

Digital Economy: A Comparative Study in ASEAN

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SUMMARY

The Association of Southeast Asian Nations (ASEAN) is an area with the rapid adoption of technology, the growth of internet and mobile phone users, region-wide digital initiatives to increase connectivity between markets, and the drastic acceleration of digitalization across practically all aspects of the economy. Currently, especially in the Covid-19 pandemic period, the digital economy is a key factor driving the growth of the region's economy. Based on the Networked Readiness Index (NRI), the study will analyze and compare the differences between ASEAN countries in terms of the digital economy. The purpose of the study is to understand the strengths and weaknesses of each country, thereby giving an overview of the potential of ASEAN countries in the period of digital economy readiness. The study results clearly show the digital economy gap and many differences in terms of the people pillar across countries. Singapore and Malaysia are among the top digital economies in the region; however, only Thailand made substantial progress from 2019–2021. Although ranked the lowest in the digital economy, Lao PDR and Cambodia have many positive improvements. Although ASEAN countries have strengths in digital technology, applying digital technology toward sustainable development is still a challenge for most countries in the region.

Keywords: ASEAN; Digital economy; NRI

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INTRODUCTION

The term digital economy was used by Lane (1999), who wrote that the digital economy is “the convergence of computing and communications technologies on the internet and the resulting flow of information and technology that is stimulating all of electronic commerce and profound organizational change” (Lane 1999, p. 317). It is not clear when the digital economy was first mentioned; however, most acknowledge that the focus of the digital economy is the emergence of the internet technology, which has combined the application of digital information, personal computers, and information publishing (on websites) (Dahlman et al.

2016; Lane 1999). As a result, the internet has had a big impact on organizations and society. Moreover, the quick diffusion and adoption of information and communication technologies (ICTs) have opened the emergence of products/services that we usually call digital products/services (Ayres & Williams 2004).

To distinguish between a traditional economy and a digital economy, Valenduc & Vendramin (2017) identify common characteristics of the digital economy: “the irrelevance of geographical location, the key role played by platforms, the importance of network effects and the use of big data” (p.7). To develop a clearer concept of the digital economy, Bukht & Heeks (2017) suggest that this portion of the economic output is derived exclusively from digital technologies with business models based on digital goods or services. In

particular, the digital economy will differ from the traditional economy in terms of resources, process, structure, and business model. For example, resources in a digital economy include technologies, content, and human resources.

At the birth of the digital economy, the application and emergence of digital products/services had just begun and depended heavily on the development of technologies; the role and impact of the digital economy were still uncertain, and there were many question marks (Ayres & Williams, 2004). In the past twenty years, the global economy has witnessed a strong rise in the digital economy. The digitalization waves supported by technological innovation have created sweeping changes across many fields, strongly influencing traditional fields and opening up new ones. For example, Airbnb and Booking.com are mostly the rulers of the hospitality industry. The financial and banking sector is witnessing the mass emergence of fully digital banks such as Revolut and N26. In the entertainment sector, Netflix is dominant. In education, it is Edx and Coursera. Transportation is Uber or Grab car. The carmaker is Tesla, a self-driving car. It is not hard to name a digital player with groundbreaking technology that creates and meets more and more new user needs. Eight out of the ten largest companies by market capitalization globally are tech giants. More precisely, as Baller et al. (2016) note, the future of nations, businesses, and individuals will depend more than ever on their adoption of digital technology.

The benefits that the digital economy brings to countries are huge, contributing to the comprehensive development of each country, but the growth of the digital economy is not without challenges (Dahlman et al. 2016).

Countries also need to shape and develop digital economy development strategies to catch up with the trend of competing with other economies. The challenges that developing countries face in the digital economy include protecting personal/user data, building information infrastructure, investing more R&D activities in core technologies, and developing qualified human resources (Petrenko et al. 2017).

In order to measure the readiness towards the Digital Economy, the World Economic Forum 2001 suggests using the Networked Readiness Index (NRI). This index refers to “how well the economy of a country uses digital technology to improve competitiveness and welfare” (Petrenko et al. 2017, p.97) and also assesses the components of the NRI of each country (Petrenko et al. 2017).

