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## Innovation Ecosystem of ASEAN Countries

### Ecosistema de innovación de los países de la ASEAN

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#### Abstract

The paper investigates the innovation ecosystem alignment of ASEAN countries, based on the Global Competitiveness Report 2019 and Global Innovation Report 2019. Of interest are issues on institutions, human capital and research, infrastructure, market sophistication, and business sophistication. The results show the comparative strengths and weaknesses of each ASEAN economy. The information is suggestive to policymaker and private sectors if any measurement is required to close these gaps or to leverage their innovation ecosystem.

**Key Words:** ASEAN competitiveness; Innovation ecosystem.

#### Introduction

Innovation can be simply defined as a new idea, improvement or solution that can be commercialized or implemented (Bessant & Tidd, 2001). It is crucial for any organization to execute successful innovation in order to survive in a highly competitive environment. Innovation can be an outcome such as product innovation, process innovation, marketing innovation, business model innovation, supply chain innovation or organizational innovation.

#### Resumen

El documento investiga la alineación del ecosistema de innovación de los países de la ASEAN, con base en el Informe de Competitividad Global 2019 y el Informe de Innovación Global 2019. Son de interés temas sobre instituciones, capital humano e investigación, infraestructura, sofisticación de mercado y sofisticación empresarial. Los resultados muestran las fortalezas y debilidades comparativas de cada economía de la ASEAN. La información es sugerente para los formuladores de políticas y los sectores privados si se requiere alguna medida para cerrar estas brechas o aprovechar su ecosistema de innovación.

**Palabras clave:** competitividad de la ASEAN; Ecosistema de innovación.

Innovation can be a process such as new product development (Kahn, 2018).

Extension of firm innovation can include the production of knowledge, the transformation of knowledge into artifacts and the continuous matching of products, systems, processes, or service to market needs and demands (Pavitt, 2005). Innovation in the organization needs management to succeed in organizational goals (Birkinshaw, Hamel & Mol, 2008).

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Innovation has become a key success factor in the global economy. With the sophisticated level of globalization and vast technology advancement, the innovation ecosystem is at the utmost state yet (Mercan & Goktas, 2011).

The scope of the paper focuses on the innovation ecosystem of Southeast Asian countries, who have been working together to integrate their trade, economic, social and development. It is the aim of the paper to investigate the innovation ecosystem alignment of these countries. Once strong and weak components in the innovation ecosystem are identified, the information is then suggestive if any measurement is required to close these gaps or to leverage their innovation ecosystem.

### **ASEAN in Brief**

#### *ASEAN Profile*

The Association of Southeast Asian Nations (ASEAN) is an intergovernmental organization among 10 member states, i.e., Indonesia, Malaysia, Philippines, Singapore, Thailand, Brunei, Lao PDR, Myanmar, Cambodia, and Viet Nam. The aim of ASEAN integration is to promote socio-economic collaboration and cooperation. Today, ASEAN plays an increasingly significant role in the global economy. ASEAN contributes 3.5% of the world GDP and 7.2% trade in the world. The population of ASEAN shares 8.5% of the world. FDI inflow of ASEAN is at 154.7 billion USD (ASEAN Secretariat, 2019b).

These countries were initially grouped by geographic location. Yet the socioeconomic are much diverse. According to ASEAN secretariat statistics, the countries size ranges from a tiny 720-sq.km.-island of Singapore to a huge 1,916,862- sq.km., 17,508-islands of Indonesia. The population also ranges from 265.0 million in Indonesia to 0.4 million in Brunei. The GDP of ASEAN countries ranges from 13.5 billion USD to 1.0 trillion USD. GDP per capita also widely ranges from the richest group of Brunei and Singapore at 32,413.9 USD and 64,041.4 USD, respectively. The medium groups are Thailand

and Malaysia with GDP per capita of 7,187.2 USD and 10,941.7 USD, respectively. Then again, the GDP per capita ranges from 1,508.8 USD to 3,870.6 USD among 5 ASEAN low-income countries (ASEAN Secretariat, 2019b).

