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Sharing unreviewed research data: Problems and prospects

Обмін нерецензованими дослідницькими даними: проблеми та перспективи

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Abstract

This paper highlights the results of the survey of Ukrainian scientists on the exchange of unreviewed research data with other scientists, and their motivation to use and disseminate unreviewed research data. By "research data" we mean both processed (summarized in the form of text data, tables, figures, infographics, etc.) and unprocessed information collected by researchers due to experiments, observations, simulations, through surveys or in other ways, or generated from available information. A questionnaire was distributed in different Facebook groups for scientists ("Ukrainian Scientific Journals" "Ukrainian Scientists Worldwide", "Pseudoscience News in Ukraine", "Scientific Conferences and Publications", "Academic Virtue and Plagiarism", "Higher School and Science of Ukraine: Disintegration or Blossoming?", "Ukrainian cuisine of scientific publications") and through university networks. Results from 736 respondents demonstrated awareness and attitudes about data sharing, advantages, and disadvantages of data sharing for scientists. Most of the respondents don't trust the results of scientific research published in sources other than peer-reviewed scientific

Анотація

У цій статті висвітлено результати опитування українських науковців щодо обміну нерецензованими дослідницькими даними з іншими вченими та їхньої мотивації використовувати й поширювати нерецензовані дослідницькі дані. Під «дослідницькими даними» ми розуміємо як оброблену (узагальнену у формі текстових даних, таблиць, рисунків, інфографіки тощо), так і необроблену інформацію, зібрану дослідниками в результаті експериментів, спостережень, моделювання, за допомогою опитувань чи в інший спосіб, або згенеровану з наявної інформації. Анкету було поширено у фейсбук-групах для науковців («Українські наукові журнали», «Українські науковці у світі», «Новини псевдонауки в Україні», «Наукові конференції та публікації», «Академічна доброчесність і плагіат», «Вища школа і наука України: розпад чи розквіт?», «Українська кухня наукових публікацій») та через університетські мережі. Результати, отримані від 736 респондентів, продемонстрували ставлення до обміну даними, переваги та недоліки обміну даними для вчених. Більшість респондентів не

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journals. Only 34.7 % of the respondents use to publish their unreviewed research data. The reasons that can stop scientists from sharing research data are the following: problems with copyright protection, luck of time, fear to lose publishing opportunities, contradictions with the requirements of the journals, risk of misinterpretation, risk of losing leadership in the field of research, ethical norms violations, prejudice. Researchers, especially those who work at universities, highlighted lack of time for data sharing, because they teach and supervise students, conduct research, have administrative activities, participate in community services. Among the reasons for data sharing the scientists noted cooperation, formation of reputation, increasing the likelihood of being quoted, feedback from the scientific community, development of science, saving results to use in the future, etc. 30.9 % of the respondents indicated that they do not find anything that could motivate them to share research data. Meanwhile about 78.0 % of respondents are sure, that they need trainings in the field of data sharing.

Keywords: research data, data sharing, open science, peer review, repository, scientific journal, scientific communication.

довіряють результатам наукових досліджень, опублікованих у інших джерелах, окрім рецензованих наукових журналів. Лише 34,7 % респондентів публікують свої нерецензовані дослідницькі дані. Серед причин, які можуть стримувати вчених від того, щоб ділитися дослідницькими даними, такі: проблеми із захистом авторських прав, брак часу, страх втратити публікаційні можливості, суперечності з вимогами журналів, ризик неправильного тлумачення, ризик втрати лідерства в галузі досліджень, порушення етичних норм, упередження. Дослідники, особливо ті, хто працює в університетах, скаржилися передусім на брак часу для обміну даними, оскільки вони навчають і контролюють студентів, проводять дослідження, мають адміністративні обов'язки, беруть участь у громадській діяльності. Серед причин обміну даними науковці відзначили співпрацю, формування репутації, підвищення ймовірності цитування, зворотний зв'язок із науковою спільнотою, розвиток науки, збереження результатів для використання в майбутньому тощо. 30,9 % респондентів вказали, що вони не бачать причин, які могли б спонукати їх поділитися дослідницькими даними. Водночас близько 78,0 % респондентів упевнені, що їм потрібні тренінги з обміну даними.

Ключові слова: дослідницькі дані, обмін даними, відкрита наука, рецензування, репозитарій, науковий журнал, наукова комунікація.

