Chapter **2**

Improving Digital Connectivity for E-commerce: A Policy Framework and Empirical Note

Lurong Chen

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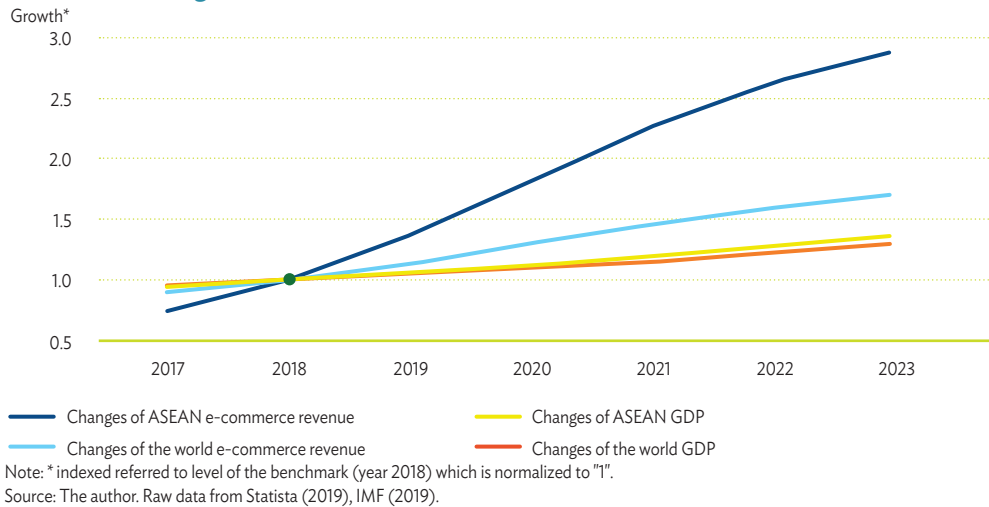
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1. Introduction

Digital transformation is a global trend. Globally, e-commerce revenue reached US$1.6 trillion in 2018 and is expected to grow to US$2.7 trillion by 2023. The Association of Southeast Asian Nations (ASEAN) and East Asia together has the world's fastest-growing online market, with an existing Internet user base of over 350 million users and an overall market size of US$72 billion in 2018. E-commerce is the most dynamic sector in the region. In the next 5–10 years, the regional e-commerce market is projected to grow at an average rate of 25%–35% per year. By 2025, e-commerce will represent a market exceeding US$100 billion, increasing from US$20 billion in 2017 (Google and Temasek 2019, Statista 2019).
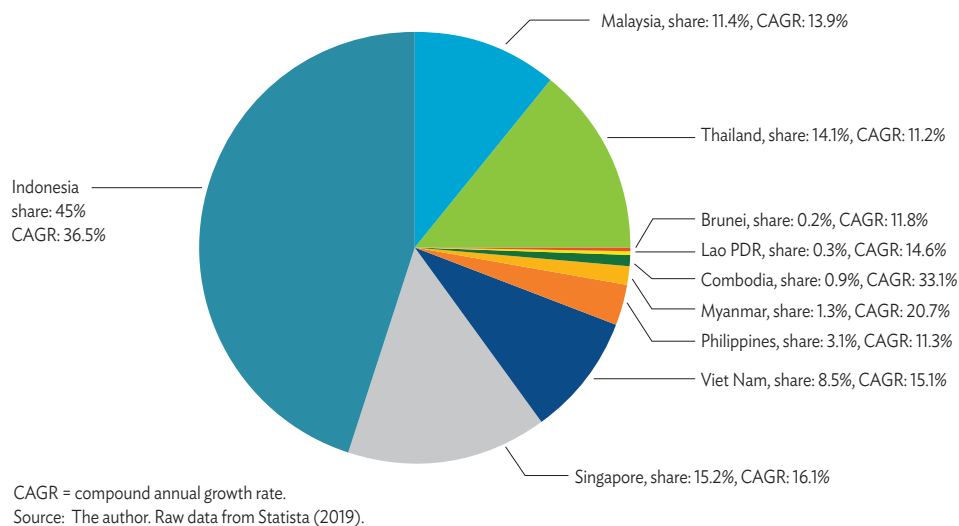
Using 2018 as the baseline year, Figure 2.1 shows the (projected) changes of e-commerce revenue and gross domestic product (GDP) for both the world and ASEAN. From 2018 to 2023, the annual growth of e-commerce revenue in ASEAN is projected to be four times as much as that of the regional GDP, whilst during the same period, global e-commerce revenue worldwide is projected to be twice as much as that of the world GDP. The total e-commerce revenue of ASEAN will increase by almost 200%. Together with China and India, i.e. via free trade and market integration, the region could be part of the world's epicentre of e-commerce by 2023, taking over 40% of the world's e-commerce market.