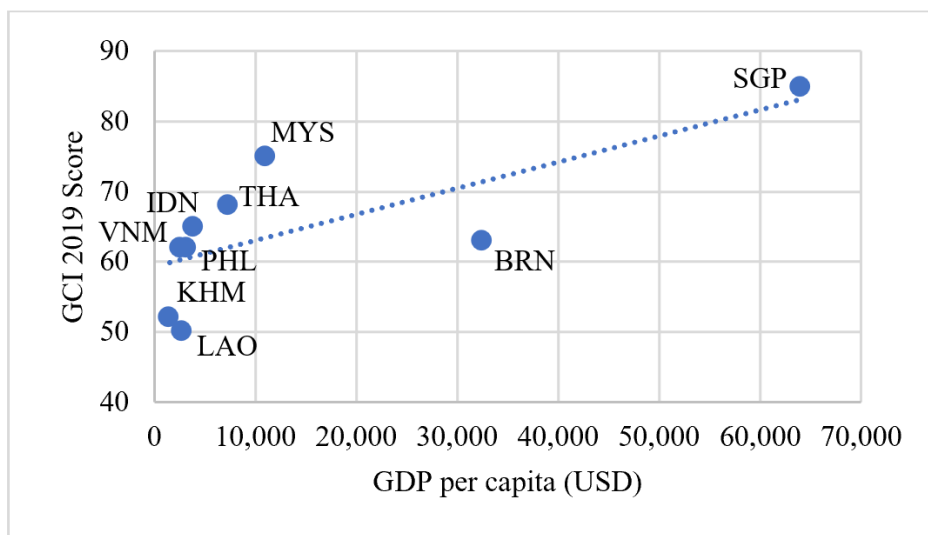
Despite a long collaboration since 1961 and a recent concrete economic agreement among member states, the collaboration is still challenging (Wei-Yen, 2005). With a colossal gap of each country's socioeconomic, the realization and alignment are questionable (Chia, 2014; Petri, Plummer & Zhai, 2012).

The latest ASEAN Economic Community (AEC) Blueprint 2025 consisting of five interrelated and mutually reinforcing characteristics, i.e., (1) a highly integrated and cohesive economy, (2) a competitive, innovative, and dynamic ASEAN, (3) enhanced connectivity and sectoral cooperation, (4) a resilient, inclusive, people-oriented, and people-centered ASEAN, and (5) a global ASEAN (ASEAN Secretariat, 2015).

Regarding the innovation ecosystem, ASEAN has addressed several related issues such as ASEAN Patent Examination Cooperation, ASEAN Science, Technology and Innovation Fund, ASEAN Declaration on Innovation, ASEAN Innovation Roadmap in 2019 (ASEAN Secretariat, 2019a).

#### *Competitiveness of ASEAN*

To preliminarily reflect these 10 ASEAN member general performance, Figure 1 illustrates each country's GDP per capita versus competitiveness performance, based on the World Economic Forum's Global Competitiveness Report 2019 (Klaus, 2019). Here, it shall be noted that the Global Competitiveness Index (GCI 2019) is a rather broad perspective. The report investigates institutions, infrastructure, ICT adoption, macroeconomic stability, health, skills, product market, labor market, financial system, market size, business dynamism, and innovation capability. A total of 141 economies are included in GCR 2019. However, Myanmar is not included in this report.



**Figure 1.**  
ASEAN member GCI 2019 score vs GDP per capita

Of all perspectives per GCI 2019, Singapore scores at 85 and is ranked the world's 1st. Malaysia and Thailand are ASEAN 2nd and 3rd at the world's 27th and 40th, scoring at 75 and 68, respectively. Fig.1 maps GCI 2019 score with GDP per capita of 9 ASEAN countries. The linear line is here called "Expectation line" which is simply a linear fit with the data on both axes. The line represents the expected level of score upon the economic potential, by which here uses GDP per capita to represent. The location above the linear trend line means the country gets a higher score than what is expected. It means the country has high performance than the expectation. Here, the expectation is notable in the ASEAN league only. The location under the line is otherwise.

Here, it can be seen that Malaysia is the most outperformed, positioning very high above the trend line. Thailand and Indonesia also perform well. Singapore, Viet Nam, and the Philippines, despite the positions above the trend line, performed almost what is expected. Brunei, Cambodia and Lao PDR, on the other hand, performed much lower than expected. This information is only suggestive on an overview of how these countries are generally viewed by outsiders.

### Theoretical framework

#### *Innovation and Innovation Ecosystem*

Innovation requires adequate human resources and supporting infrastructure and the environment to execute what is invented for

commercialization. The capability to innovate relies on many perspectives, i.e., institutional factors, cultural factors, technology, investment (Mercan & Goktas, 2011; Jackson, 2011; Ramingwong & Manopiniwes, 2019; Ramingwong, Manopiniwes & Jangkrajarn, 2019). The concept is simple but the execution of innovation is complex and uncertain. Moreover, it is difficult to measure the level of innovation (Kline & Rosenberg, 2010).