Introduction

Information and communication technologies make it possible to disseminate research data on various platforms before it is published in peer-reviewed scientific journals and to involve users in the dissemination and discussion of scientific information.

There are a lot of different definitions of data sharing. In an open science data sharing is considered as making research data publicly available without any restrictions on reuse (Nielsen, 2009). N. PM and S. Saeed (2019) describe data sharing as "the practice of making data used for academic research available to other investigators" (p. 290). In general, it is making data available for people who have not generated them and preservation data for public to provide access for reuse (Zhu, 2020). According to W. Chawinga and S. Zinn, the concepts "data sharing" and "open data" have similar meanings (Chawinga, & Zinn, 2019).

Data sharing is a purposeful effort to make raw data publicly available (Kaye et al., 2018; Ross, 2016). Such data help to create transparency, reproducibility, and drive further scientific researchers (Rowhani-Farid, Allen, & Barnett, 2017; Watson, 2015).

Open science movement requires researchers to share their data by depositing data sets in reliable sources, by providing metadata. The FAIR Principles focused on public accessibility, as well as on encouraging scientists to make information findable and reusable (Wilkinson, et al., 2016). European policy is based on the transformation of Europe into an area where open science is the new paradigm for carrying out research and to making the results freely available (Guedj, & Ramjoue, 2015).

There are a lot of ways of data sharing, including websites, cloud services, data journals, etc.

(Bishoff, & Johnston, 2015, p. 11). Funding agencies, journal publishers, and open science movement also encourage to use data repositories, that help "to manage, share, access, and archive researchers' data sets" (Uzwyshyn, 2016, p. 18).

With data sharing research data are available for: (a) researchers; (b) practitioners; (c) science communicators (scientific journalists); (d) members of the public (Paradis, et al., 2020). Some publishers such as Nature, Science, Elsevier, PLOS One requires authors to submit research data together with manuscripts.

There are general studies on research data sharing. S. Huh highlighted advantages of data sharing: promotion of reproducibility, ensuring scientific soundness. Data sharing saves resources because it helps to avoid the need to generate the same data (Huh, 2019). N. Paradis, M. Knoll, C. Shah, et al. also proved the correlation between data sharing on social media and the whole number of citations (Paradis, et al., 2020).

The aim of this study is to find out awareness and attitudes about data sharing among Ukrainian scientists, advantages, and disadvantages of data sharing for them.

Methods

A survey was developed and distributed online in September-October 2021 in Facebook groups "Ukrainian Scientific Journals", "Ukrainian Scientists Worldwide", "Pseudoscience News in Ukraine", "Scientific Conferences and Publications", "Academic Virtue and Plagiarism", "Higher School and Science of Ukraine: Disintegration or Blossoming?", "Ukrainian cuisine of scientific publications", and through university networks.

Closed-ended and open-ended questions **were included in the survey.** The project of the survey was discussed in the Printing and Publishing Institute of the National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute" (12 scientists discussed the survey). These researchers shared their attitudes about the questions. Their comments were considered. The final version of the survey was developed using the Google Forms. Then the survey was tested at the National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute through university network (90 scientists tested it). The results of the survey were processed during October-November 2021.

Overall, 736 researchers answered the questions. 2.5 % of them were 25 years old or younger, 24.0 % were 26–35, 29.6 % were 36–45, 18.8 % were 46–55, 14.3 % were 56–65, and 10.8 % were above 65 years. 47.5 % of the respondents were male, 52.2 % were female, and the others preferred not to answer (0.3 %).

58.8 % of the respondents were PhD, 18.8 % Doctors of Sciences, 12.5 PhD students, 7.3 % researchers with no scientific degree, and the others were students (2.7 %). The representatives of the following scientific branches answered the questions: social communication (9.3 %), economics (8.9 %), chemistry (8.5 %), engineering (8.4 %), pedagogy (8.1 %), physics and mathematics (7.3 %), biology (6.2 %), medicine (5.9 %), agricultural sciences (5.7 %), history (5.5 %), philology (4.8 %), IT (4.7 %), jurisprudence (4.4 %), philosophy (3.8 %), geography (2.9 %), ecology (2.9 %), geology (2.7 %).

