is associated with flexibility of thinking, behavior, and emotional response. As for children, the importance of external factors in coping with stress is greater than internal ones. For example, it was found that most children tend to "distract" from the problem (63.6%) and "fantasize about how things could be or will be in the future" (52.4%), which indicates an avoidance orientation. A somewhat smaller number of students believe that the best ways to cope with stress are "sleeping if possible" (35.1%), "crying" (23.5%), "being alone with oneself, avoiding interaction" (20.3%).

It is worth noting that there are ways to respond to a traumatic situation by showing aggression (17.2%) and remaining completely indifferent to everything (15.8%). The most optimal coping

strategies used by children are developing the habit of "thinking about what I am doing and why" (20.1%) and "getting support from others" (18%).

It should be noted that the coping strategies used by children develop in the family and depend on the coping behavior of their parents or other significant and close people. Thus, according to the survey results, a significant majority of children were able to actualize certain internal resources to cope with stressors.

The question "What did close people (parents, other relatives) do when you were particularly anxious (scared)?" allows us to identify the most common coping strategies of parents, as they affect the psycho-emotional state of their children (Figure 12).

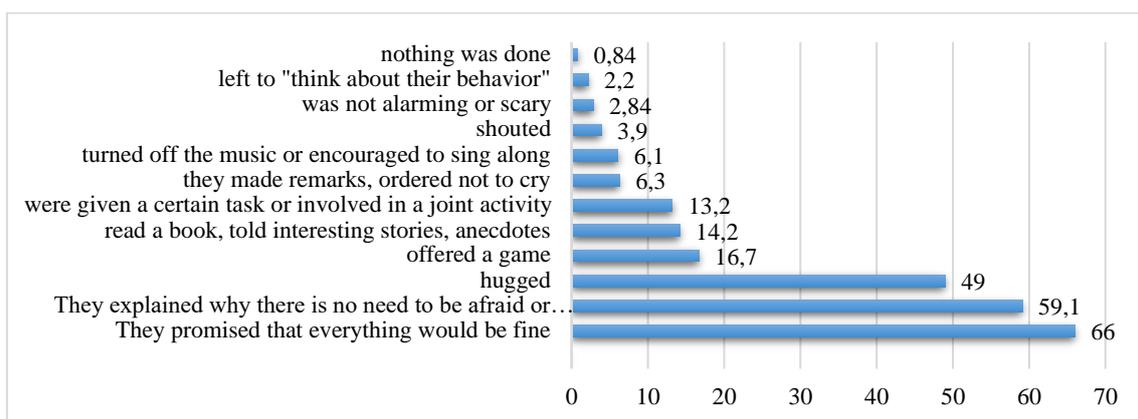


Fig. 12. What did loved ones do when you were especially disturbing (scary)
Source: Results of a survey conducted by the authors.

According to the survey, parents most often used the following coping strategies: "promising that everything will be fine" (66%), "explaining why there is no need to be afraid or what to do"

(59.1%), "hugging" (49%), which indicates their high level of self-control and self-control, ability to demonstrate courage, willpower, and optimism.

Some less popular strategies can be noted, but they are based on imagination, creativity, humor, and joint activities: “suggesting a game” (16.7%), “reading a book, telling interesting stories, jokes” (14.2%), “giving a certain task or involving in joint activities” (13.2%), “playing music or encouraging singing together” (6.1%). Some parents use ineffective coping strategies: “shouting” (3.9%), “making remarks, telling them not to cry” (6.3%), or “doing nothing” (0.84%).

Thus, it is especially important for a child to feel that close people (parents, other family members) support and ensure psychological security and well-being, especially in martial law. The ability to create a favorable psychological atmosphere reduces anxiety, helps to dispel irrational fears, improves the quality of interaction, maintains and strengthens enthusiasm and optimistic perception of reality, despite the difficult living conditions.

Specialists working with children who have had traumatic experiences as a result of military operations are offered the following psychosocial assistance technologies (group work) (Kisarchuk (ed.), 2020):

- debunking the myth of the “unique situation” (involves each participant realizing that the vast majority of those present during the training are facing a similar situation or similar obstacles);
- application of art therapy techniques (sand work, fairy tale therapy, theatricalization, color therapy, isotherapy) and MAC (metaphorical association cards);
- animal-assisted therapy (equine-assisted therapy, canine-assisted therapy);
- “Sandwich Plus-Minus-Plus” technique (a technique for providing feedback that allows you to focus on a new manifestation of constructive behavior);
- BASIC PH model (identification of the dominant channel of overcoming the consequences of psychotrauma) (World Health Organization, 2020);
- grounding and unhooking technique (to help participants “get involved” in life, start moving towards their own values, achieve a high level of concentration and awareness) (World Health Organization, 2020);
- “Wheel of Life” methodology (identifying problematic areas of life, searching for internal and external resources to improve the situation) (Korniienko, Lisovetska, Lutsenko, & Romanovska, 2017, p. 146);

- modified technique of analysis of available individual and group resources (identification of existing internal and external resources that a person can use for normal life) (Pank, & Tkachuk, 2021, p. 22-23);
- methods of working with images (framing, positive counter-images, switching off) (Smith et al., 1999, p. 19–20);
- double focus techniques (replacing a negative image with a positive one) (Smith et al., 1999, p. 22–24);
- use of a Fear Thermometer (tracking own reactions related to fear) (Smith et al., 1999, p. 34–35);
- role-playing games (allow to identify one’s own attitude to the problem, develop new behavioral strategies and test their effectiveness);
- methods of psychological self-regulation (breathing exercises; active inclusion of imagery).

The results of the study allowed us to identify the peculiarities of the functioning of children aged 6–17 during martial law. The fact that most children do not abuse indicates a high level of parental awareness of life safety, which in turn shapes the child’s position.

It has been determined that the physical and mental well-being of schoolchildren depends primarily on the influence of a combination of factors, including sleep disturbances, distance learning, monotony, as well as gunshots and other sharp sounds. An additional factor in the increased level of anxiety during this period is distance learning, in which students cannot concentrate due to certain difficulties in connecting, a shifted daily routine that depends on the situation in a particular region, worries about family and friends, changes in responsibilities, and other distractions.

Conclusions

Under martial law, distance learning has become one of the main ways for teachers and students to interact. According to the students, conducting classes in a remote format is complicated by unstable connection, uneven workload, interruptions, shifting classes an hour or two ahead, canceling classes, and postponing classes to the next day. These problematic situations increase the amount of mental, emotional, and physical stress on students, and increase the level of anxiety when assessing knowledge, skills, and abilities.

We consider hope, compassion, and love of life to be the leading emotions and feelings that have a positive impact on the formation of a child's personality in war. The dominant negative emotions are excitement, fear, rapid mood changes, extreme fatigue, trembling (from loud sounds), sadness, longing, indignation, irritation, and anger.

A large number of children faced certain problems related to personal communication, but going through a common traumatic experience allows children to feel kinship and mutual understanding, which can increase stress resistance and the ability to effectively regulate their minds.

There has been a noticeable increase in the frequency of conflicts (especially between children and parents) due to frequent use of the phone, refusal to do what adults demand, academic performance, and prohibitions and restrictions. Parents demonstrate a high level self-control, the ability to demonstrate courage, fortitude, and optimism. The coping strategies they choose are based on imagination, creativity, humor, and joint activities with their children.

The results of the study show that children successfully realize themselves in sports, creative, and volunteer activities, take care of their health and well-being, and establish positive social interaction. However, at this stage, it is extremely important to minimize the number of negative environmental factors, ensure that basic needs (including basic emotional needs) are met, and increase the number of adaptive coping strategies to activate additional resources of the individual.

The following factors should be taken into account when organizing group work with children who have had traumatic experiences as a result of military operations: age, degree of traumatic experience, nosology, level of stress resistance, etc. Thus, specialists form homogeneous (homogeneous) groups based on certain characteristics in order to provide deeper psycho-correctional work.

Psychosocial assistance technologies include the use of art therapy techniques and MACs (metaphorical association cards), animal-assisted therapy, the "Sandwich Plus-Minus-Plus" technique, the BASIC PH model, the "Wheel of Life" technique, grounding and unhooking techniques, the Fear Thermometer, a modified technique for analyzing available individual and group resources, methods of working with

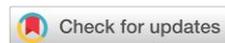
images, dual focus techniques, role-playing games, and methods of psychological self-regulation. This system of methods and techniques allows the child to explore his or her own life situation, identify strengths (resources), which will contribute to the process of self-healing and increase the person's resilience.