Often, the term "ecosystem" is referred to as the relation of actors to the focus environment (Durst & Poutanen, 2013; Mercan & Goktas, 2011). Thus, the innovation ecosystem can be considered as the collection of economic agents that possess a relationship or are clustered. The success innovation ecosystem may require many drivers. For example, a strong relationship between universities and firms could support knowledge creation and knowledge diffusion effectively (Carayannis & Cambell, 2009). Innovation policy is also required to properly raise the promotion of the national innovation system (Cooke, Uranga & Etxebarria, 1997; Lundvall, 1998; Nelson, 1993).

#### *Innovation performance: Global Innovation Index*

The paper sourced data from the report The Global Innovation Index 2019 (GII 2019) published by Cornell University, INSEAD, and the World Intellectual Property Organization (Cornell University, INSEAD & WIPO, 2019). Whilst the report collects innovation

performance of 130 economies, the paper then focuses on ASEAN member countries.

GII 2019 comprises of two main indexes, i.e., innovation input and innovation output (see Fig.2). The input, or innovation enablers, comprises of 5 pillars, i.e., (1) Institutions, (2) Human capital and research,

(3) Infrastructure, (4) Market sophistication, and (5) Business sophistication. The output, or result of innovation, comprises of 2 pillars, i.e., (6) Knowledge and technology outputs and (7) Creative outputs. Each pillar is divided into three sub-pillars and each sub-pillar is composed of individual indicators. A total of indicators for GII 2019 is 80.

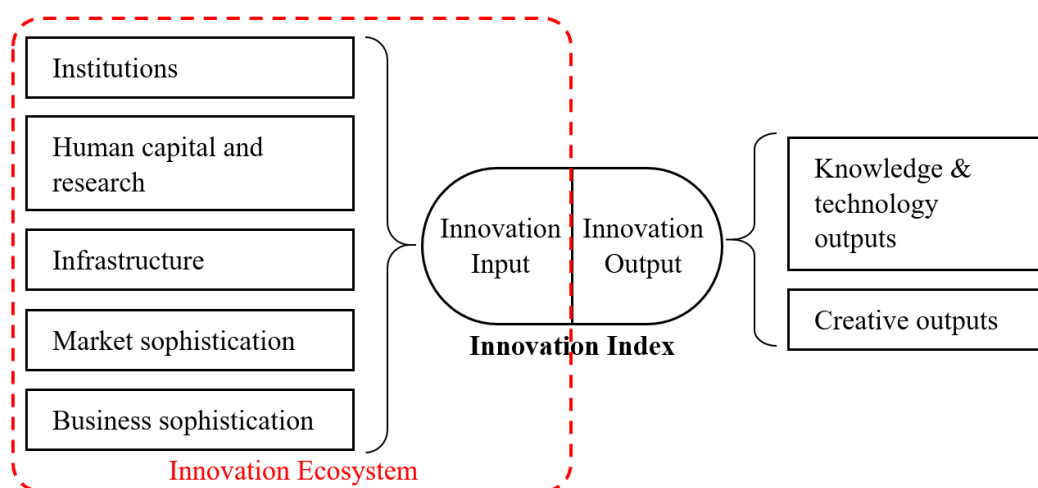


Figure 2. Structure of the Global Innovation Index 2019 (Cornell University, INSEAD & WIPO, 2019)

In 2019, the world’s top three economies with the highest innovation performance are Switzerland (score 67.24), Sweden (score 63.65) and the United States of America (score 61.73). Among ASEAN, the top three economies with the highest performance are Singapore (ranked world’s 8th, score of 58.37), Malaysia (ranked world’s 35th, score at 42.68) and Viet Nam (ranked world’s 42nd, score at 38.84). Thailand is also closely-ranked at the world’s 43rd, scoring at 38.63.

**Methodology**

The paper aims at investigating the innovation ecosystem alignment of ASEAN countries. Therefore, the paper explores and then compares key components that reflect the innovation ecosystem of each ASEAN country. The key components used in this paper are taken from GII 2019 innovation input pillars, i.e., (1) Institutions, (2) Human capital and research, (3) Infrastructure, (4) Market sophistication, and (5) Business sophistication. The investigation is not only score benchmarking but score mapping with the country’s GCI 2019 score to reflect the expectation based on their competitiveness.

Thus, the strengths and weaknesses of each country can be identified.