Findings

To the question "Where do you keep the intermediate results of your research?" the answers were following (the respondents could choose several answers): on a PC (93.2 %); on USB, external hard drives, etc. (62.5 %); in cloud services (56.3 %); in social networks for scientists (17.1 %); in repositories (14.5 %); on corporate servers (7.1 %); in handwritten version (3.5 %) (Figure 1).
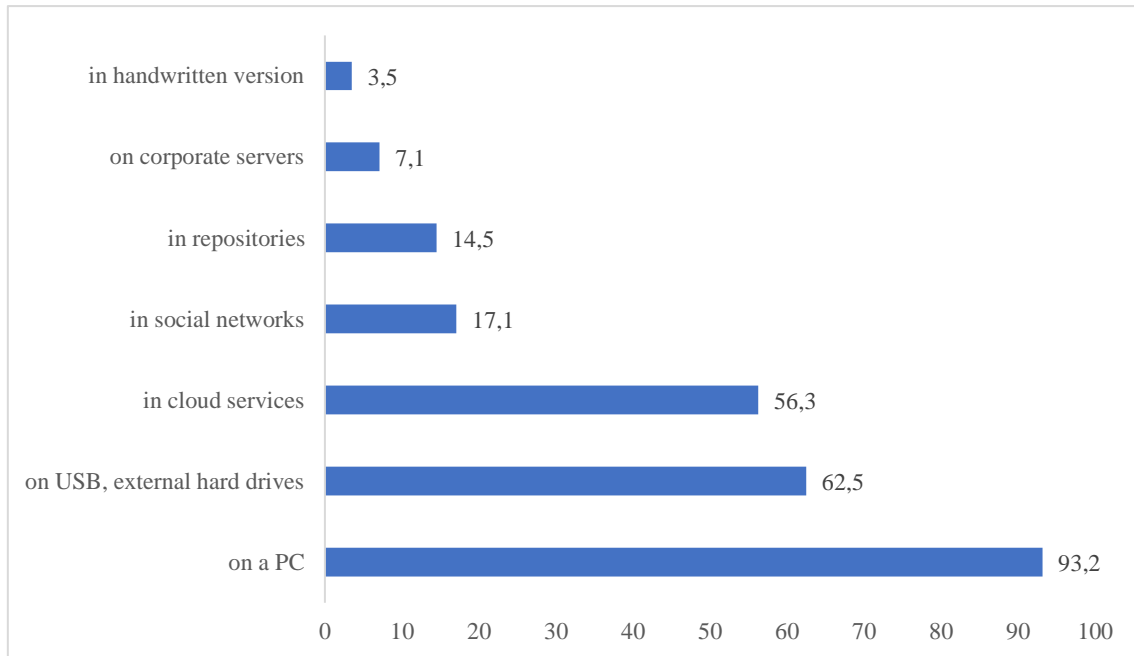
Figure 1. Percentage of the answers to the question "Where do you keep the intermediate results of your research?", %

To the question "Do you trust the results of scientific research published in sources other than peer-reviewed scientific journals?" 37.5 % of the respondents answered "yes". Meanwhile, 62.5 % of respondents do not trust unreviewed scientific content (Figure 2).
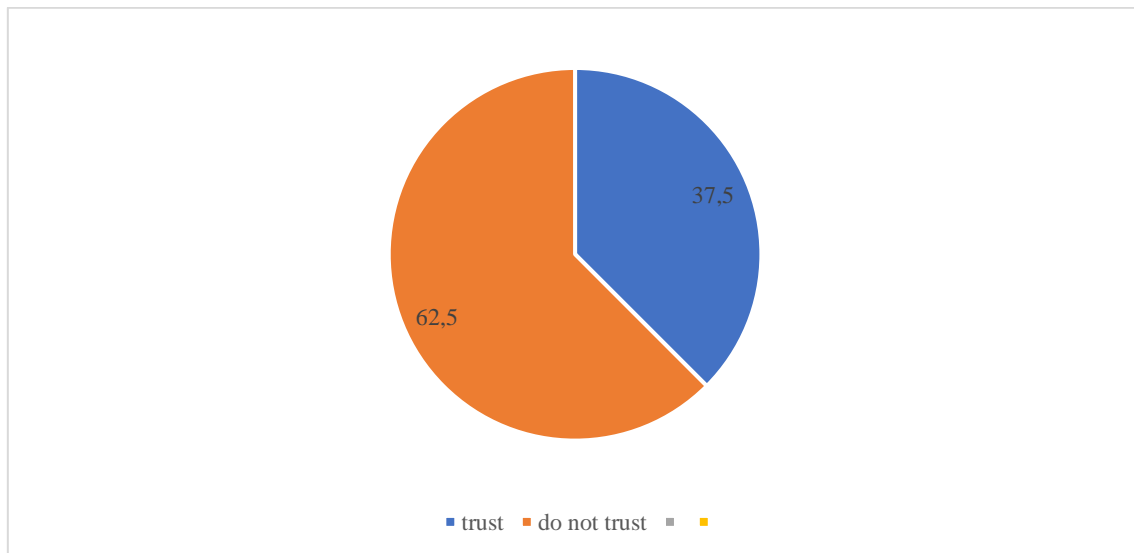