E-commerce Connectivity in ASEAN

Figure 2.1: The Growth of E-commerce Revenue and GDP

Growth*

— Changes of ASEAN e-commerce revenue   — Changes of ASEAN GDP
— Changes of the world e-commerce revenue   — Changes of the world GDP

Note: * indexed referred to level of the benchmark (year 2018) which is normalized to "1".
Source: The author. Raw data from Statista (2019), IMF (2019).

E-commerce in ASEAN member states is projected to achieve a double-digit average rate of growth. Indonesia has the largest and the fastest-growing market (Figure 2.2). In 2018, Indonesia contributed to nearly 45% of regional e-commerce revenue. This figure is projected to increase to be over 60% within 5 years, as the Indonesian e-commerce market is booming at the rate of over 30% per year. Singapore, Thailand, and Malaysia also owned a double-digit market share, and their markets all expect high-speed, double-digit growth in the following years. By 2023, their combined market size will double, although the combined share in the regional market[1] will be less than 30%, down from 40% in 2018.

Figure 2.2: Country Share in the Regional Market

Malaysia, share: 11.4%, CAGR: 13.9%
Thailand, share: 14.1%, CAGR: 11.2%
Brunei, share: 0.2%, CAGR: 11.8%
Lao PDR, share: 0.3%, CAGR: 14.6%
Combodia, share: 0.9%, CAGR: 33.1%
Myanmar, share: 1.3%, CAGR: 20.7%
Philippines, share: 3.1%, CAGR: 11.3%
Viet Nam, share: 8.5%, CAGR: 15.1%
Singapore, share: 15.2%, CAGR: 16.1%
Indonesia share: 45% CAGR: 36.5%

CAGR = compound annual growth rate.
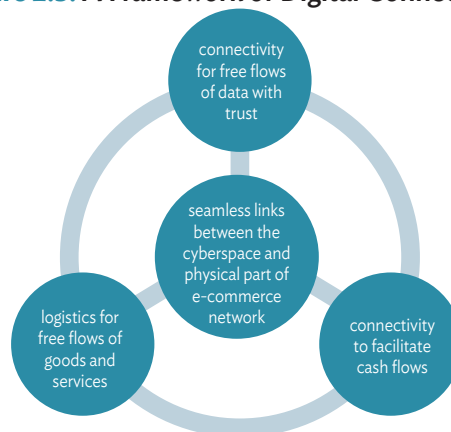Source: The author. Raw data from Statista (2019).

[1] The regional market that includes ASEAN, Japan, Republic of Korea (henceforth Korea), China, Australia, New Zealand, and India.

To create the opportunity to realise the potential of fast growth, there are needs for a digital-friendly ecosystem to facilitate digital transformation in the region. Above all, improving connectivity to support e-commerce is a priority. As the International Telecommunication Union (ITU) and the United Nations Educational, Scientific and Cultural Organization (UNESCO) (2019) argue, digital connectivity needs 'efforts to promote the benefits of online participation while mitigating the potential downsides'. Accordingly, broadband adoption should be 'not just available, accessible, relevant and affordable, but also safe, trusted, empowering users and leading to positive impact' (ITU and UNESCO 2019: ix).