**Results and Discussion**

*Innovation Ecosystem of ASEAN Countries*

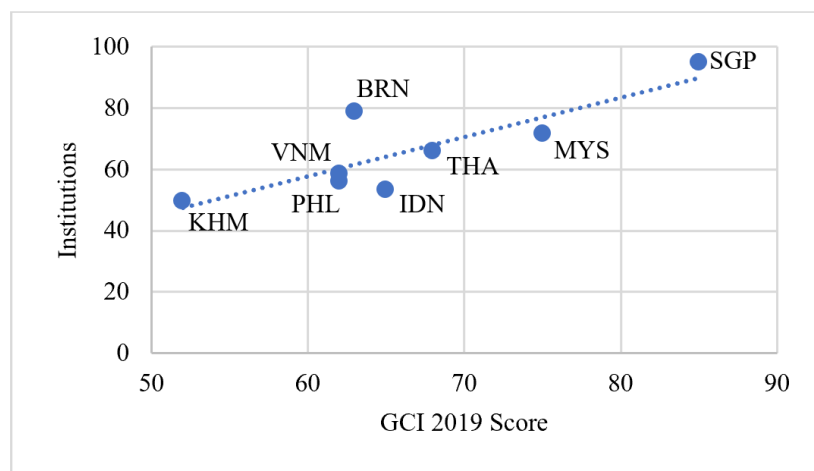
Focusing on the innovation ecosystem, wherein this case, is an innovation input score per GII 2019. The top three ASEAN countries are Singapore, ranked the world’s 1st at score 72.15, Malaysia, ranked the world’s 34th at score 52.93 and Thailand, ranked the world’s 47th at score 46.58. This is consistent with the competitiveness of these 3 countries that are outperformed other ASEAN countries. However, the following investigates scores of 5 input (pillars in GII 2019) for all ASEAN countries in each perspective if there are any hidden strengths and weaknesses of any economy in any aspect. Fig. 3-7 map each innovation input score with the country’s GCI 2019 score. It shall be noted that Myanmar and Lao PDR are not available in GII 2019.

### A. Institutions

Pillar of institutions concerns political, regulatory and business environments. There are 7 indicators, e.g., political and operational stability, government effectiveness, regulatory quality, rule of law, ease of starting a business.

Singapore is ranked the world's 1st in this pillar and also ranked the world's 1st in indicators of political and operation stability, government effectiveness and cost of redundancy, dismissal. Ease of starting business of Singapore is ranked world's 3rd.

Regarding the trend line (see Fig. 3), it can be seen that Brunei is the best performer on this pillar. Brunei is ranked the world's 1st in the issue of the cost of redundancy dismissal and ranked the world's 7th in political and operational stability. Government effectiveness and ease of starting business are also strengths of Brunei in this perspective. Indonesia is otherwise. The cost of redundancy dismissal and ease starting a business are among the concerning issues for Indonesia.

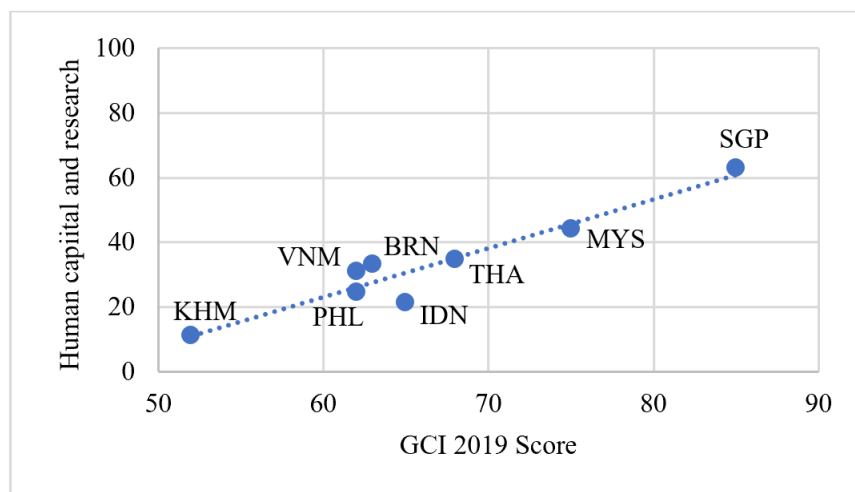


**Figure 3.**  
ASEAN member scores on institutions vs GCI 2019 score.

### B. Human Capital and Research

Pillar of human capital and research concerns education, tertiary education and R&D. There are 12 indicators, e.g., expenditure on education,

school life expectancy, tertiary enrolment, graduates in science and engineering, a ratio of researchers, gross expenditure on R&D, QS university ranking.