Figure 2. Level of trust to unreviewed scientific content, %

The sources trusted by the researchers are the following: repositories, Biorxiv, popular science media. In addition, some researchers have indicated that they trust the work of individual scientists, regardless of where they are published (for example, data posted on the personal websites), the results of scientists from institutions with good reputation, data that is widely used and cited by other scientists, data created in collaborations within international projects.

At the same time, the respondents were unanimous about the reasons why they do not trust research data, that have not been peer-reviewed: only peer reviewing makes it possible to "weed out" unreliable or low-quality data. Individual answers are the following: "high probability of data errors"; "different responsibilities of authors"; "lack of references does not allow to verify information"; "two scientists always know more."

Only 34.7 % of the respondents use to publish their unreviewed research data. In particular, they use social media for scientists (76.5 %), Zenodo (31.3 %), meetings (22.1 %), blogs (18.5 %), arXiv.org (17.3 %), Figshare (16.2 %), personal cites (12.2 %) (respondents could choose several possible answers or add their own) (Figure 3).
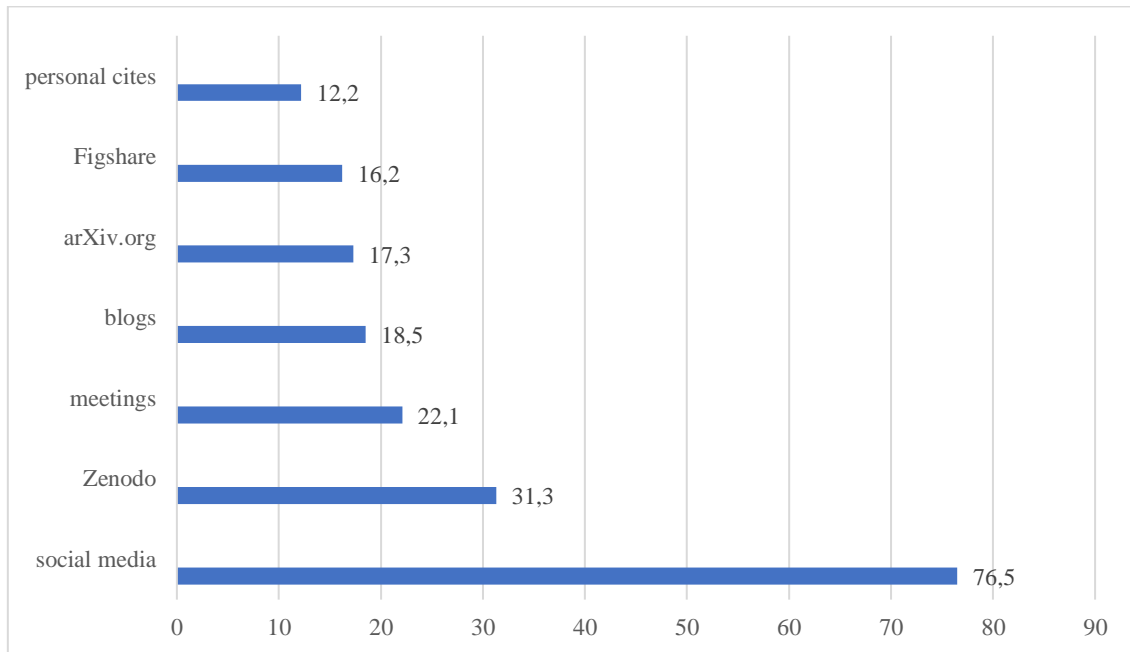

Figure 3. Sources where the respondents use to share their unreviewed research data, %