Extensively, digital connectivity will affect not only e-commerce but also a nation's overall economic performance. From the global perspective, Baldwin (2016) explains the economic logic of the way digitalisation (the development of information and communications technology) could lead to the new pattern of globalisation ('third unbundling') characterised by the new type of international division of labour, which would create new strategies for national development, as Kimura (2018) illustrates. Kimura and Chen (2018) further develop the policy framework and apply it to analyse the development strategy of Indonesia's economy. Empirically, the World Bank (2009) estimates that at the national level, on average a 10% increase of fixed broadband penetration would increase GDP by 1.2% to 1.4%, depending on the country's stage of development.

According to Chen (2017, 2019), the region needs to facilitate cross-border e-commerce and digital trade along four aspects: (i) data connectivity, (ii) logistics to facilitate the free flow of goods and services, (iii) financial connectivity to facilitate cash flows, and (iv) seamless links between cyberspace and the physical parts of the e-commerce network (Figure 2.3).

Figure 2.3: A Framework of Digital Connectivity

connectivity for free flows of data with trust

seamless links between the cyberspace and physical part of e-commerce network

logistics for free flows of goods and services

connectivity to facilitate cash flows

Source: The author.

2. Data Connectivity

In the digital age, the Internet is the main carrier of data and information. Above all, the development of e-commerce needs good quality Internet connection. In ASEAN, the general quality of regional Internet infrastructure looks satisfactory compared with that of the world average. However, the development of ICT-related infrastructure in individual Asian countries is uneven. There still exist gaps of development in ICT infrastructure across and within countries. For instance, the entry-level broadband connection in Singapore is much faster than that in the CLM countries – Cambodia, Lao PDR, and Myanmar. The average Internet connection speeds in the region range from 20.3 megabits per second (Mbps) in Singapore, ranked seventh globally, to 5.5 Mbps in the Philippines, ranked 100th. The peak Internet connection speed in the region ranges from over 180 Mbps in Singapore, the world's number 1, to 42 Mbps in the Philippines, number 97. In many countries, getting connected to the Internet in rural areas or remote villages is not as easy as in urban areas.

ICT technology is evolving rapidly. As of this writing, fibre-optic cables are still the most efficient media to 'carry' data despite the rise of satellite use. The connection between mobile phones and the nearest cell phone tower is wireless. Metadata are carried over terrestrial or subsea fibre-optic cables or both. Fundamentally, fibre network building is a crucial part of the needed infrastructure of the digital economy. Compared with the traditional fields of infrastructure, fibre technology is progressing rapidly. Building, maintenance, and upgrade of the fibre networks require sustained input capital, technology, and managerial efforts. This matter poses some common challenges to all countries. But emerging Asian countries face some extra difficulties due to highly dispersed geography and large population. Additionally, there is always a 'budget problem' to solve, especially among capital-scarce countries.

Typically, five groups of factors should be considered in improving data connectivity: (i) network coverage, (ii) speed of Internet connection, (iii) affordability, (iv) contents, and (v) cybersecurity.

2.1. Network Coverage

According to World Bank (2019) data, the Internet penetration in ASEAN countries, measured as the number of Internet users as a percentage of total population, ranges between 22% in the Lao PDR and 81% in Singapore (Table 2.1), indicating the existence of gaps in Internet access across countries. A large number of people and/or households in ASEAN, especially in the less developed countries, still do not have Internet access.

ASEAN's fixed-line broadband subscriptions are generally low. Even in Singapore, the number of subscriptions per 100 inhabitants to fixed-line broadband is lower than that in the Republic of Korea (henceforth Korea) (42) or Japan (32). More people choose to

access the Internet using their mobile phones, thanks to the technology progress in wireless connection. In ASEAN member states, the 3G/4G network has already covered the majority of the population. With mobile phones supporting 3G technology (technically the minimum requirements of mobile Internet use), over 60% of people in the CLM can access the Internet.[2] Despite so, some gaps in network construction still exist across countries. While most countries already have the 4G network with full or almost-full coverage of its population, i.e. 100% in Singapore and 98% in Thailand, CLM countries will need to catch up more quickly with the construction of the 4G network.