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DOI: <https://doi.org/10.34069/AI/2024.74.02.31>

How to Cite:

Bobechko, N., & Fihurskyi, V. (2024). Presumptions as means of proof in criminal procedure law of states with continental and Anglo-American legal systems. *Amazonia Investiga*, 13(74), 373-380. <https://doi.org/10.34069/AI/2024.74.02.31>

Presumptions as means of proof in criminal procedure law of states with continental and Anglo-American legal systems

Презумпції як засоби доказування у кримінальному процесуальному праві держав континентальної та англо-американської систем права

Received: January 4, 2024

Accepted: February 21, 2024

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Abstract

The aim of this article is to study legal regulation, doctrinal approaches on understanding and using presumptions in criminal procedure proof of the states with continental and Anglo-American legal systems. The methodological basis of this research consists of general scientific and special legal methods, namely dialectical, analysis, generalization, structural and functional, hermeneutic, dogmatic and comparative legal methods. The article analyzes one of the means of criminal procedure proof – presumption. By analyzing the corresponding norms of CPC of Ukraine, legal positions of the European Court of Human Rights, Supreme Court of the USA and the views of fellow researchers, the authors present their vision of issues within the scope of the study. The significance of presumptions as means of proof in criminal proceedings is clarified and their types which are distinguished in the doctrine of criminal procedure of continental and Anglo-American legal systems are characterized.

Keywords: criminal procedure law, process of proof, means of criminal procedural proof, legal presumptions, factual presumptions.

Анотація

Метою статті є вивчення правового регулювання, доктринальних підходів щодо розуміння та використання презумпцій у кримінальному процесуальному доказуванні держав континентальної та англо-американської систем права. Методологічну основу дослідження становлять загальнонаукові та спеціально-правові методи, зокрема діалектичний, аналізу, узагальнення, структурно-функціональний, герменевтичний, догматичний, порівняльно-правовий. У статті проаналізовано один із засобів кримінального процесуального доказування – презумпції. Аналізуючи відповідні норми КПК України, правові позиції Європейського Суду з прав людини, Верховного Суду США, погляди дослідників, автори подають своє бачення питань, що входять до предмета дослідження. З'ясовано значення презумпцій як засобів доказування у кримінальному провадженні та охарактеризовано їх види, виокремлені у доктрині кримінального процесу континентальної та англо-американської систем права.

Ключові слова: кримінальне процесуальне право, процес доказування, засоби кримінального процесуального доказування, правові презумпції, фактичні презумпції.

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Introduction

An indispensable tool of cognition in criminal proceedings is the use of knowledge that certain facts are *prima facie* proof of other facts. This refers to the conclusion to which the law directs the subject of proof when a certain set of facts is established, namely presumption.

When the word 'presumption' (from Latin. *praesumptio* – assumption) is used in everyday speech, it is considered that a certain phenomenon, state or event can exist and arise but not certainly or not necessarily. It may happen that the assumption will be rebutted; however, checking it each time would not be economical both in financial and temporal dimensions. In other words, something may or may not happen but it will not necessarily take place.

Presumption as a legal category was widely used back in ancient Roman law. Later, a lot of presumptions were introduced into the national legal systems of different states. Without them, the process of proof would have been complicated and lengthy, and the completion of criminal proceedings would have been impossible within a reasonable time frame.

To form presumptions several factors must interact simultaneously: there must be a possibility to form the most probable conclusion from the observed facts, events, phenomena and their individual properties, the importance and significance of which in the regulation of social relationships are recognized by the majority of people. This must occur at the most favorable moment and in the most favorable environment which will formalize this conclusion and obtain its consolidation in the existing system of legal norms. Thus, presumption is a general assumption, based on the laws of logic, which reflects some general tendency (fact, event, etc.) (Rudzki & Panomariovas, 2016). Therefore, not every assumption may be regarded as a presumption.

Although a presumption is a result of certain reasoning, it is erroneous to equate a presumption and a logical conclusion. Reasoning is a 'way' which leads to a 'goal' – logical conclusion. Nevertheless, the presumption as well as the logical conclusion are the results of reasoning; though it differs from the latter in the various consequences it entails (for example, it allocates the burden of proof between parties) and its obligatory nature. Unlike a logical conclusion, a presumption enshrined in law is always

obligatory and does not lose its force, even if the existence of the presumed fact is disputed in a specific case (Rudzki & Panomariovas, 2016).

A presumption is based on certain social patterns, formulated on the basis of life experience (from Latin *praesumptio ex eo quod plerumque fit* – a presumption arises from what usually happens). That is why a presumption contains some part of truth.

The article provides answers to questions regarding the essence of presumption as a means of criminal procedural proof, the types of presumptions in criminal procedural law as classified by researchers, and the legal provisions and doctrinal positions regarding the application of presumptions in proof in criminal proceedings of continental and Anglo-American legal systems.

Literature review

The use of presumptions in the process of proof in criminal proceedings have been studied by Michael H. Graham, Piotr Hofmański, Shari L. Jacobson, Laird Kirkpatrick, Kabore Sandrine Marie, Mustapha Mekki, Christopher B. Mueller, Artūras Panomariovas, Liesa Richter, Tomas Rudzki, Stanisław Waltoś, Worku Yaze Wodage. The scientific ideas, theoretical positions and recommendations formulated by these researchers are particularly important for the improvement of criminal procedure law of the respective states and for the application of its regulations.

Waltoś & Hofmański (2020) define presumptions as judgements about high credibility of a certain fact arising from another fact or facts and does not arouse any doubts. The researchers classify presumptions as surrogates of proof.

Explaining the significance of this means of proof, Mustapha Mekki (s.f), Kabore (2017) argue that a presumption makes it possible to exempt from proof, if it is established by law. This is evidential argumentation, when presented to a judge, which helps to establish a certain fact based on indirect evidence. Thus, it constitutes a shift of the subject of proof.

In turn, Rudzki & Panomariovas (2016) drew attention to the fact that variety and prevalence of presumptions is based on three elements: social

policy of the state, aspiration to optimize the law and aspiration to provide flexibility, consistency and clarity in legal relations.

Mueller, Kirkpatrick & Richter (2018) considering the issue of presumptions, noted that to help the prosecutor carry the heavy burden imposed on the state in criminal cases, courts and legislatures have created what are often called "presumptions," but which, because of constitutional constraints, can only operate as inferences. Many jurisdictions have recognized a "presumption" inviting an inference of intent on the basis of proven behavior.

Instead, Shari L. Jacobson (1987) concluded that theoretical distinction between permissive and mandatory presumptions has resulted in much confusion and serves no practical purpose. Because mandatory presumptions confuse the jury and jeopardize the rights of the accused without serving any purpose that cannot be accomplished through other evidentiary devices, such as affirmative defenses, they should be eliminated.

Michael H. Graham (2009) argued that a mandatory presumption may affect not only the strength of the "no reasonable doubt" burden but also the placement of that burden; it tells the trier that they must find the elemental fact upon proof of the basic fact, at least unless the defendant has come forward with some evidence to rebut the presumed connection between the two facts. Meanwhile, a mandatory presumption is not mandatory at all, i.e., the burden of production may not as a matter of law be shifted to the defendant.

Wodage (2014) expressed the opinion that endorsing persuasive presumptions against accused persons cannot stand valid in the face of the fundamental human right to, and principle of, the presumption of innocence. The risk of convicting and punishing innocent individuals requires society to prefer erring on acquitting criminal persons rather than erring on the conviction of innocent persons.

Methodology

The methodological basis of the article is a dialectical approach to the scientific understanding of social phenomena. In writing this article, general scientific and specialized legal methods of cognition were also used: analysis (applied to identify shortcomings in the legal regulation of the use of presumptions in criminal procedural proof); generalization (used

to characterize the legal positions of the European Court of Human Rights and the Supreme Court of the United States regarding the conditions of using presumptions in criminal procedural proof); structural-functional method (made it possible to elucidate the significance of presumption as a means of criminal procedural proof); hermeneutic method (applied to interpret the essence of legal and factual presumptions); doctrinal or specialized legal method (used in studying scientific approaches to understanding presumption as a means of criminal procedural proof); comparative legal method (provided the opportunity to compare the legal regulation of the use of presumptions in criminal proceedings of the continental and Anglo-American legal systems).