43.7 % of the scientists use unreviewed research data of other researchers to prepare their scientific publications from such sources as social media for scientists (81.2%), personal cites (62.6 %), blogs (60.5 %), arXiv.org (56.8 %), Zenodo (40.1 %), Figshare (35.6 %), meetings (29.2 %), reports on industrial exhibitions, producer reports (17.3 %) (respondents could choose several possible answers or add their own) (Figure 4).
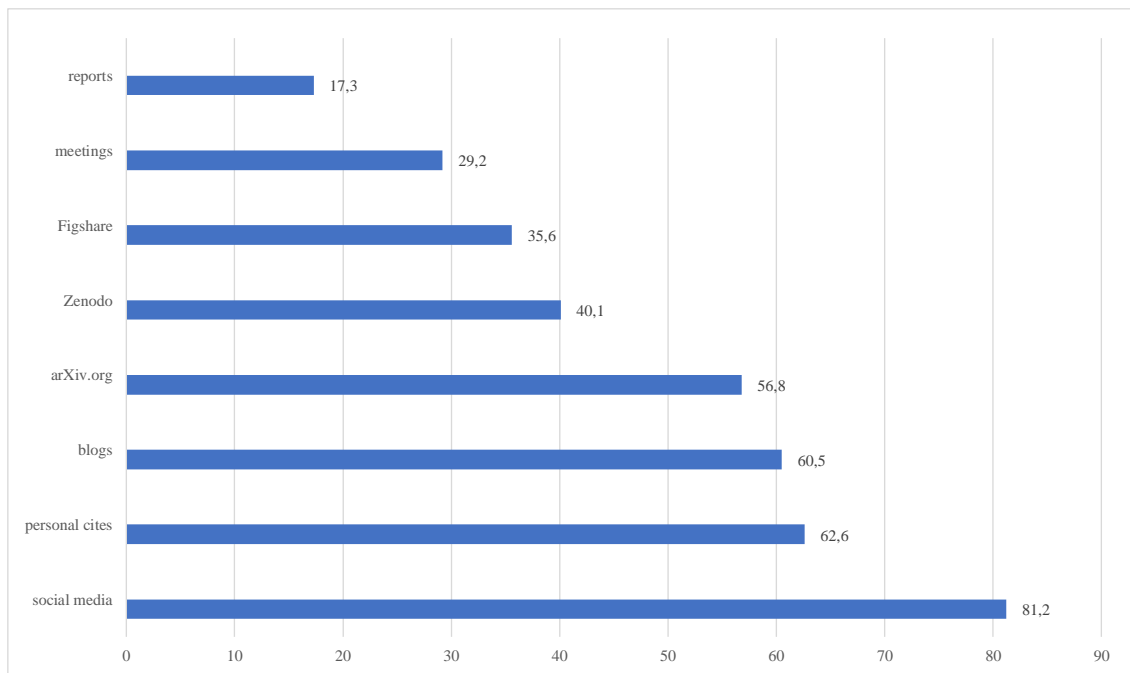

Figure 4. Sources from which 43.7 % of respondents use unreviewed research data, %

The most scientists from such fields as biology (50.3 %), chemistry (58.2 %), physics and mathematics (63.8 %) use to share their data. By contrast, psychologists (11.2 %), educational researchers (9.7 %) social communications (6.3 %) share their data less often. Some universities give support and trainings in data sharing, for example Igor Sikorsky Kyiv Polytechnic Institute.

About 70.0 % of the respondents lack awareness of what opportunities data repositories give. For example, the Zenodo repository is open to all scholars, regardless of the field of knowledge and sources of funding for their research. All deposits are stored in CERN Data Center. Every Zenodo deposit gets a DOI for free. Figshare allows to safely manage the results of own scientific research and make them visible, accessible, and cited.

To the question "What types of research data would you prefer if you were sure of its reliability?" the following answers were received: presentations (75.0 %), preprints (68.2%), infographics (51.2 %), databases (43.8 %), drawings (39.5 %), audio (12.5%) (respondents could choose several possible answers or add their own). Researchers agree that open data should be formatted, adjusted, and user friendly.

The most popular type of research data among respondents is preprint – scientific papers published in open sources for free access to a wide audience before publication in peer-reviewed scientific journal. Preprints help to initiate open discussion, get feedback from readers, comments, remarks that help to improve scientific work. Preprints also may serve as an early indicator of later academic impact. But there can be errors, inaccurate conclusions, general phrases, and they cannot be added to scientific reports (Paradis, et al., 2020).