This study aims to add more knowledge to the digital economy of ASEAN countries. The main goal of this research is to uncover the similarities and differences between these countries in the path to the digital economy by using hierarchical cluster analysis. The overall structure of this study is divided into five parts. The first part is the introduction. The second part deals with the literature review and the third section is concerned with the materials and methodologies used in

this study. The fourth part analyzes the hierarchical cluster analysis results. Finally, the fifth part is the conclusion.

LITERATURE REVIEW

Previous studies have investigated the digital economy. In particular, many studies have used official digital economy indicators to show differences between countries. For example, Nagy (2019) used the Digital Economy and Society Index 2017 to compare the digital economy development between Hungary and Ukraine. In the ASEAN region, Box & Lopez-Gonzalez (2017) reviewed the importance of digital technology in the future development of the digital economy, and the authors suggested a variety of aspects – technology, human skills, infrastructure, and regulation policy – that ASEAN countries need to pay attention to developing in the digital era. Through reviewing the opportunity and challenges from digital transformation, Avirutha (2021) highlighted the importance of digital skills and government policies in the ASEAN region on the path to the digital economy. A few studies have delved into different aspects of the digital economy in ASEAN countries. Pitakdumrongkit (2018) proposed policy solutions to address digital protectionism issues in ASEAN. In a study on digital literacy, Kusumastuti & Nuryani (2020) found no difference between digital literacy levels among eight countries in ASEAN. Studies on innovation, the participation of women, and one country's situation in the digital economy have also been conducted (Marsan, 2022; Nengsi, 2019; Cameron et al., 2019). Most agreed that countries' reactions to the digital economy orientation differ according to each country's culture, policy and conditions, so the status of digital economies in this region will change year by year. This study adds to the research line by classifying countries in ASEAN by groups, thereby highlighting and comparing differences between countries in terms of technologies, people, governance, and impacts that have received scant attention in previous studies.

The Association of Southeast Asian Nations (ASEAN) was officially founded on August 8, 1967, in Bangkok, Thailand, with the five founding members of Indonesia, Malaysia, the Philippines, Singapore, and Thailand. After nearly 55 years, ASEAN is an intergovernmental cooperative organization with ten members in Southeast Asia (Brunei Darussalam, Vietnam, Lao PDR, Myanmar and Cambodia have joined the original members) and it has become an increasingly important political and economic partner in the Asia-Pacific region. One of the main aims and purposes of ASEAN is to “promote regional cooperation....to toward peace, progress and prosperity in the region” (The ASEAN Declaration 1967, p.1). ASEAN has an area of 4.46 million km² (approximately the area of the European Union, which is 4.475 million km²), with a population of about 600 million (the EU has