Results and discussion

In procedural law *presumption* is a means of proof which allows drawing a conclusion about the existence or non-existence of a fact (a presumed one) based on another already established fact (a basic one). In order to draw a specific conclusion about the existence or nonexistence, accurateness or falsity of a fact, such presumptions necessitate the prior establishment of a basic or underlying fact.

Presumptions ensure the definitiveness of criminal procedural regulation, expedite criminal procedural activities, save resources and funds. Presumptions simplify the process of proof by relieving the need of some subjects to prove presumed facts (for example, the innocence of the defendant, the validity of a court decision that has acquired legal force), and placing this obligation on others. Besides, presumptions exempt these parties from the necessity to repeat the same legal procedural processes.

In search of truth, it is relevant to use presumptions as exceptions. If a "presumption" is something that is "more likely than not," then in a process of proving that focuses on the idea of seeking the truth, presumptions should be resorted to in rare cases. They should only be used when it is necessary to overcome a certain uncertainty that cannot be eliminated by other standard methods, and without disrupting the balance of data that have evidential significance. Presumptions are justified in situations where there is a lack of complete and reliable knowledge. However, when such knowledge exists or can be obtained through unbiased data, such reliance is at least irresponsible (Rudzki & Panomariovas, 2016).

Thus, being one of the methods of understanding objective reality, presumption shall be used when there is a need to act, to draw conclusions concerning certain facts, when the level of knowledge is limited.

In Polish doctrine of criminal procedure, presumption is understood as a judgment of the high credibility of a certain fact arising from another fact or facts which raise no doubts. They distinguish a presumed fact (*fakt domniemany*), which and which arises from another, and the basis for presumption (*podstawa domniemania*) i.e., a fact that asserts the high probability of another fact (Waltoś & Hofmański, 2020).

Thus, the ground for presumption and presumed fact are linked by a cause and effect relationship.

A similar approach is also used in Anglo-American criminal procedure jurisprudence. Thus, presumption is defined as a rule which requires the establishment of a basic fact to consider the existence of a presumed fact. After proving the basic fact, which is a ground for the presumption, the presumed fact shall be considered established unless and until it is rebutted. Presumption expresses a legally recognized connection between facts (Jacobson, 1987).

Presumptions are divided into legal and factual ones based on the way they are established.

Legal presumptions (*praesumptiones iuris*) arise from legal regulations. In turn, depending on the way of their rebuttal, such presumptions are divided into rebuttable and irrebuttable.

Rebuttable (*praesumptiones iuris tantum*) or conditional presumptions consist of the presentation of evidence that, despite the proven circumstance belonging to the subject of proof, the legal consequences were different from those stipulated in the provision establishing the presumption. Striking examples of such presumptions include the presumption of innocence, the presumption of the truthfulness of a court decision that has acquired legal force.

On the other hand, irrebuttable (*praesumptiones iuris ac de iure*) or absolute presumptions cannot be challenged by evidence to the contrary. While not as common, such presumptions are established in a number of provisions of the criminal procedural law. For instance, an investigative judge, judge or the jury cannot take part in criminal proceedings if they personally, their close relatives or members of their family

are interested in the outcome of the proceedings (Art. 75, Part 1, Cl. 3 of the CPC of Ukraine); in any case, testimony given by investigators, prosecutors, members of operational units, or any other person regarding statements made by individuals to investigators, prosecutors, or members of operational units during the conduct of criminal proceedings cannot be considered admissible evidence (Art. 97, Part 7 of the CPC of Ukraine); repeated failure to appear in court by a victim who has been duly summoned (particularly, when there is a confirmation of receipt of the summons or acknowledgment of its content by other means), without valid reasons or without notification of the reasons for non-attendance after the prosecutor's refusal to support public prosecution and with the victim's consent to support the prosecution, is equated to the victim's refusal to press charges and results in the closure of the criminal proceedings for the relevant charges (Art. 340, Part 6 of the CPC of Ukraine) (Law of Ukraine No. 4651-VI).

Factual presumptions (*praesumptiones homini*) judgments about facts that arise from life experience and observation of relevant patterns of life and relationships between events. They make it possible to assert the credibility of a specific fact based on its natural origin. Therefore, factual presumptions are not subject to criminal procedural regulation. On the other hand, they are considered rebuttable. An example of a factual presumption is the guilt of the accused and the absence of the need to prove it at every court hearing. However, if there are doubts about their guilt, the presumption ceases to be applied, and this circumstance must be proven (Art. 242, Part 2, Cl. 3 of the CPC of Ukraine) (Law of Ukraine No. 4651-VI). Factual presumption is used when a fact relevant to criminal proceedings cannot be directly proven with evidence, or it would be particularly difficult to obtain such evidence.

Factual presumptions do not exclude the presentation of evidence to the contrary.

Presumption serves as a tool of evidence. Presumption, especially irrebuttable, corresponds partially to relative truth that cannot be rebutted. Legal presumptions express a certain normality, a certain probability. The stronger the presumption, the higher the probability. Truth, particularly through legal presumptions, is true provided that it either embodies a certain amount of values or transmits a certain probability (Mekki, s.f). Presumptions are facts that rather establish the likelihood of true evidence. It is a situational argument (Kabore, 2017).

The study of foreign legal regulations confirms that national legislation of states may establish legal or factual presumptions that shift the burden of proof from certain issues to the suspect or accused. The European Court of Human Rights (hereinafter – ECtHR) has repeatedly expressed its legal position regarding their compliance with Article 6 of the European Convention on Human Rights and Fundamental Freedoms (hereinafter – ECHR).

In the following way, a man from the Republic of Zaire was arrested at the Roissy Airport while he was picking up his luggage, in which they had found a large quantity of cannabis. The applicant claimed that he was unaware of the presence of cannabis and mistakenly took the luggage, thinking it was his own. He was charged with both the criminal offense of illegal importation of drugs and the customs offense of smuggling prohibited goods. The court found him guilty and sentenced him to two years in prison, banned him from residing in France, and imposed a fine. The Paris Court of Appeals overturned the verdict regarding the criminal offense related to the illegal importation of drugs but upheld the lower court's decision regarding the customs offense of smuggling prohibited goods. The Court of Cassation rejected the appeal, stating that Article 392(1) of the Customs Code was correctly applied in the case, according to which "a person who possesses smuggled goods is considered responsible for committing an offense."

The ECtHR noted that the Convention does not prohibit presumptions of fact or law in general. However, it obliges member states to stay within certain limits in this regard in criminal law.

From the point of view of the ECtHR the Paris Court of Appeals made a clear distinction between the criminal offense of illegal drug importation and the customs offense of smuggling prohibited goods. Under the first point, the court acquitted Mr. Salabiaku, applying the presumption of innocence and thereby demonstrating meticulous respect for the presumption of innocence. On the other hand, under the second point, it upheld the verdict issued by the lower court, without contradicting itself, as the facts and actions incriminated under this point were different. Specifically, it noted that Mr. Salabiaku "went through customs with the luggage and declared to the customs officers that it was his property." It added that he could not "claim an inevitable mistake since he had been warned by an Air Zaïre official... not to take possession of a suitcase unless he was sure it was his, notably because he would have to open it at

customs." Therefore, before declaring himself the owner of the suitcase and confirming his possession in the eyes of the law, he could have checked it to ensure it did not contain any prohibited goods. The court noted that "by not doing so and having in his possession luggage containing 10 kilograms of herbal and seed cannabis, he committed a customs offense in the form of smuggling prohibited goods".

As a result, the ECtHR concluded that in this case, the French courts did not apply Article 392(1) of the Customs Code in a manner which contradicts the presumption of innocence (Case of *Salabiaku v. France*, 1988).

In turn, in the case of *Phillips v. The United Kingdom*, the ECtHR noted that Article 2 of the 1994 Act provides that the Crown Court must issue a confiscation order where there is a defendant who the court is to sentence for one or two drug trafficking offenses, and with respect to whom the court has found that he received at some point a payment or other reward connected with drug trafficking. In determining whether the defendant obtained a benefit from drug trafficking and to what extent, Article 4(2) and (3) of the 1994 Act requires courts to presume that any property apparently belonging to the defendant at some time since his conviction, or property acquired by him within six years before the commencement of criminal proceedings as payment or reward connected with drug trafficking, as well as to presume that any expenses incurred by him during this same period were paid for from proceeds of drug trafficking. This statutory presumption may be rebutted by the defendant regarding any property or expenses if its falsity is proved or if its application could risk an unjust decision (Article 4(4)).