To the question "What can stop you from sharing research data before publishing it in peer-reviewed scientific journals?" we received the following answers (respondents could choose answer option or write their own answer): "I'm not sure about copyright protection, other scientists can use my data as "research parasites" (68.8 %), "I have no time" (65.5 %), "I don't need it" (43.8 %), "I'm afraid of losing publishing opportunities" (43.4 %), "I'm not paid for it" (37.5 %), "it contradicts the requirements of the journal, where I plan to publish my results" (31.8 %), "I'm afraid that the data will be misinterpreted" (31.3 %), "it is prohibited by grantor" (20.1 %), "I am afraid of losing leadership in my field of research" (18.8 %), "I'm afraid that using my data, other scientists will find mistakes" (12.6%), "I don't know how to do it" (12.5 %), "it would violate ethical norms" (7.3 %), "I have prejudice" (6.3 %) (Figure 5).

Figure 5. Percentage of the answers to the question "What can stop you from sharing research data before publishing it in peer-reviewed scientific journals?", %

Researchers, especially those who work at universities, highlighted lack of time for data sharing, because they teach and supervise students, conduct research, have administrative activities, participate in community services.

To the question "What would motivate you to share research data before their publication in peer-reviewed scientific journals?" we received the following answers (respondents could choose several options and suggest their own): "it allows to cooperate with other scientists" (56.3 %), "it contributes to the formation of reputation" (43.8 %), "it increases the likelihood of being quoted" (37.5 %), "it allows to get feedback from the scientific community" (31.3 %), "it stimulates the development of science" (21.7 %), "I can get not only more citations, but journalists and donors may know what I am doing" (21.3 %), "it increases the likelihood of publishing the results in peer-reviewed journals" (7.3 %), "it allows save my results to use in the future" (6.3 %). 30.9 % of the respondents indicated that they do not find anything that could motivate them (Figure 6).
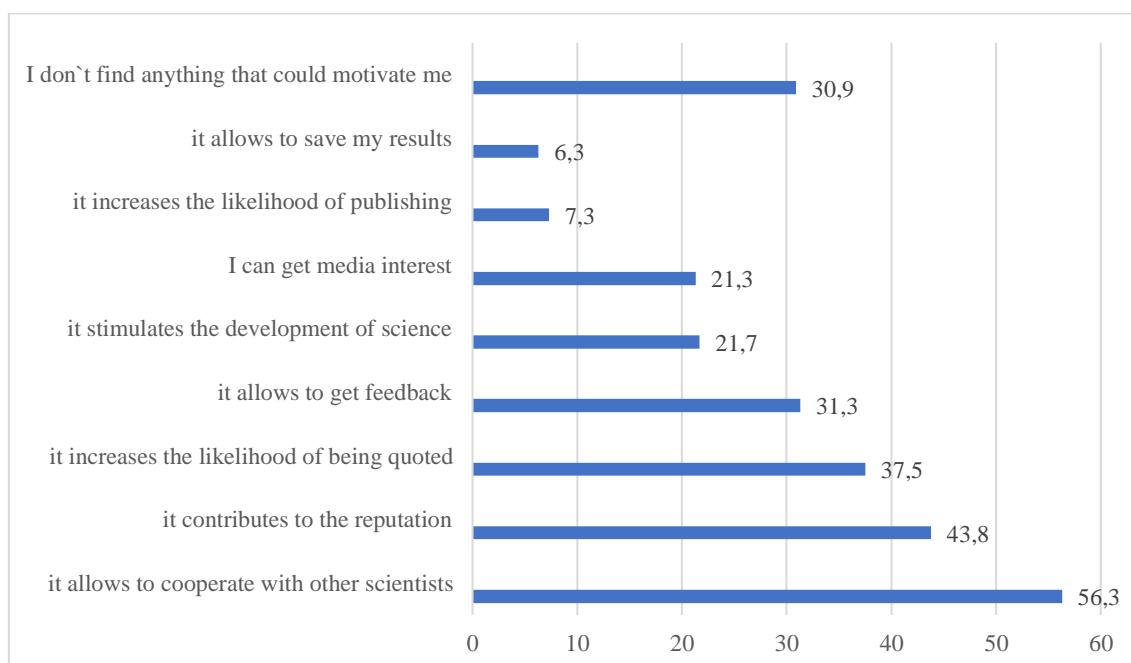

Figure 6. Percentage of the answers to the question "What would motivate you to share research data before their publication in peer-reviewed scientific journals?", %

About 78.0 % of the respondents need trainings in several areas of research data sharing: creating metadata for research data (77.1 %); sharing data (74.6 %); the use of data repositories and open access (74.1 %); storing and backing up data (61.5 %); ethics and consent for data creation (62.2 %); copyright and intellectual property (58.4 %). Sharing their own experiences of disseminating unrealized research data, scientists also noted cases of violations of academic integrity.