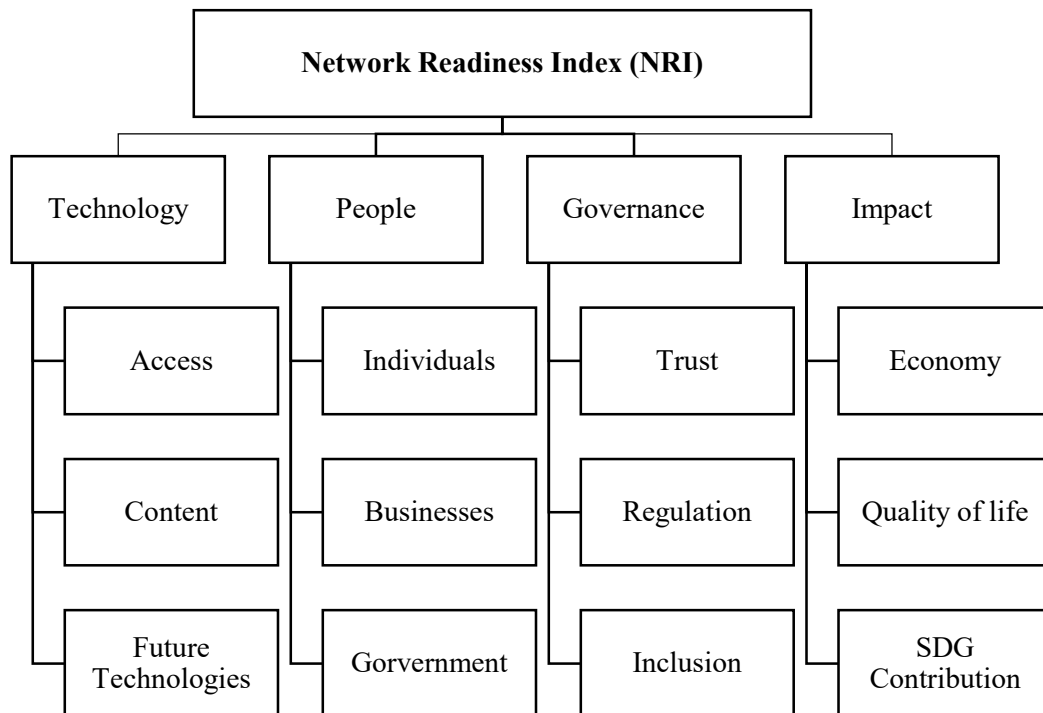
447 million). According to the IMF’s statistical data, the ASEAN GDP growth rate in 2021 was 2.9%. ASEAN countries have established many working frameworks for the digital economy. For example, in Hanoi in 2019, ASEAN countries formally signed an e-commerce agreement that came into effect in December 2021. The principal goal of this agreement is to implement the latest rules for managing e-commerce in the region and to stimulate a regionally integrated digital economy. With its entry into force, especially since the Covid-19 pandemic, the implementation of the e-commerce agreement has been very important in the economic recovery. Besides that, other projects include the AEC Blueprint 2025, the Masterplan on ASEAN Connectivity 2025, and the e-ASEAN Framework Agreement. Currently, ASEAN is working with the World Economic Forum on digital economy projects such as the Pan-ASEAN data policy, ASEAN digital skills, ASEAN e-Payment, and ASEAN cybersecurity.

MATERIALS AND METHODS

This study uses data from The Network Readiness Index report for three years, from 2019 to 2021, to analyze the digital economy of eight countries in the ASEAN region. Brunei Darussalam and Myanmar are not included in this study due to the lack of data from NRI reports. In addition, the article also uses reports of the World Bank and International Monetary Fund to have an overview of the economies of these countries.

In terms of methodology, this study mainly uses desk research methods, focusing on analyzing the strengths and weaknesses of countries in the report review, the main and sub-components of the Network Readiness Index. Data from the Network Readiness Index and analysis are performed using hierarchical cluster analysis in SPSS 22. In addition, this study attempts to compare and contrast indicators and readiness for the digital economy development of each ASEAN country.

From 2019, the updated NRI is based on four pillars: technology, people, governance, and impact. Each pillar consists of three sub-pillars (Figure 1).



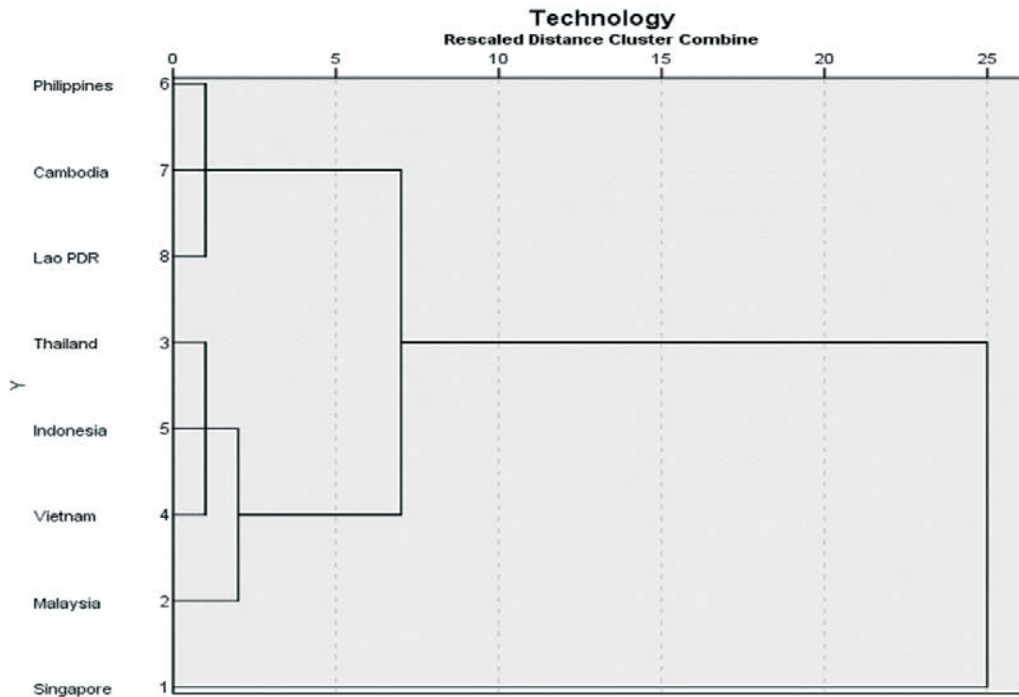
Note: SDG=Sustainable Development Goals
 Source: The Network Readiness Index 2019 (Dutta & Lanvin 2019)