Returning to the relevant second and third criteria – the nature of the proceedings in the case, as well as the type and severity of the punishment facing the applicant – the ECtHR noted that the presumption required by the 1994 Act that all property owned by the applicant during the previous six years is proceeds from drug trafficking imposes on the national court a requirement to consider its involvement in other drug-related unlawful activities prior to the commission of the offense for which he was convicted. Contrary to the usual burden on the prosecution to prove the elements of the allegations made against the accused, the burden of proof was placed on the applicant: through a weighing of probabilities, he had to prove that he acquired the property in question through means other than drug trafficking.

Continuing further, the ECtHR concluded that the purpose of this procedure was not to convict or acquit the applicant of any other drug-related offense. Although the Crown Court assumed that he had profited from drug trafficking in the past, for instance, this was not reflected in his record, which included only the conviction for the offense committed in November 1995. Under such circumstances, it cannot be asserted that the applicant was "charged with the commission of a crime". Besides, the purpose of the procedure under the 1994 Act was to provide the national court with the opportunity to properly determine the amount for the confiscation order. The ECtHR considered this procedure analogous to the court determining the amount of a fine or the duration of a prison sentence to be imposed on an already convicted criminal. The ECtHR emphasized that although, despite the above conclusion, the issuance of a confiscation order did not lead to the bringing of any new "charge" within the meaning of Article 6(2) of the ECHR, this provision should still be applied to protect the applicant from assumptions made during the consideration of the confiscation of property issue. Although it is evident that Article 6(2) of the ECHR regulates criminal proceedings in general, not exclusively the consideration of the substance of the charge, the right to the presumption of innocence under Article 6(2) of the ECHR arises only in connection with a specific "charge" of committing a crime. In the event that the accused is found guilty of such a crime, the provisions of Article 6(2) of the ECHR cannot be applied to assertions regarding the character and behavior of the accused as part of the punishment determination procedure if such allegations do not have the character and degree to equal the bringing of a new "charge" in the autonomous sense of the ECHR. In conclusion, the ECtHR ruled that the provisions of Article 6(2) of the ECHR cannot be applied to proceedings in a case concerning the confiscation of property against the applicant (Case of Phillips v. United Kingdom, 2001).

The use of presumptions in the criminal process of the United States is characterized by its specificity. This issue is regulated by decisions of the Supreme Court of the USA, including *New York v. Allen* (1979), *Sandstrom v. Montana* (1979) ta *Frances v. Franklin* (1985).

In American criminal procedural doctrine, the following provisions regarding presumptions correspond to the legal positions of the Supreme Court of the United States.

Firstly, an irrebuttable presumption directed against the defendant is unconstitutional because it relieves the state from the obligation to prove every element of the offense beyond a reasonable doubt. Secondly, the burden of proving an element of the crime through presumption cannot be placed on the defendant. Thirdly, since a presumption arises from a legal regulation requiring the existence of the presumed fact to be considered established in the absence of evidence to the contrary, presumptions operating against the defendant can never be applied in criminal cases. A rebuttable presumption cannot be used by the trial court to render a verdict against the defendant based on an element of the crime proven through it. Fourthly, the jury may receive instructions regarding the inference drawn from the underlying fact to the presumed fact provided there is a sufficient rational connection between them. Namely, a) if the presumed fact is more likely true than not, the jury may receive an instruction that if they find the underlying fact, they are entitled, but not obligated, to infer the presumed fact (*instructed factual inference*); b) if the presumed fact is an element of the crime or is contested, and there is a sufficient rational connection, the jury may receive an instruction that if they find the underlying fact beyond a reasonable doubt, they may, but are not required to, conclude the derived fact. A sufficient rational connection exists if the court decides that the evidence of the underlying fact establishes that the presumed fact is more likely true than false (*instructed elemental inference*); c) if the fact to be inferred is an element of the crime or is contested by the defense but there is a sufficient rational connection, the jury may receive an instruction that if they find the underlying fact beyond a reasonable doubt, they may, however, are not required to, consider the underlying fact as sufficient evidence of the presumed fact. The underlying fact is an obvious, foreseeable proof. A sufficient rational connection exists if the court determines that the jury could only infer from the underlying fact that the presumed fact was established beyond a reasonable doubt *prima facie* (*instructed prima facie inference*) (Graham, 2009; Mueller, Kirkpatrick & Richter, 2018).

The aforementioned provisions have been consolidated in Rule 303 of the Federal Rules of Evidence in the United States, which Congress rejected on the grounds that the issue of presumptions in criminal cases was under its consideration in the form of bills to revise the Federal Criminal Code. Nevertheless, the project of this rule has not lost its relevance. According to it, the judge is not authorized to instruct the jury regarding the establishment of a presumed

fact that testifies against the defendant. If the presumed circumstance establishes guilt or is an element of the crime, or if it is contested by the defense, the judge may submit the question of guilt or the existence of the presumed circumstance to the jury for consideration, but only if the jury, who have a sufficient level of competence, can, based on the evidence as a whole, including evidence of underlying facts, find guilt or the presumed circumstance to be beyond reasonable doubt. If the presumed fact has lesser impact, its existence may be submitted to the jury for consideration, provided that the underlying facts are supported by substantial evidence or established in another way, if only the evidence as a whole does not refute the existence of the presumed fact. Whenever the jury is asked to consider the existence of a presumed fact against the defendant, the judge must instruct them that they may consider the underlying facts as sufficient evidence of the presumed fact, but they are not required to do so. Besides, if the presumed fact establishes guilt, is an element of the crime, or is contested by the defense, the judge must instruct the jury that its existence must be proven based on all the evidence beyond a reasonable doubt (Graham, 2009).

In the criminal process of the United States, a presumption typically operates as a rule allowing the inference of the existence of one fact based on evidence of the existence of another fact. It is construed specifically as an inference because it is permissive rather than obligatory, as it does not place the burden of proof on the prosecution, and the jury are not required to adhere to it. The purpose of such permissive presumptions is to guide the jury to a natural inference that they might not otherwise reach. On the other hand, mandatory presumptions require the person establishing the facts to draw conclusions in favor of the presumed fact. Mandatory presumptions pose problems when used in criminal cases because they have the effect of reducing the burden of proof on the prosecution. The use of mandatory presumptions, according to the position of the United States Supreme Court, may violate the defendant's rights to due process because a conviction is possible in the absence of evidence beyond a reasonable doubt of every element constituting the charged crime (Jacobson, 1987).

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In turn, the rebuttal of presumed facts occurs in one of three forms: provisional, evidential and persuasive presumptions (Wodage, 2014).

Provisional presumptions. The necessity to draw a conclusion from a proven underlying fact is determined in each specific case. The jury may exercise their discretionary power to draw or not to draw a conclusion about the existence or non-existence of a certain presumed fact. However, when such a conclusion has been drawn, the party, against which a certain presumed fact is exercised bears the burden of proving it. If such a party wants to challenge this provisional conclusion, they have to provide evidence to make a reasonable conclusion about the existence of the presumed fact (Wodage, 2014).

Evidential presumptions. The jury is required to draw a conclusion based on the proven underlying fact. After establishing the underlying fact the jury must draw a conclusion about the existence of a presumed fact unless the opposite is proven. The conclusion remains unchanged in the absence of contrary evidence. This means that the party against whom such a conclusion has been drawn, must provide sufficient evidence to cast doubt on the credibility of the presumed fact since, otherwise, the jury must uphold the conclusion made. The presumption ceases to operate only if such a party presents some rebutting evidence that casts doubt on the presumed fact (Wodage, 2014).

Persuasive presumption is a rule which shifts the burden of proof onto a party after certain underlying facts have been proven or recognized. The underlying facts give rise to a presumed fact, and the party must prove the opposite. The jury

is required to draw a conclusion on the grounds of a proven underlying fact until such a conclusion is rebutted by the challenging party. In such cases the party, against whom such a conclusion has been drawn, bears the burden of proof only regarding the presumed fact. If such a party wants to avoid losing in this presumed fact or in the entire case, depending on the circumstances, they have to prove the absence of the presumed fact. It is not enough only to cast a doubt on the credibility of the presumed fact. The party has to persuade based on the balance of probabilities that their position regarding such a fact is credible. For such a party, it is not sufficient to merely cast doubt on the truth of the presumed fact. They must convince based on a balance of probabilities that their position regarding such a fact is true (Wodage, 2014).