Discussion

Through the exchange of research data, the quality of research can be improved and accelerated. Data sharing gives impetus to innovation based on existing datasets, helps generate new knowledge, and promote discoveries, formulate hypotheses, create new meanings by combining existing datasets, and test findings (Smith, & Roberts, 2016). It takes a lot of time and money to create research data. By reusing research data, we maintain the resilience of research systems. In this way, open data promote sustainable development (Gurin, Manley, & Ariss, 2015).

C. Borgman defines research data as "entities used as evidence of phenomena for the purposes of research or scholarship" (Borgman, 2015, p. 29). According to Martone et al., research data are primarily the results of empirical research on which scientific results and conclusions are based (Martone, Garcia-Castro, & Van den Bos, 2018).

In this study we define "research data" as data obtained by researchers as a result of observations, experiments, descriptions, measurements, modeling, etc. or summarized on the basis of existing data.

In line with Y. Zhu our results prove that scientists usually support the idea of data sharing, but don't like to make their own research data publicly available (Zhu, 2020).

We agree with W. Chawinga and S. Zinn that data sharing helps to prevent research fraud, for example falsifying methodologies. Data sharing allows independent researchers to re-analyse the data, that promotes research integrity (Chawinga, & Zinn, 2019).

Our results proved that more experienced researchers share data much more willingly than early career scientists. On the other hand, researchers in every age group may generate low-quality research data.

We can fully agree with D. Sayogo and T. Pardo, that negative trends and challenges for researchers in data sharing are a lack of time (Sayogo, & Pardo, 2013), and selfish, non-cooperative behavior (Hunt, 2019).

Many researchers do not share their research data, even those funded by sponsors who require to make such data publicly available (Volk, Lucero, & Barnas, 2014). Our survey also confirms previous results that scientists are afraid of misinterpretation of data and losing authorship and publishing opportunities (Aleixandre-Benavent, et al., 2020). At the same time, we found that Ukrainian scientists luck awareness about data sharing. Meanwhile, the practice of data sharing is repetitive: the authors who had such experience, tend to share data in the future (Zenk-Möltgen, et al., 2018).

Our survey illustrated good and bad practices of research data sharing among Ukrainian scientists. As C. Tenopir, N. Rice, S. Allard, et al., we consider as advanced practice storing research data in repositories; mediocre practice is archiving data in the personal cloud or on the server of the institution; and bad practice is using flash drive, computer, or paper for storing such data (Tenopir, et al., 2020). Our study confirms previous research that scientists still share research data via e-mail and memory cards or CDs (Koopman, & De Jager, 2016).

We fully agree that the problem of data quality assessment before research data publication is being updated (Luzi, Ruggieri, & Pisacane, 2019). This assessment could help the members of the scientific community improve his or her paper and save readers' time.

Our findings are consistent with prior research of S. Koslow about technical, economic, political, motivational, legal, and ethical barriers for data sharing (Koslow, 2002). The main barriers are ethical, especially if data are collected from children and young adults. Sharing some research data can harm people and offend them (Takashima, et al., 2018; Mbuagbaw, et al., 2017).

Moreover, sharing some types of data may be restricted or prohibited. It can also sometimes harm specific researchers, institutions or society as a whole (Research Data Alliance and The Committee on Data for Science and Technology, 2016). Our research confirms the need for training in several areas of data sharing. It is important to involve professionals in data management, research support departments, and libraries (Melero, & Navarro-Molina, 2020).

Conclusion

The results of the survey show that most of the researchers don't deposit scientific data in open-access repositories or have low level of data sharing. On one hand, many scientists worry about authorship. But, on the other hand, data sharing has some benefits: it helps in collaboration, increases confidence in findings and generate discussions among scientists. Data sharing contributes to the intensification and diversification of research, the establishment of scientific communication, helps to solve social problems and increases the level of understanding of science by citizens. So, it is important to provide support for research data sharing. An educational campaign is also needed about the importance of data sharing for collaboration, recognition, and proper citation.

As a result of a survey, it was found the positive effects of data sharing such as intellectual development, new publishing opportunities, etc. However, ethical problems were also revealed, such as violation the ethical norms of scientific communication.

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