Meanwhile, these countries also need to develop a network for electricity access. The coverage of Internet access in a country is limited by the lower value of either network coverage or electricity access. The urban–rural gaps in electricity access seem even wider (Table 2.1). In Cambodia, although all urban residents have access to electricity, 80% of its population still live in the rural areas where less than two-fifths have electricity access. A similar wide urban–rural gap also exists in Myanmar, which needs to further increase its urban electricity access as well. In these countries, including the Lao PDR, an urgent task is to resolve the problems in electricity supply in the rural areas.

Table 2.1: ASEAN Access to the Internet

Country	Internet penetration (users as percentage of population)[i]	Fixed-line subscriber penetration (per 100 inhabitants)[i]	Mobile subscriber penetration (per 100 inhabitants)[i]	Mobile connection (% of population)[i]		Electricity access[ii]		
				3G	4G	Urban (% of urban population)	Rural (% of rural population)	Share of rural population
Brunei	94.9	9.6	126.6	92.7	90.0	100.0	100.0	22.5
Cambodia	34.0	0.8	126.3	83.9	57.5	100.0	36.5	79.1
Indonesia	32.3	2.3	173.8	93.8	90.4	100.0	94.8	45.5
Lao PDR	25.5	0.4	54.1	78	9.0	97.4	80.3	60.3
Malaysia	80.1	8.5	133.9	96.2	92.0	100.0	100.0	24.6
Myanmar	30.7	0.2	89.8	90.5	75.1	89.5	39.8	65.4
Philippines	60.1	3.2	110.4	93.0	80.0	96.9	86.3	55.7
Singapore	84.4	25.8	148.2	100.0	100.0	100.0	0.0	0.0
Thailand	52.9	11.9	176.0	98.0	98.0	99.9	100.0	48.5
Viet Nam	49.6	10.8	125.6	95.0	95.0	100.0	100.0	65.8
China	54.3	28.0	104.6	98.0	98.0	100.0	100.0	43.2
India	34.5	1.3	87.3	88.0	88.0	98.4	77.6	66.9

Notes: (i) raw data from World Bank , (ii) raw data from ITU (2019b).
Source: The author.

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[2] Based on the value of the indicator of 'Mobile subscriber penetration (100%)' published by GSMA Intelligence.

2.2. Speed of Network Connection

The quality of the network connection is another important factor of digital connectivity. To the end users, good quality means faster, more stable, and more secure connection. Table 2.2 compares the network quality across ASEAN countries based on their bandwidth capacity and the average speed of Internet connection.

Table 2.2: Speed of Fixed-line and Mobile Connection

Country/Group	Fixed-line connection		Mobile connection		Bandwidth capacity	
	Average upload speed (Mbps)	Average download speed (Mbps)	Average upload speed (Mbps)	Average download speed (Mbps)	Total bandwidth (Gbps)[i]	Per Internet user (Kbps)
Brunei	n.a.	n.a.	n.a.	n.a.	~44	~108.2
Cambodia	16.4	13.0	8.6	7.4	102 ~ 174	19 ~ 32
Indonesia	9.9	15.6	8.4	9.5	1784 ~ 2072	21 ~ 25
Lao PDR	n.a.	n.a.	n.a.	n.a.	~32.2	~18.4
Malaysia	15.2	21.9	9.1	16.7	1078 ~ 1424	43 ~ 56
Myanmar	9.6	8.8	14.4	22.7	83 ~ 92	6 ~ 7
Philippines	15.7	15.2	6.5	11.7	1101 ~ 2534	19 ~ 44
Singapore	170.9	132.2	31.7	76.0	4522 ~ 4544	954 ~ 959
Thailand	25.3	48.8	9.9	15.4	1764 ~ 4364	48 ~ 120
Viet Nam	31.9	29.5	7.7	14.3	4038 ~ 6100	91 ~ 137
China	27.7	84.4	18.1	42.2	10993 ~ 20785	15 ~ 28
India	16.8	20.7	3.9	8.2	6185 ~ 10248	16 ~ 26