Conclusions

A presumption as a means of proof is impossible without the presence of two facts – a basic (underlying) one and a presumed one, which are linked by a cause-and-effect relationship. Presumptions serve as a tool for procedural economy, as they relieve the parties involved in criminal proceedings from the necessity to prove certain (presumed) facts. On the other hand, legal presumptions complicate the search for truth in criminal proceedings.

Criminal procedure science of the European states distinguishes between legal and factual presumptions. In turn, the first ones can be rebutted and unrebutted. In national legislations of the states with continental legal systems the presumptions may be established which transfer the burden of proof on certain issues to the suspect or accused. According to the European Court of Human Rights (ECtHR), the European Convention on Human Rights does not prohibit the use of legal or factual presumptions, but within certain limits.

According to the doctrine of criminal procedure and judicial practice of the USA, a presumption is defined as a conclusion which does not place the burden of proof on the prosecution and the jury are not obliged to adhere to it. Particularly, the court is not entitled to instruct the jury on establishing a presumed fact that goes against the defendant. Two types of presumptions are distinguished – *permissive presumptions* and *mandatory presumptions*. The use of the latter in accordance with the legal positions of the Supreme Court of the USA may violate the rights of the defendant to due process.

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DOI: <https://doi.org/10.34069/AI/2024.74.02.32>

How to Cite:

Larkin, M., Boiarov, V., Pyrozhkova, Y., Melkovskiy, O., & Loboda, Y. (2024). Forensic-linguistic and religious expertise in the investigation of crimes committed by members of youth informal groups (associations) of extremist orientation. *Amazonia Investiga*, 13(74), 381-391. <https://doi.org/10.34069/AI/2024.74.02.32>

Forensic-linguistic and religious expertise in the investigation of crimes committed by members of youth informal groups (associations) of extremist orientation

Судово-лінгвістична та релігійозна експертиза при розслідуванні злочинів, учинених членами молодіжних неформальних груп (об'єднань) екстремістської спрямованості

Received: January 4, 2024

Accepted: February 22, 2024

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Abstract

The article explores the unique challenges of conducting forensic-linguistic and religious expertise during the investigation of crimes committed by members of youth informal groups (associations) with extremist leanings. It outlines the specific investigative practices for these types of crimes. The research aims to analyze forensic-linguistic and religious expertise in investigating crimes perpetrated by members of these groups. The importance of these types of expertise is underscored by the rising number of extremism cases among young people, which necessitates innovative identification and prevention methods. Linguistic analysis can reveal underlying meanings and manipulative language tools, crucial for effective crime investigation and maintaining justice and societal safety. As extremist crimes often transcend international

Анотація

У статті досліджуються унікальні проблеми проведення судово-лінгвістичної та релігійозна експертизи під час розслідування злочинів, учинених учасниками молодіжних неформальних груп (об'єднань) екстремістського спрямування. У ньому викладено конкретну практику розслідування цих видів злочинів. Дослідження спрямоване на аналіз судово-лінгвістичної та релігійозна експертизи у розслідуванні злочинів, учинених членами цих груп.

Важливість цих видів експертизи підкреслюється зростанням кількості випадків екстремізму серед молоді, що вимагає інноваційних методів виявлення та запобігання. Лінгвістичний аналіз може виявити глибинні значення та маніпулятивні мовні засоби, що має вирішальне значення для

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borders, it is vital to develop adaptable research methods for different cultural and social contexts.

The study employs scientific methods such as observation, analysis, synthesis, comparison, generalization, and extrapolation. It reviews scientific literature on youth groups, anti-extremism, crime investigation, forensics, and religious studies, alongside examining investigation materials from crimes committed by youth extremist groups.

Promising avenues for future research include analyzing forensic examinations conducted during the investigation of crimes committed by youth informal groups with extremist orientations. This could enhance understanding and provide better strategies for tackling extremism in various contexts.

Keywords: forensic linguistic examination, religious examination, investigation, crime, youth, informal group.

Introduction

In recent times, the world has experienced surges in violent extremism, claiming the lives of numerous innocent individuals. These extremist ideologies, whether rooted in religion, ethnicity, or politics, advocate for the dominance of a specific group while opposing a more inclusive and tolerant society. This presents two interconnected challenges for modern societies: the escalation and cross-border proliferation of violent extremism, and the management of increasingly diverse and multicultural populations. Addressing violent extremism requires immediate interventions to safeguard people and assets, but preventing its spread necessitates a broader perspective that goes beyond strict security measures to address the underlying developmental factors contributing to the phenomenon.

The application of special knowledge during the investigation of crimes committed by members of youth informal groups (associations) of extremist orientation is an extremely necessary condition for obtaining evidentiary information and establishing the objective truth. One of the forms of application of special knowledge in the

ефективного розслідування злочинів і підтримки справедливості та соціальної безпеки. Оскільки екстремістські злочини часто виходять за межі міжнародних кордонів, життєво важливо розробити адаптивні методи дослідження для різних культурних і соціальних контекстів.

Дослідження використовує такі наукові методи, як спостереження, аналіз, синтез, порівняння, узагальнення та екстраполяція. Він оглядає наукову літературу з питань молодіжних груп, боротьби з екстремізмом, розслідування злочинів, криміналістики та релігієзнавства, а також аналізує матеріали розслідування злочинів, скоєних молодіжними екстремістськими групами.

Перспективним напрямком подальших досліджень є аналіз судово-медичних експертиз, проведених під час розслідування злочинів, вчинених молодіжними неформальними групами екстремістської орієнтації. Це могло б покращити розуміння та забезпечити кращі стратегії для боротьби з екстремізмом у різних контекстах.

Ключові слова: судово-лінгвістична експертиза, релігієзнавча експертиза, розслідування, злочин, молодь, неформальна група.

investigation of criminal proceedings of the specified category is forensic examination.

Expertise in criminal proceedings, in which members of youth informal groups (associations) of extremist orientation are suspected, as a general rule, can be divided into two groups: general (typical) and special. The first group should include scientific and expert studies that are inherent in the investigation of crimes in which harm is caused to the life and health of a person: forensic-medical, forensic-psychiatric, forensic-biological, separate forensic (traceological, ballistic, dactyloscopic, handwriting) and some other examinations. The second group, in particular, should include forensic-linguistic and religious expertise (Larkin, 2019).

It is the specificity of forensic-linguistic and religious studies that allows us to establish the motivational component of crimes, the nature of ideas, and views that united young people in an informal group of extremist orientation.

The subject is the study of forensic-linguistic and religious expertise in the investigation of crimes

committed by members of youth informal groups of extremist orientation, namely the study of speech and religious aspects that are important for establishing the facts, circumstances, and motives of the crime, as well as for the identification and confirmation of the guilt of suspects.

The task of scientific research in the field of forensic-linguistic and religious expertise in the investigation of crimes committed by members of youth informal groups of extremist orientation is:

1. Analysis of crimes committed by youth groups to identify general trends that may indicate specific methods of activity and motivation.
2. Study of the peculiarities of forensic-linguistic and religious expertise in the investigation of crimes committed by members of youth informal groups (associations) of extremist orientation.
3. Identification of problematic issues of conducting forensic-linguistic and religious expertise in the investigation of crimes committed by members of youth informal groups (associations) of extremist orientation and search for solutions.

These tasks will help not only to understand the nature and spread of extremism among young people but also to develop strategies and measures to counter this phenomenon in society.

Regarding the use of specific terms, we note that definitions of concepts are provided in the text.

Theoretical framework or literature review

During the study of forensic-linguistic and religious expertise in the investigation of crimes committed by members of youth informal groups (associations) of extremist orientation, the works of the following scientists were studied:

Gora (2013) drew attention to problematic issues of special linguistic knowledge in the judiciary of Ukraine. It was remarked that the publication of their methods and their discussion by the scientific community is important from the point of view of verifying the reliability of experts' conclusions. Conducting forensic examinations only since knowledge in the field of science, technology, art, or craft without reference to published methodological works in the field of forensic research may raise doubts about the reliability of the results obtained. Understanding the parties of criminal proceedings the basics of

the methodology of conducting and the tactics of appointing forensic experts is important not only for the correct assessment of the conclusions of experts conducted at the initiative of the prosecution parties but also for identifying their own initiative in appointing an expert according to an agreement or submitting a petition to the investigating judge for the appointment of an expert.