Figure 1: The key indicators of Network Readiness Index

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in the ASEAN region are classified by each pillar as follows.

The study uses cluster analysis for the four pillars listed in The Network Readiness Index 2021 report: technology, people, governance, and impact Countries

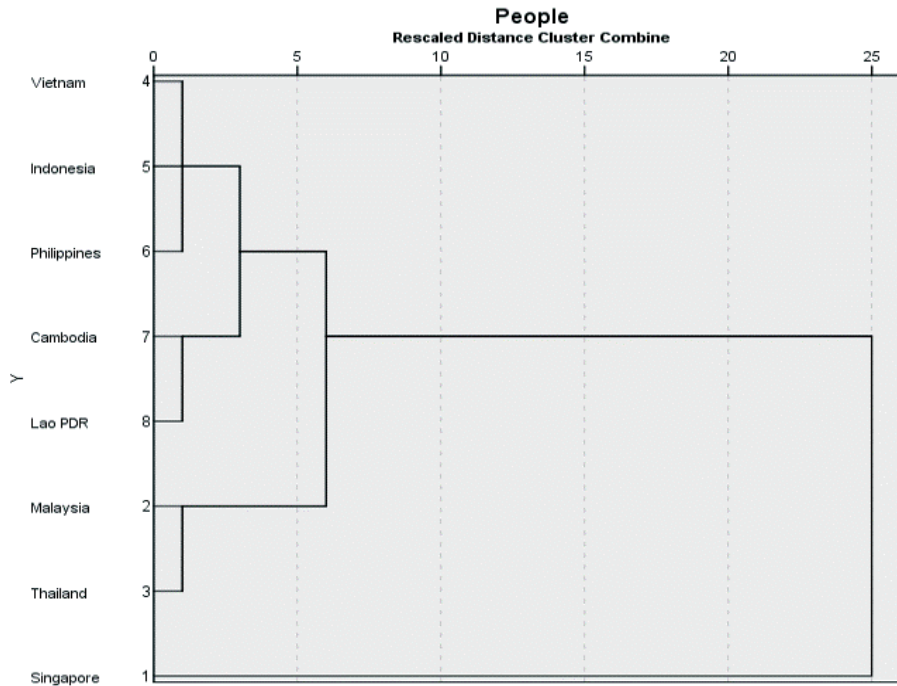


Source: Author’s elaboration based on data from the NRI 2021 report

Figure 2. The hierarchical clustering according to the Technology pillar

Figure 2 shows the hierarchical clustering results with three main clusters about the technology pillar. The first level contains the Philippines, Cambodia, and Lao PDR. The second level includes Thailand, Indonesia, Vietnam, and Malaysia. Singapore is top level not just only in ASEAN but also in the world ranking.

Meanwhile, the cluster analysis result of the people pillar is shown in Figure 3. Singapore continues to be the country with the highest index. The second cluster includes Malaysia and Thailand. Finally, although Vietnam, Indonesia, and the Philippines have higher scores than Cambodia and Lao PDR, these countries are all ranked third.