**Figure 4.**  
ASEAN member scores on human capital and research vs GCI 2019 score.

Singapore is the world's 5th in this pillar and on indicators of PISA scales in reading maths and sciences and tertiary inbound mobility. Graduates in science and engineering and number of researchers also ranked as the world's 5th.

From Fig. 4, ASEAN countries mostly perform as expected as the locations are close to the trendline, except Indonesia. Tertiary inbound mobility and gross expenditure on R&D are among low.

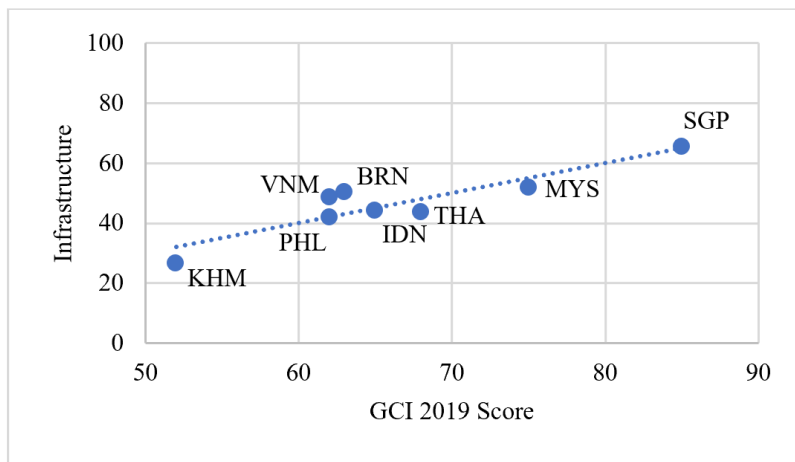
*C. Infrastructure*

Pillar of infrastructure concerns ICTs, general infrastructure, and ecological sustainability.

There are 10 indicators, e.g., ICT access, ICT use, e-participation, logistics performance, GDP/unit of energy use, environmental performance, ISO 14001 environmental certificates.

Singapore is ranked the world's 7th in this pillar. Singapore is the world's top 10 on ICT access, government online service, logistics performance and GDP/unit of energy use.

Fig. 5 is suggestive that Viet Nam and Brunei performed better than expectation. Viet Nam is good at logistics performance and the number of ISO 14001 environmental certificates. Brunei is good at electricity output and gross capital formation.

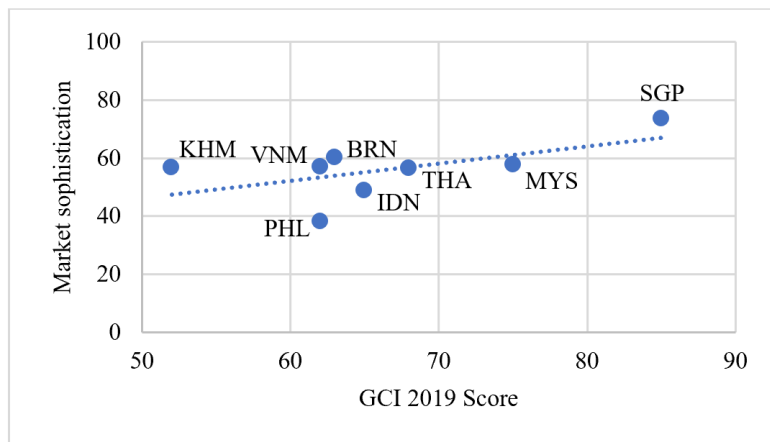


**Figure 5.**  
ASEAN member scores on infrastructure vs GCI 2019 score

*D. Market Sophistication.*

Pillar of market sophistication concerns credit, investment and trade/ competition/ market scale.

There are 9 indicators, e.g., ease of getting credit, market capitalization, venture capital deals, the intensity of local competition, domestic market scale.