The subject of Khavarivskyi's (2012) research was the state examination of religious studies in Ukraine. The author concluded that Ukraine currently does not have a legal mechanism for the examination of religious organizations. The prospects for the functioning of the Institute of Religious Expertise in Ukraine under such circumstances can only be characterized by declarativeness and ineffectiveness. In this regard, the Ministry of Culture of Ukraine must initiate the development and adoption of a corresponding by-law, for example, the Resolution of the Cabinet of Ministers of Ukraine "On State Religious Expertise". With this act, it is necessary to approve the detailed procedure for conducting the state religious examination and the provisions of the Expert Council on this matter. It is worth predicting that organizational and logistical support of the activities of the Expert Council will be carried out by the Ministry of Culture of Ukraine. Some experts believe that it is more correct to use the term "state religious examination", which emphasizes the state nature of such examination and makes it clear that the state body in matters of religion is the only competent body for conducting such examinations (even though "religious examination" may also be conducted by scientific institutions, public organizations, etc.). The procedure of the state religious examination in Ukraine (if it is enshrined in the law) can become an effective administrative tool to fight against the illegal activities of certain religious organizations. It is also worth considering the possibility of creating a register of religious trends, movements, and currents, about which religious examinations were conducted.

Azhniuk (2017, 2016) investigated the issue of linguistic expertise. It was concluded that linguistic expertise and linguistic expert practice are now actively researching and developing new, accessible technologies for using linguistic knowledge in the field of law. At the same time, the potential scope of their application is constantly expanding. The linguist's argumentation often becomes a powerful tool to strengthen the legal position of the legal practitioner. Linguistics can offer new, non-

standard approaches to solving legal problems. Practice shows that the conclusion of a linguistic examination often resolves controversial issues in the field of justice.

Linguistic expertise in law enforcement became the object of research by Sudak (2015). It was concluded that the legislator did not establish unified special legal norms that would determine the order of appointment and the specifics of conducting forensic linguistic examinations. Our proposed method is aimed at optimizing the work of linguist experts, as it allows building a logical chain of actions that leads to obtaining a rational result of the examination in the form of a perfect conclusion.

Boyarov (2017) investigated some issues of questioning witnesses in criminal proceedings about extremist activities. Chernyavskiy (2010) investigated the theoretical and practical foundations of financial fraud investigation methodology.

Kolosok (2014) analyzed the requirements for a religious expert in the field of scientific expertise. It was concluded that, at the moment, there are no clearly defined legal norms regulating the conduct of religious studies examinations in Ukraine. It is not established in which cases such examinations are appointed, who carries them out, exactly how they are carried out, what are the objects of the examination and what are the requirements for experts' conclusions. It has been established that experts in this field cannot be public organizations, persons who have connections with religious organizations, civil servants, priests, or theologians. A religious expert who conducts religious examinations must have a higher academic education, a scientific degree in the field of religious studies, experience in participating in interdisciplinary research, and professional competence. Unfortunately, the legislation does not establish specific requirements for the qualification of such experts. Therefore, it is necessary to create conditions for the specialized training of future religious experts.

Tytarenko (2013) investigated the methodological features of religious expertise as a mechanism for regulating social relations. It is concluded that the development and institutionalization of analysis, forecasting based on expertise and management of the religious situation depends on the following factors: overcoming the gap that persists between academic science and practical religious studies;

an increase in the level of "demand" of the government and other subjects of the religious situation for expert-analytical products of this kind; development of a culture of strategic thinking of the political and managerial elite in decision-making in the field of issues related to the religious life of Ukrainian society.

Garasimov, Dufenyuk, and Zakharova (2019) analyzed the methodology for investigating certain types of crimes. Moreover, Didkivska (2020) drew attention to the peculiarities of criminal proceedings in crimes committed by minors from socially disadvantaged families. In her work, Shcherbyna (2023) carried out an analysis of the characteristics of a criminal who is a member of a youth informal group (association). During the research, a number of characteristic features inherent in the participants of informal youth groups (associations) were identified: they create their own system of values and ideology, which is characterized by nihilism, conflict and denial of generally accepted ethical, cultural, moral and legal norms in society; when a person is involved in an informal association, a complete change in his worldview is observed; participants are characterized by unmotivated, increased cruelty and uncontrolled aggression; may commit criminal offenses spontaneously or organized; the number of participants can range from a few to thousands of people; most participants abuse alcohol, narcotic substances, may have other types of addiction, e.g. gambling; they usually have a low level of income and a low level of intelligence; may have common features of speech (slang), clothing, appearance (hairstyle, make-up, tattoo, etc.) or leave certain "ritual" or "ritual" signs at the scene of a criminal offense (Satanists, skinheads).

Additionally, Babakin (2022) considered operational investigative monitoring of the operational situation in combating crimes committed by young people. Based on the above, it was concluded that the process of operative and investigative monitoring in combating crimes committed by young people includes several successive stages. First, the collection and study of general information about the criminogenic environment in which young people function is carried out. Then information about the criminological situation and specific objects of operational attention is revealed. Next, a search for information about these objects in a criminally active and criminogenic environment is conducted to identify trends in the development of crime among young people. Then a search is made for investigative information on specific criminal offenses and

persons who may commit them. After that, the collection and assessment of information about forces and means is carried out. The next stage is the identification of factors affecting the operational situation, after which a set of general and operational search measures is developed to improve the process of searching, obtaining, and verifying information. However, the issues raised are not yet final and require further separate research or scientific study.

Regarding the key trends that can be seen from the conducted analysis, it is worth emphasizing the following: researchers are developing integrated approaches that combine the methods of linguistics and religious studies to analyze the texts, communications, and symbols used by extremist groups; research aimed at analyzing the ideas, beliefs, and motivations behind the actions of youth extremist groups, particularly through linguistic and religious analysis of their statements, propaganda and literature; research is aimed at developing and improving methodological approaches to forensic-linguistic and religious expertise, including standardization of evaluation procedures and criteria.

In the process of investigating criminal proceedings related to the activities of youth informal groups of extremist orientation, investigators need to use the special knowledge of various experts. This may include the involvement of specialists in the field of psychology, religious studies, and other disciplines in conducting investigative (research) actions. For example, psychologists can be involved in the interrogation of juvenile suspects or witnesses, and religious scholars - in the analysis of literature and texts seized during searches. In addition, during the investigation, it may be useful to involve specialists to conduct an inspection of the scene, question people, search and other actions that require specific knowledge.

Research methodology

In the process of working on the article, the scientific literature devoted to youth informal groups (associations), the fight against extremism, crime investigation, forensics, religious studies, etc. was analyzed. The empirical basis of the study was the materials of the investigation of crimes committed by members of youth informal groups (in particular, extremist orientation).

Note that it is essential to use a variety of scientific methods, which include observation,

analysis, synthesis, comparison, generalization, and extrapolation, for forensic-linguistic and religious expertise in the investigation of crimes committed by members of youth informal groups of extremist orientation. Below is how these methods were applied in the study:

Observation: Observing the activities of the group and its members, including speech and behavioral activity, can help understand the dynamics of their interaction and identify possible extremist tendencies. The use of this method helped to draw conclusions about the specifics of extremist groups and their behavioral features.

Analysis: The analysis of scientific works, texts, communications, and other materials related to forensic linguistic and religious expertise in the investigation of crimes committed by members of youth informal groups of extremist orientation allowed us to understand the peculiarities of this type of expertise, as well as problematic aspects in this context. In addition, the analysis method contributed to the identification of trends regarding the researched issue and problematic aspects of conducting the researched type of examinations.

Synthesis: Compilation of received data and results of analysis to create a comprehensive view of forensic linguistic and religious expertise in the investigation of crimes committed by members of youth informal groups of extremist orientation. This method contributed to comprehensive research and the formation of conclusions.

Comparison: Comparison of the examined types of expertise both among themselves, and research and comparison with other types of expertise allowed to identify of common and distinctive features, as well as to establish patterns and trends.

Generalization: Formulation of general conclusions and assumptions based on the analysis of specific cases and data, which made it possible to conclude the nature of the extremist activity of the group, as well as the specifics of the examination of this crime.