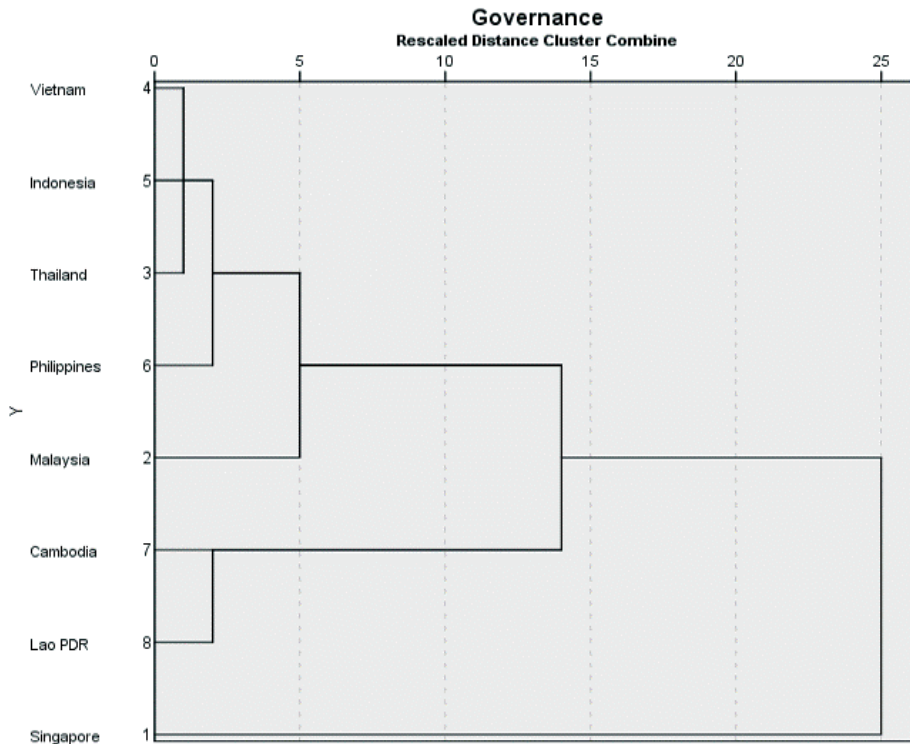


Source: Author’s elaboration based on data from the NRI 2021 report

Figure 3: The hierarchical clustering according to the people pillar

Figure 4 shows hierarchical clustering results for the governance pillar. Cambodia and Lao PDR continue to be in a low level of governance pillar countries. Vietnam, Indonesia, Thailand, Philippines,

and Malaysia, with a slightly higher score, are listed in the next level of the governance pillar. Singapore is in the cluster with the highest governance index.

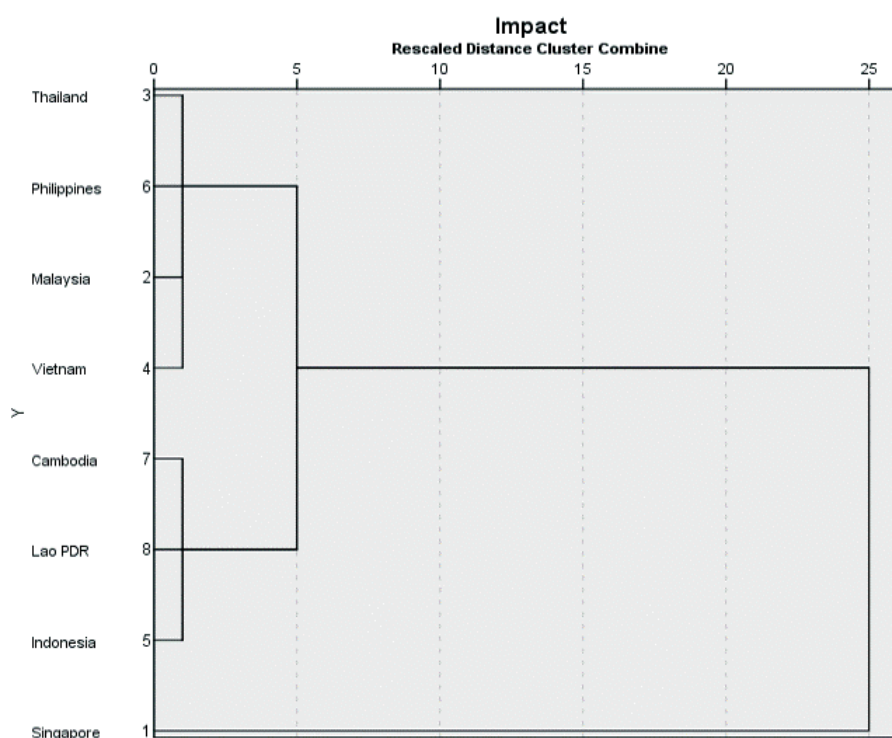


Source: Author’s elaboration based on data from the NRI 2021 report

Figure 4: The hierarchical clustering according to the governance pillar

Finally, Figure 5 shows hierarchical clustering results for the impact pillar. Easily recognizable, Singapore is the first cluster with the highest impact