Note: (i) calculated by per Internet bandwidth per user multiple by the total number of Internet users.
Gbps = gigabits per second, Kbps = kilobits per second, Mbps = megabits per second.
Source: The author. Based on EUI (2019), ITU (2019) and World Bank (2019).

There are big gaps in the countries' bandwidth capacity. While on average each user in Singapore can get almost 1 Mbps bandwidth, a user in Myanmar can only get a 'quota' of as little as 6.2 Kbps. Accordingly, fixed-line connection in Singapore is on average 15 to 16 times faster than that in Myanmar. When using the same phone to download information from the Internet, the speed in Singapore is 10 times as fast as that in Cambodia. Except Singapore, the average speed of Internet connection in ASEAN is slower than that in China.

Despite so, one should not deny the fast ICT development in the region. In general, the overall network speed already reaches the level that allows countries to use new ICT tools, cloud computing, for example. According to the definition[3] of Cisco (2019), Internet speed in almost all countries, including that in the CLM, has met the minimum requirements for advanced cloud applications (apps).

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[3] Cisco (2019) defines the requirements on Internet speed for business and consumer cloud service into three categories: (i) basic cloud apps (the low level), (ii) intermediate cloud apps (the middle level), and (iii) advanced cloud apps (the high level). For advanced cloud apps, the speed of download and upload of the network needs to be higher than 2.5 Mbps and 1 Mbps, respectively, and the network latency must be less than 100 millisecond (ms).

2.3. Affordability of Internet Access

From the supply side, another important factor worth considering is the affordability of using the Internet. With technology progress and market competition, in general, the cost of Internet access, especially that with mobile connection, has been dramatically driven down in recent years. The GSMA (2019) has included 'affordability' as a main component indicator of its mobile connectivity index; and as for mobile connection, South Asia has some of the best levels of affordability worldwide. For instance, in early 2010s, ordinary people in India could not afford to surf online using mobile phones. But today, 10 years later, the price of mobile data in India has been lower than that in China,[4] making access to the Internet through mobile connection much more affordable (Figure 2.4).