**Figure 6.**  
ASEAN member scores on market sophistication vs GCI 2019 score

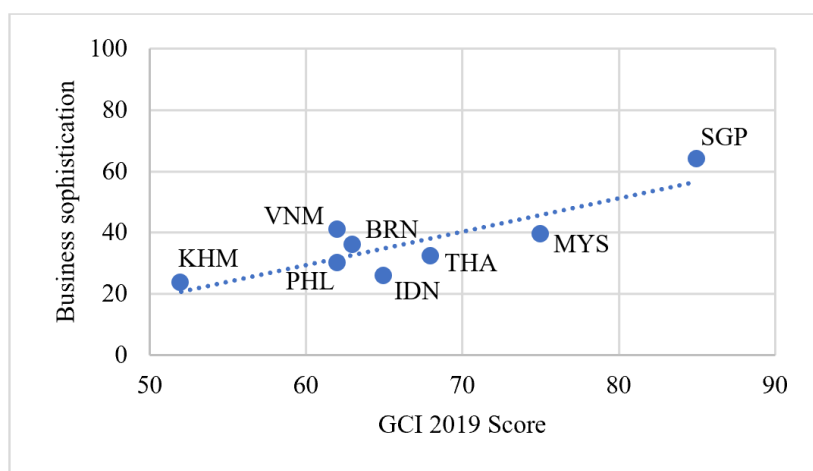
Singapore is ranked the world's 5th on this pillar. Singapore is the world's top 10 on ease of protecting minority investor, market capitalization, venture capital deal, and applied tariff rate.

The linear trend line in Fig. 6 represents ASEAN countries on the market sophistication perspective. Interestingly, Cambodia performs much better than expected. Based on the rather low competitiveness of Cambodia, ease of getting credit, % GDP of domestic credit to private sector and microfinance gross loan of Cambodia are outstanding. However, ease of protecting minority investors, applied tariff rate, the intensity of local competition and domestic market scale are among Cambodia's restraints.

Oppositely, the Philippines is underperformed. Although the Philippines is relatively good in market capitalization and applied tariff rate, it needs improvement in ease of getting credit and ease of protecting minority investor.

#### E. Business Sophistication

Pillar of business sophistication concerns knowledge workers, innovation linkages and knowledge absorption. There are 15 indicators, e.g., knowledge-intensive employment, Gross domestic expenditure on research and development (GERD) performed by business, GERD financed by business, university/ industry research collaboration, state of cluster development, intellectual property payments, FDI net inflows, the ratio of research talent in business enterprise.



**Figure 7.**

ASEAN member scores on business sophistication vs GCI 2019 score

Singapore is ranked the world's 4th on this pillar. Singapore is the world's best in percent of knowledge-intensive employment and joint venture strategic alliance deals. Singapore is also superior in university/ industry research collaboration, cluster development, intellectual property payments, high-tech import, and FDI net inflows.

On the other hand, Indonesia is underperformed (see Fig. 7). The issues are knowledge-intensive employment, formal training offered by firms, joint venture strategic alliance deals, and FDI net inflows.

Noticeably, Thailand and Malaysia also perform under expectation in this pillar (see Fig. 7). Thailand needs improvement in GERD financed by abroad, ICT service imports and FDI net inflows. Whilst Malaysia needs improvement in GERD financed by abroad and formal training offered by firms.

#### *Comparative Strengths and Weakness of ASEAN Countries on the Innovation Ecosystem*

Table 1. summarizes the observed strengths and weaknesses of ASEAN countries, only based on the ASEAN league.

**Table 1.**  
*Comparative strengths and weaknesses of ASEAN countries in the innovation ecosystem*

Country	Strengths	Weaknesses
Brunei	Institutions + Infrastructure +	
Cambodia	Market sophistication +	
Indonesia		Institution - Business sophistication -
Lao PDR	N/A	N/A
Malaysia		Business sophistication -
Myanmar	N/A	N/A
Philippines		Business sophistication -
Singapore	Institutions + Human capital and research + Infrastructure + Market sophistication + Business sophistication +	
Thailand		Business sophistication -
Viet Nam	Infrastructure +	

**Conclusion**

Despite the socio-economic diversification of 10 ASEAN economies, initiatives were launched to promote and increase the competitiveness of the member countries as a whole. Whilst the innovation ecosystem is a key success factor to economic development, 5 perspectives on the innovation ecosystem, reported in Global Innovation Report 2019, are investigated. To reflect the expectation of each ASEAN country, the investigation considers the competitiveness level per World Economic Forum's Global Competitiveness score. Singapore, as the world's highest competitiveness, is the world's best in the innovation ecosystem as expected. Brunei is also comparably exceptional in institutions and infrastructure perspectives. Viet Nam is also outstanding in infrastructure. Cambodia is good at market sophistication. On the other hand, Indonesia is weak in the institution and business sophistication. Philippines, Thailand, and Malaysia also perform under expectation in business sophistication. These kinds of information may be suggestive to any policymakers or public sectors if any measurement shall be addressed to these issues.

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