index. Vietnam, Malaysia, the Philippines, and Thailand are the second cluster. Indonesia, Lao PDR, and Cambodia are in the third cluster.



Source: Author's elaboration based on data from the NRI 2021 report

Figure 5: The hierarchical clustering according to the impact pillar

Based on the overall NRI score 2021 and the result of cluster analysis, the countries in ASEAN can be divided into three classes. The first class contains Singapore, the second class is made up of Malaysia, Thailand, Vietnam, Indonesia, and the Philippines, and the third class includes Lao and Cambodia.

The first class: Singapore

Singapore is among the top 10 countries globally in terms of the digital economy. However, there is a slight decrease in the NRI index of 80.01 in 2021 compared to 82.13 in 2019 and 81.39 in 2020. One of the strong pillars of Singapore is the impact of digital technologies on society. The impact pillar ranks first in the world in Singapore, contributed to by the Economic and Sustainable Development Goal (SDG) contributions sub-pillar, which ranks on top of the world. This can be explained by the huge investment in the sustainable development of Singapore (Dutta & Lanvin 2021). In addition, Singapore achieves impressive indicators in high-tech manufacturing, healthy life expectancy, high education quality, and sustainable cities. Another strength of Singapore is the technology pillar, which ranks 8th globally. The accessible ITCs and robust financing of future

technologies are the most contributive sub-pillar, ranking 3rd and 4th respectively in 2021; this is the sub-pillar for which Singapore has indexes in the 1st place, such as handset prices, 3G mobile network, mobile apps development, and robot density. However, some indicators indicate that Singapore could improve its privacy protection by legislation.

The second class: Malaysia, Thailand, Vietnam, Indonesia, and the Philippines

Compared to countries in the upper-middle-income group economy, Malaysia performed better in every pillar. High technology is a strong point in Malaysia's digital economy, which is ranked 38th globally, contributed to by the future technologies sub-pillar, where Malaysia invests impressively in emerging technologies. The strengths in the technologies pillar are its good international internet bandwidth and scientific publications on artificial intelligence. Besides, another strength of Malaysia's digital economy comes from the impact of digital technologies. Strong high-tech export and high-tech manufacturing and the gig economy's prevalence are the strongest indicators. However, weak performance

in some indicators in this pillar such as income inequality and sustainable cities should be improved.

Thailand, Vietnam, and Indonesia are world-ranked 54th, 63rd, and 66th, respectively, for NRI 2021. Out of these three countries, Thailand is superior in many aspects. The point that helps the digital economy in Thailand have a high position is the strength in accessing digital technologies, including use of SMS (ranked 26th), Internet bandwidth (rank 9th), and Internet access in schools (rank 26th). These factors make Thailand a bright spot in the technology pillar. Despite standing behind Indonesia in terms of the technology, people, and governance pillars (rank 61st, 80th, 73rd, respectively), Vietnam has a higher overall NRI thanks to the contribution of the Impact pillar. Mainly, the digital economy in Vietnam relies heavily on bright spots in economic development (GDP growth rate - rank 2nd), high-tech exports (rank 3rd). Indonesia (overall rank 66th) has a bright spot in the contribution from the technology pillar. This is possible thanks to large contributions from indicators such as Internet bandwidth (rank 1st), SMS sent (rank 11th), AI publications (rank 18th), investment in emerging technologies (28th), and computer software spending (27th).