Figure 2.4: Affordability of Mobile Connection, 2014 vs. 2018
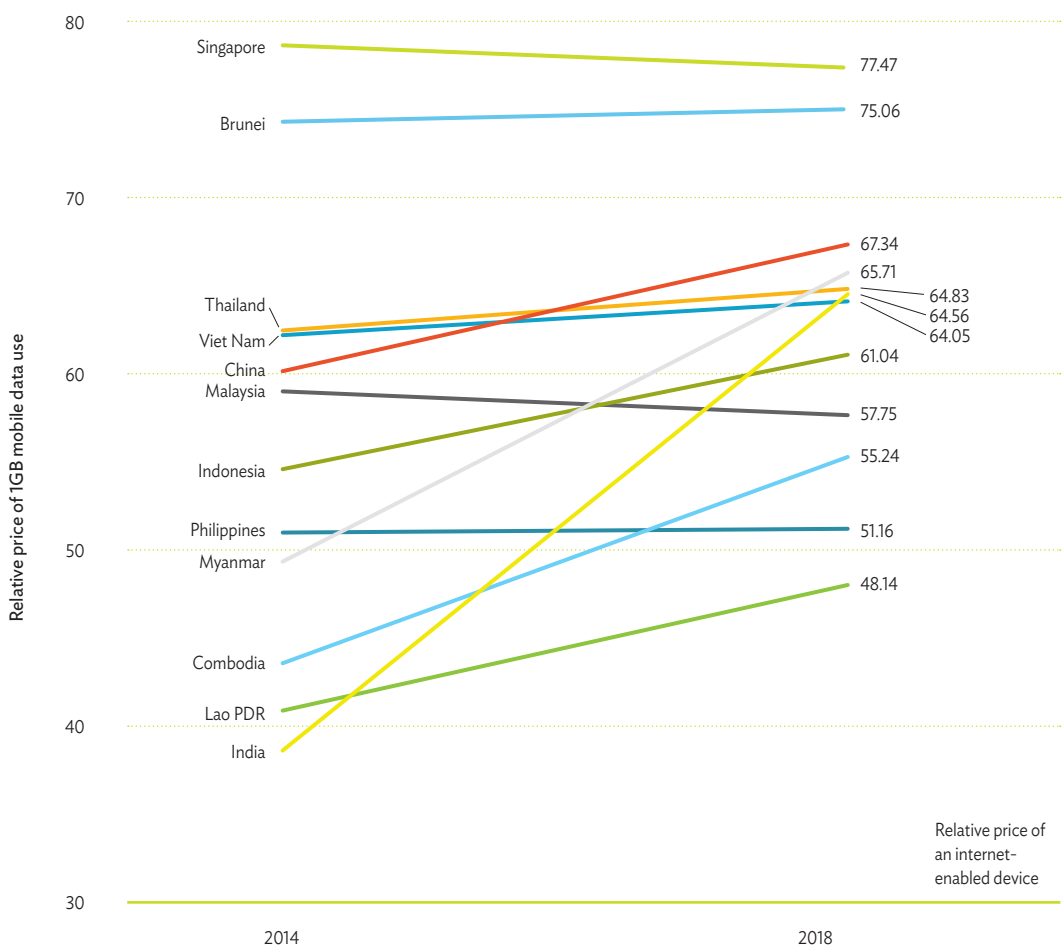
Note: (i) Relative price of 1 GB mobile data use = the price of 1 GB mobile data use/ monthly gross national income (GNI) per capita, (ii) Relative price of an internet-enabled device = Average price of an Android Internet-enable device / monthly GNI per capita
GB = gigabyte.
Source: The author. Raw data from GSMA (2019).

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[4] More details are shown in Figure 2.4.

CLM countries also substantially improved from 2014 to 2018. Using mobile connection to access the Internet has now been more affordable in Myanmar than in other ASEAN member states, except Singapore and Brunei Darussalam. In comparison, affordability of mobile Internet access in Malaysia and the Philippines does not seem to improve. Region-wise, the gap across countries has been narrowed.

Figure 2.5 reveals more details on the price of 1 gigabyte (GB) of mobile data use relative to the country's monthly gross national income (GNI) per capita (indicated by the vertical axis) and the relative price of an Android Internet-enabled device (indicated by the horizontal axis).