Extrapolation: Using the obtained data to make assumptions about the future trends of the group's development and its impact on society, which can serve as a basis for developing preventive measures and strategies to combat extremism, as well as improving the conduct of examinations.

These methods made it possible to carry out a comprehensive and objective study of the extremist activity of youth groups and led to the development of effective strategies for countering this phenomenon. This method was used to form generalizations about the trends of the researched type of expertise, as well as to identify problems and form hypotheses regarding possible ways to solve such problems.

In the process of research of forensic-linguistic and religious expertise in the investigation of crimes committed by members of youth informal groups of extremist orientation, various tools and resources are used for data collection and analysis. In particular, a variety of data were collected, such as text materials (literature, publications on the Internet), video and audio recordings, as well as court cases and expert opinions. The above-mentioned methods were used to analyze the text materials.

Various tools and resources can be used in the scientific work of forensic-linguistic and religious expertise in the investigation of crimes committed by members of youth informal groups of extremist orientation. In particular, the use of software tools for the analysis of text materials in order to identify features of speech, lexical and syntactic structures that may indicate radicalization or extremist orientation; use of electronic databases and web resources to access text materials, religious texts, documents and other sources that may be the object of analysis; turning to experts in the field of linguistics, religious studies and other relevant disciplines for consultation and support in understanding complex linguistic and religious aspects; using text corpora to analyze speech features and trends in language use in the context of extremist activities.

To ensure the credibility and reliability of scientific results in forensic-linguistic and religious studies when investigating crimes committed by members of youth informal groups of extremist orientation, a responsible approach and the use of various methods were followed. In particular, strict methodological principles were followed during the collection, analysis and interpretation of data to avoid distortions and false conclusions. All phases of the study, including data collection, analysis methods, and results obtained, were documented in detail for subsequent review and review.

Results and discussion

The legal basis for conducting examinations in criminal proceedings is the Criminal Procedure Code of Ukraine (Law 4651-VI, 2012).

Forensic linguistic examination is based on the use of knowledge of linguistics and related sciences – psycholinguistics, sociolinguistics, ethno psycholinguistics, neurolinguistics, pathopsycholinguistics, philosophy of language, etc. Only a person with a higher philological education, preferably with special expert training, has the right to conduct this type of examination.

During the investigation of crimes committed by members of youth informal groups (associations) of extremist orientation, there is a need to appoint and conduct a linguistic examination of speech, which is divided into subtypes: linguistic examination of written speech and linguistic examination of oral speech.

It is generally accepted that the object of research of linguistic examination of written speech is the product of human speech activity reflected in written form.

The objects of expert research can be media reports, materials of public speeches, anonymous letters, posters and inscriptions, etc., and the subject is the semantic orientation of this material since the expert needs to determine and justify whether this material is not aimed at inciting enmity towards of one or another group: racial, religious, etc. Such examinations are conducted by psycholinguists, philologists, and social psychologists who specialize in media research (Gora, 2013).

The messages presented in the text can be presented not only verbally, but also iconically (from the Greek *eikon* - image), that is, by visual means. Thus, in February 2006, Charlie Hebdo reprinted the iconic image of the Prophet Mohammed (they were first published in Denmark in 2005). Since it is forbidden in Islam to schematically depict living beings, French Muslims have taken the weekly to court. But the court sided with the defendant (the editors), who explained that the caricature mocked radical Islamists, not religion in general. In 2011, the editors of Charlie Hebdo announced the publication of a special issue of the weekly, which indicated the invitation of the editor-in-chief to the Prophet Mohammed. This also caused a conflict, and the editor-in-chief of the publication, Stéphane Charbonnier, received 24-

hour police protection. At the same time, only 1.3% of all cartoons in 2005-2015 were devoted to the Muslim theme in the weekly magazine.

In case of availability of information and materials seized during the inspection, search, and other investigative (search) actions: texts (records, program, charter of an informal group, etc.) for research and determination of content orientation (in particular, as a purposeful act of public transmission of certain information in the form of written speech), a linguistic examination of written speech is carried out, which is an important factor in determining the motivation of the actions of persons who committed a crime.

Among the typical questions that are put forward to be resolved by the examination, in particular, the following: Does the presented material contain information that incites actions against a certain race, nation, religion, social group, or individuals as its representatives? Are special language or other means used in the presented materials for the purposeful transmission of shameful characteristics, negative emotional evaluations, negative attitudes, and incitements to actions against a certain race, nation, religion, social group, or individuals as their representatives? Do the speech (visual) means used in the material contain humiliating characteristics; negative emotional evaluations and attitudes towards a certain race, nation, social group, religion, or individuals as its representatives?

As part of the linguistic examination of oral speech, identification and diagnostic studies of a person's oral speech and semantic research of oral speech are carried out. During the identification and diagnostic studies of a person's oral speech, issues related to: the identification of a person based on linguistic signs of oral speech are resolved; determination of the type of expression (spontaneous, unspontaneous speech, text reading, etc.); identification of signs of imitation, native language, etc. in speech (Order No. 53/5, 1998). This type of forensic examination, during the investigation of crimes committed by members of youth informal groups (associations) of an extremist orientation, is also essentially aimed at establishing the motive of the criminal offense through the study of oral statements, both during the direct implementation of the criminal act and before and after it committing. The objects of the linguistic examination of oral speech for the considered type of crime are oral statements (slogans, appeals, threats, insults) that were heard during the commission of the crime and have a

clear form of fixation, in particular: audio recordings, video recordings (Resolution No. 4, 2012).

Quite often, hate crimes committed by members of various youth informal groups (associations) of extremist orientation are accompanied by offensive statements regarding the race, nationality, religion, gender, or sexual orientation of the victimized person(s). It is oral statements that make it possible to make assumptions about the nature of the criminal offense, the motives of the persons (suspects) involved in the commission, and the type of youth informal group (association).

In addition, we would like to emphasize the need to consider as objects of linguistic examination of speech only sources of information of direct (immediate) origin (printed products, audio and video materials, etc.), because the use of information of indirect origin in the expert research process (for example, protocols of interrogation of the victim, witnesses, etc.).

When investigating manifestations of extremism related to the use of computer networks: forensic examination is often conducted. The main task of the author's examination is the identification of the author of the text. Autorecognition expertise solves identification tasks (regarding the identification of the person of the author of the text), as well as diagnostic tasks (regarding the conditions, peculiarities of text composition, the fact of distortion of signs of written speech, the place of formation of speech skills, native language, education of the author of the document, etc.) (Order No. 53/5, 1998). At the same time, it is impossible to equate the linguistic examination of written communication with the author's examination (Honcharenko, 2010), because they are related as a part and a whole.

Religious expertise in the legal field of Ukraine is not legally established, but special knowledge in this field of knowledge is necessary for researching general issues of religion. In addition, as part of the judicial examination, issues related to Catholicism, new religions, Orthodoxy, Islam, charismaticism, freedom of existence of religious communities, as well as certain religious cults, authoritarian sects, etc. are investigated.

It should be noted that the study of the latest religious currents and trends in Ukraine at the state level was practiced in the late 1990s and early 2000s. In the Information Report of the State Committee of Ukraine for Religious Affairs

for 1998 "On the State and Development Trends of the Religious Situation, State-Church Relations in Ukraine", it was reported that the Committee had introduced a system of studying the processes taking place in the environment of neo-religions, anticipatory orientation towards cults, which have a negative international reputation and are trying to establish themselves in Ukraine. It was also said that the Cabinet of Ministers of Ukraine, on the initiative of the Committee, created a state religious expert council, which will deal with the examination of the religious doctrine of neo-movements and the study of their practice. It was noted that in some cases religious-mystical phraseology, paraphernalia, and practice become a cover for openly antisocial or criminal intentions.

According to the Committee, in 1997, manifestations of Satanism were recorded in Kyiv, Donetsk, Kharkiv, Chernivtsi, Crimea, Lviv, and Poltava regions (Khavarivskiy, 2012).

An essential feature of the religious examination is the establishment of the basis of those social relations that are not regulated by the norms of law and preceded or accompanied by specific actions that lead to an offense. Also, the general regularities of the behavior of a person (group of persons) of a separate creed are clarified from the point of view of religious studies as a science. Thus, answering the question of what religious norms and moral norms a person was guided by, what is the authority system of norms (hierarchy of norms) for him. It is in the examination of religious studies that religion is of interest from the point of view of its influence on human behavior, because "religion is, first of all, a teaching about how a person should manage his life", what is the connection between behavior and religious belief. The religious expert is obliged to evaluate, within the limits of a specific case, the conditions for the organization of civil society and the regime of assistance for individual freedom, from the position of a specific religion (belief), which is important for the case, that is, the relationship of religion to illegal behavior (Maidanevich, 2011).