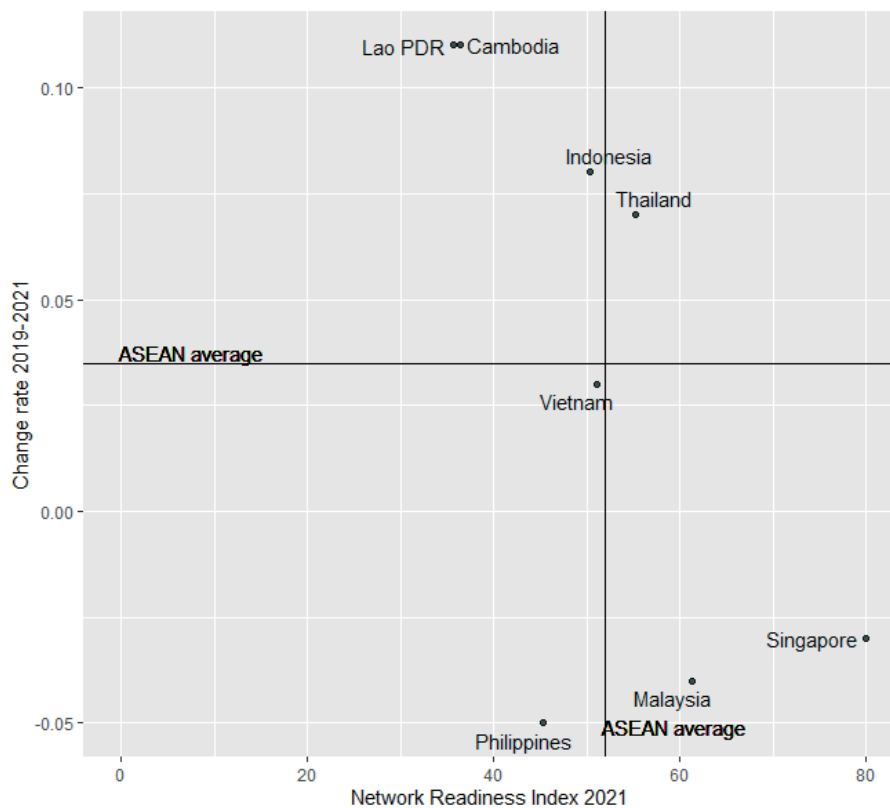
The Philippines is ranked 83rd and ranks behind Thailand, Vietnam, and Indonesia in the three pillars

of technology, governance, and people; however, the Philippines has a bright spot in the impact pillar (rank 52nd), where it places higher than all three countries mentioned above. This has been made possible by the contribution of high-tech manufacturing, high-tech and ICT services exports, and a high growth rate of GDP per capita. Typically, high-tech exports ranked 2nd globally with 95.3/100 points.

The last class: Cambodia and Lao PDR

Both Cambodia and Lao PDR rank in the bottom group in terms of the digital economy globally.

Figure 6 indicates the longitude development of the digital economy in ASEAN during the period 2019–2021. The most striking result is that Lao PDR and Cambodia have produced the best improvement during this period, followed by Indonesia. Meanwhile, the Philippines, Malaysia, and Singapore showed negative changes over three years. Singapore, Malaysia, and Thailand are the best countries with digital economies; however, only Thailand could maintain stable digital development during this period. Both Singapore and Malaysia received lower scores in 2021 compared to 2019. Vietnam is very close to the average of ASEAN but stayed relatively unchanged over three years



Source: Author’s elaboration based on data from the NRI 2019 & 2021 reports

Figure 6: The changes in Network Readiness Index in ASEAN (2019–2021)

This study contributes to a clearer view of the stage of readiness for the digital economy in ASEAN countries, thereby highlighting the strengths and weaknesses of countries in the area (shown in Table 1). The following trends are recognized.

(1) The ASEAN countries' gap is still large in terms of readiness for the digital economy. For example, while Singapore is always at the top of the world, Lao PDR and Cambodia stand at 110th and 106th.

(2) The countries in the ASEAN region have many strengths in digital technology: most of the countries in the region have good international internet bandwidth, and the countries have focused investment on emerging technologies. Singapore has the best application and development of digital technology in the area and aims to develop future technologies such as AI and robotics.

(3) For the People pillar, there are many differences between countries. For example, while some countries such as Thailand, Singapore, and the Philippines have strengths in ICT infrastructure investment, Singapore has strengths in human resources and digital skills. Some countries, such as Cambodia and Lao PDR, lack state investment support. In addition, Thailand and the Philippines have weak skills and a lack of associated professionals.