Figure 2.5: Relative Price of Smartphone and Mobile Data
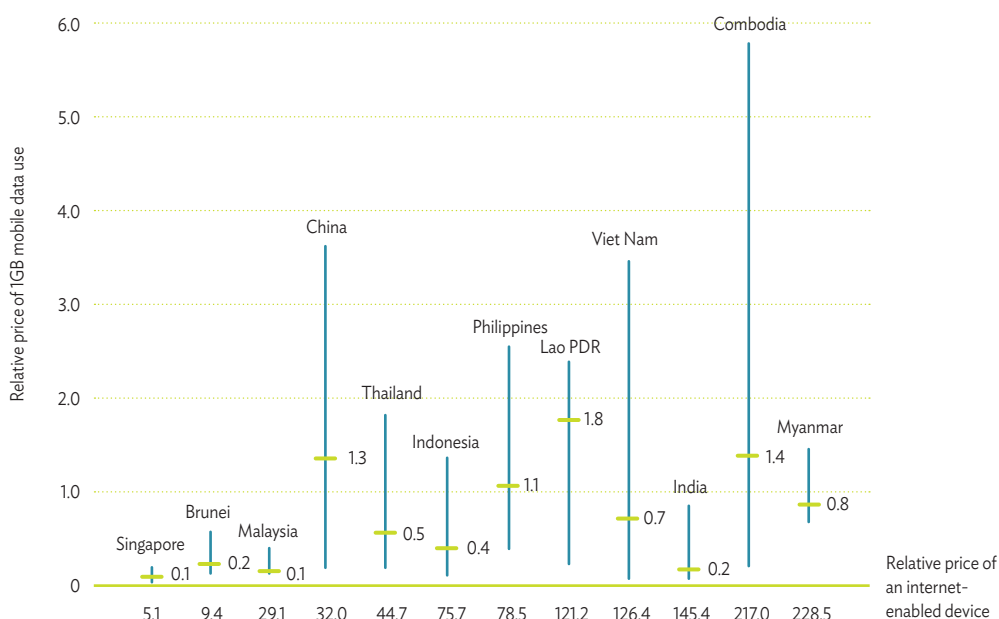
Note: (i) Relative price of 1 GB mobile data use = the price of 1 GB mobile data use/ monthly gross national income (GNI) per capita, (ii) Relative price of an internet-enabled device = Average price of an Android Internet-enable device / monthly GNI per capita
GB = gigabyte.
Source: The author. Raw data from www.cable.co.uk, www.idc.com, and the World Bank.

The vertical axis in Figure 2.5 shows the price of mobile data relative to monthly income. In countries like Malaysia or Singapore, the price of 1 GB of mobile data use is equivalent to only 0.01% to 0.03% of monthly GNI per capita while the cost of using the same amount of data in Cambodia, the Lao PDR, the Philippines, or Viet Nam is much higher. Especially in the countryside, it is very expensive to access the Internet using mobile phones partially because of the backlog in network building in the rural areas.

To further drive down the cost of mobile data, improving ICT infrastructure and increasing competition among Internet service providers are needed. Some policy interventions will be useful to mitigate the potential market failure in these areas.

2.4. Content and Services

In addition to the physical infrastructure, how well the Internet can attract users depends on the information and services it can provide. The more content people can get online, the more they will use the Internet, and the more time they will spend on it. To many users, access to the Internet is indeed access to online resources. And very often, it is not the raw data or resource but the processed information that will be most useful.

Although it is hard to measure and compare the content of online services across countries quantitatively due to its wide variety and the limited available data, the EIU (2019) conducts the survey and qualitatively rate the development of countries' e-finance, e-health, and e-commerce content (Table 2.3).

The results of the survey show that basic information in the local language already exists in all countries. As for e-finance, there is not much significant difference across countries. Qualitatively, all get the highest rating of two (best) except Indonesia, which gets one. In terms of e-health, five countries (Malaysia, Myanmar, Singapore, Thailand, and Viet Nam) get higher ratings than the others. Relatively, finance and healthcare are close to people's daily life, and users desire to be able to find more relevant content on the Internet. If it could only be domestically sourced, the richness and variety of the information tend to be limited by the development of the country's financial and healthcare sectors. It is therefore important to promote cross-border data flows and information sharing. For instance, Walsh (2019) shows that many people in Myanmar use their mobile phone to access online healthcare information provided by Thai or Vietnamese doctors.

Table 2.3: Content of the Internet, Qualitative Rating and Score

| Country	basic information in the local language (0-2, 2=best)	e-finance content (0-2, 2=best)	e-health content (0-3, 3=best)	e-commerce content (0-100, 100=best)
Cambodia	2	2	2	29
Indonesia	2	1	2	36
Malaysia	2	2	3	77
Myanmar	2	2	3	23
Philippines	2	2	2	40
Singapore	2	2	3	90
Thailand	2	2	3	68
Viet Nam	2	2	3	50
China	2	2	2	60
India	2	2	2	44

Note: Data for Lao PDR and Brunei Darussalam are not available in the source.
Source: EIU (2019)

For e-commerce, Cambodia and Myanmar seem to lag behind, while Singapore and Malaysia have rich online content compared to other ASEAN member states. In between, most interviewees in Indonesia and the Philippines are not satisfied with the accessible e-commerce content; and the opinions of those in Viet Nam are equally divided. A better-developed e-commerce market needs more and better e-commerce content.