The main tasks of religious research are: determining whether the organization is really religious; establishing its religious affiliation; defining the range of basic values, socially significant attitudes, and practices; the study of the religious direction itself; determining whether there is a negative attitude towards this religious direction or towards other religions, etc. Such a problematic issue as defining the

boundaries between religious extremism and religious attitudes and views is extremely crucial. For example, the religious examination of the beliefs and practices of the religious organization "Church of Scientology" established that "... Scientology did not avoid the declaration of the construction (transformation of the existing) society, which is common to all religions and even social philosophies (socialism, communism, etc.), based on the principles of justice or divine wisdom, and as for the essence of the creed of the "Great White Brotherhood", according to the expert's conclusions, it "... represents an attempt at an eclectic combination of the provisions of various religions, in particular, Krishnaism, as one of the branches of Hinduism, Christianity, etc. ., to present them as something new, original, and to declare the newly created religion called "Yusmalos" the "epochal religion of the future"..." (Maidanevich, 2011).

As the practice of investigating crimes committed by members of youth informal groups (associations) with an extremist orientation shows, one of the mistakes that complicates and sometimes leads to a dead end in the investigation is a contemptuous attitude to the study of certain special issues (Larkin, Biryukova, Makarenko, Ivanova, & Fedchyniak, 2020), in particular, regarding the appointment and conduct of such rather specific examinations as forensic-linguistic and religious.

Conducting forensic-linguistic and religious expertise in the investigation of crimes committed by youth informal groups of extremist orientation faces several problems, but there are also ways to solve them:

Insufficient legal framework: The lack of clear regulations governing the procedures for conducting such examinations complicates their conduct. **Solution:** Development of special legislative acts that will determine the procedure and criteria for conducting examinations.

The need for qualified experts: High qualifications and competence of experts in linguistics and religious studies are important for the objectivity and reliability of the results. **The way to a solution:** conducting specialized training and supporting scientific activity in these fields.

Objectivity and independence: To ensure the objectivity of the examination, it is necessary that the experts adhere to ethical standards, independent and impartial. **Solution:**

Development of standards of professional ethics for experts and establishment of control mechanisms for their activities.

Ambiguity in defining the objects of examination: It is important to clearly define what exactly is subject to examination to avoid disagreements in the definition of goals and objectives. Solution: Development of specific criteria and methods for determining objects of examination.

The need for further research: The development of this field requires further scientific research aimed at improving the methodology and increasing the effectiveness of forensic examinations.

The ways to solve these problems are the joint work of law enforcement agencies, scientific institutions, and other interested parties to develop and implement the necessary regulatory acts, standards, and methods to ensure the quality and objectivity of forensic examinations.

Here are some examples of forensic-linguistic and religious expertise, which can be carried out during the investigation of crimes committed by members of youth informal groups of extremist orientation:

1. Analysis of radical propaganda materials: Experts can examine religious or ideological texts, correspondence, websites and other materials to determine the presence of elements of radicalization or calls to violence.
2. Linguistic analysis of communication tools: Experts can examine the linguistic features of group members' communication, such as the use of specific vocabulary, stylistics, and syntax, which may indicate their extremist orientation.
3. Analysis of religious texts and symbols: Experts can study religious texts, symbols, and rituals to determine their use and interpretation by group members and their possible influence on their behavior.
4. Psychological state expert report: Psychological experts can conduct an assessment of the mental state and motivation of group members to understand the factors that contributed to their participation in extremist actions.
5. Examining Internet Activity and Social Networks: Experts can analyze a group's online activity, including their social networks and forums, to identify posts,

discussions, and other activities indicative of their extremist activities.

These examples demonstrate the diversity and complexity of forensic-linguistic and religious expertise that can be applied in the investigation of crimes related to youth extremist groups.

Regarding the applied value of the obtained results, this is manifested in several aspects:

1. Improving the effectiveness of crime investigations: Scientific research contributes to the development of analytical methods and tools that facilitate the detection of extremist activities and crimes committed by youth groups. This helps law enforcement agencies fight extremism more effectively.
2. Improvement of judicial processes: Scientific research ensures the objectivity and reliability of expert opinions, which is an important factor for judicial processes and consideration of cases.
3. Development of preventive measures: Research results can be used to develop and implement preventive programs aimed at preventing radicalization and intervention in the activities of extremist groups.
4. Supporting security policy: Scientific research can become the basis for the development and improvement of security policies aimed at preventing extremism and protecting society.

Therefore, the applied value of research in this area lies in its impact on practical aspects of combating extremism, improving law enforcement and judicial systems, as well as preventing similar events in the future.

Conclusions

Research requires the development of methodologies that would allow systematic and objective analysis of linguistic and religious aspects of extremism among youth groups.

The effectiveness of the examination depends on the qualifications and competence of the experts in linguistics and religious studies, as well as their ability to adhere to ethical standards and independence.

It is important to develop clear legal norms that will determine the procedure for conducting forensic-linguistic and religious examinations, as well as the criteria for appointing and qualifying experts.

It is important that experts adhere to the principles of objectivity, independence and ethics during the examination to guarantee the reliability of the results.

Therefore, the use of a wide range of forensic examinations is a necessary prerequisite for a high-quality and effective investigation of crimes committed by members of youth informal groups (associations) of extremist orientation. Undoubtedly, a special place is occupied by forensic-linguistic and religious expertise, which should provide answers and questions about the specifics of formation, activities of youth informal groups (associations) of extremist orientation and motives of criminal attacks.

The main problems of the research of forensic-linguistic and religious expertise in the investigation of crimes committed by members of youth informal groups of extremist orientation are analyzed, including: methodological challenges (the development of adequate methodologies for carrying out forensic-linguistic and religious expertise in the context of studying extremism among youth groups can be difficult due to the complexity of analyzing linguistic and religious sources); access to data (getting access to relevant linguistic and religious sources, such as textual materials, propaganda materials, literature, requires specific approaches and may face limitations); objectivity of expertise (ensuring the objectivity and independence of expert analysis can be a difficult task, especially in conditions of high social tension and the influence of political factors); identification of extremism (identification of criteria and signs of extremism in linguistic and religious texts, which are the object of research, can be subjective and refuted); ethical issues (researching extremism among youth has ethical aspects, in particular regarding the use of confidential information, ensuring confidentiality and protecting the rights of persons under research. These issues require attention and solutions to achieve quality results in researching extremism among youth groups.

About further scientific research, we consider it necessary to conduct a study of international experience in the linguistic and religious analysis of texts, identify linguistic and symbolic signs of extremist propaganda and ideology, and improve forensic-linguistic and religious expertise in the investigation of crimes committed by members of youth informal groups of extremist orientation.

Regarding the limitations of the study, we consider it necessary to pay attention to the following. Thus, research problems include the peculiarities of the investigated type of crime: crimes committed by youth informal groups with an extremist orientation often include various aspects that require a complex approach to their understanding and analysis. In addition, research requires expert knowledge in the field of forensic linguistics, religious studies, psychology and other disciplines to adequately understand and explain the actions of criminals. Also, obtaining access to materials such as correspondence, websites and other group communications may be difficult due to their confidential nature or technical limitations. The risk is that the results of the study may be subject to subjective interpretation, as they are based on the interpretation of texts, symbols and behavior of group participants.

Future research in this area will have a specific focus on the analysis of crimes committed by members of youth informal groups with extremist ideology. Forensic linguistics will focus on the linguistic aspects of materials found at the scene, such as correspondence, social media posts, etc. A religious examination will examine the influence of religious beliefs on the motivation and behavior of criminals. Given the complexity of interpreting and understanding extremist activity, such studies will require a broad interdisciplinary approach.

As for the practical implications of the obtained results, the results of the examinations can help law enforcement agencies improve their strategies for investigating and countering extremism among youth groups. In addition, the obtained results can be used to develop extremism prevention programs and educational initiatives among young people aimed at preventing radicalization. The obtained results can contribute to the development and implementation of state policies to combat extremism and protect public safety. Finally, understanding the motivations and factors that lead to participation in extremist groups can help design social rehabilitation programs for individuals who have left such groups.

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