(4) Establishing legal frameworks for the governance pillar is a strong point in some ASEAN countries, especially E-commerce. However, except for Singapore, using digital payment is still a big challenge for countries in the region.

(5) For the impact pillar, as a young and dynamic economic region in the world, the digital economy in

ASEAN is greatly supported by high economic development and high-tech services export. Applying digital technologies toward sustainable development will be a big challenge for most economies.

CONCLUSIONS

Based on the latest data from the NRI, the report analyzes the latest look at the ASEAN region, one of the most dynamically developing regions in the Asia Pacific region.

Overall, some significant implementations from these findings should be mentioned. The current study raises the possibility that government policy has an urgent role in developing the digital economy in the ASEAN region. First and foremost, the digital economy is developed based on advanced technologies, so governments need to focus more on developing new technologies such as AI, big data, and blockchains. Unfortunately, this is the current technological weakness of most countries in the region. Second, governments should promote ICT applications in enterprises, especially small and medium-sized enterprises. At the same time, they should encourage the application of e-government and strengthen cooperation in R&D between universities and enterprises. Thirdly, it is recommended for these regional economies to improve legal frameworks on privacy protection and promote financial inclusion, especially in rural areas. Finally, although ASEAN countries have strengths in economic development, it is a popular place for high-tech manufacturing worldwide. Nevertheless, to create sustainability in digital economy development, governments must pay more attention to developing the quality of life and sustainable cities and communities.

Table 1
The strengths and weaknesses of ASEAN countries

Pillar	Sub-pillar	Indicator	Strength in	Weakness in
Technology	Access	International internet bandwidth	MY TH VM IO CB	
		Handset prices	SI	
		Population covered by at least a 3G mobile network	SI	
		SMS sent by population 15-69	TH VM IO	SI CB
		Household with internet access	CB	LS
	Content	AI scientific publications	MY VM IO	
		Mobile apps development	SI	
	Future technologies	Investment in emerging technologies	MY IO PH CB LS	
		Robot density	SI	IO PH
		Computer software spending	IO	
Adoption of emerging technologies		LS		
People	Individuals	Use of virtual social networks	MY TH PH CB	
		Active mobile broadband subscriptions	TH VM IO CB	SI
		ICT skills		TH PH
	Businesses	Technician and associate professionals	SI	

		GERD financed by business enterprise	TH VM	IO
		Annual investment in telecommunication services	TH IO PH CB	VM LS
		Firms with a website		MY IO
		Professionals		TH CB
	Government	Government promotion of investment in emerging tech	SI	
		Publication and use of open data	PH	
		R&D expenditure by governments and higher education		CB
	Government online services		LS	
Governance	Trust	Cybersecurity	MY IO	
		Secure internet servers	SI	
		Online access to the financial account		CB
	Regulation	Legal frameworks adaptability to emerging tech	MY SI LS	
		E-commerce legislation	MY SI TH VM IO PH	
		Regulatory quality	SI	
		Privacy protection by law content		MY SI VM CB
		ICT regulatory environment		IO
	Inclusion	Rural gap in use of digital payments	SI	MY VM PH LS
		Gender gap in internet use	CB	
		Availability of local online content	LS	
		Socioeconomic gap in use of digital payment		VM PH
	Impact	Economy	High tech and medium high-tech manufacturing	MY SI TH PH
High-tech exports			MY TH VM PH CB LS	
Prevalence of gig economy			MY VM IO LS	
GDP growth rate per person engaged			VM PH CB	SI
ICT services exports			PH	TH
PCT patent applications				LS
Quality of life		Healthy life expectancy at birth	SI	
		Freedom to make life choices	VM PH CB	
		Income inequality	LS	MY
SDG contributions		Quality Education	SI VM	TH IO PH
		Sustainable cities and communities	SI	MY TH VM
		Good health and well-being	TH	

Note: CB: Cambodia, IO: Indonesia, LS: Lao PDR, MY: Malaysia, PH: Philippines, SI: Singapore, TH: Thailand, VM: Vietnam

Source: Author's elaborate base on The Network Readiness Index report

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