Online public services and e-government are also important content of the Internet. Figure 2.6 uses the UN E-Participation Index (EPI) to compare the well-being of the government's use of online services in providing information to its citizens as well as their interaction with stakeholders and involvement in decision-making processes. The value of the index ranges between 0 and 1. The country with the best performance will get the highest normalised value of the index '1', and the scores of the other countries will be relative to this benchmark value.

Figure 2.6: E-participation
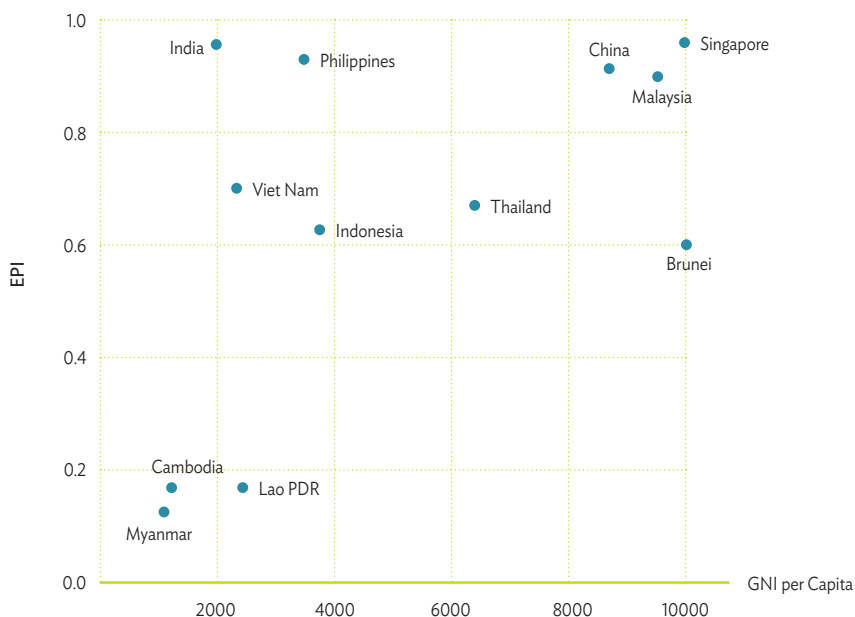
EPI = E-participation Index, GNI = gross national income.
Source: The Author. Raw data from UN (2019) and the World Bank.

Relatively, CLM countries are still lagging behind in promoting online public services and citizen engagement. The CLM's average score of EPI is 0.15, lower than the world average value (0.57) and that of the other ASEAN member states (0.77). It is rather urgent for the CLM to narrow the gap in providing information to its citizens, interacting with stakeholders,

and engaging in decision-making processes.[5] (UN, 2019). However, low income of the country and limited resources or capacity of the government should not be the main obstacle since there is no solid correlation of low income and low e-participation. For instance, India and Viet Nam have similar GNI per capita but have much higher EPI scores. Most important is to change the mindset of both the government and the public. On the one side, e-participation helps increase the awareness of policies and regulations and facilitate their implementation and enforcement. On the other side, prompt feedback from the wider public helps policymakers make decisions and take actions more quickly in response to the public needs.

2.5. Security and Reliability

Measures on cybersecurity are necessary to ensure the free flow of data with trust. Possible cyberthreats include theft (of identity, personal data, secrets); infringement of intellectual property rights; denial of service; leakages of private information; and the disruption of critical infrastructure. The level of organisation and sophistication of cyberthreats has been significantly increasing (OECD, 2012). As for digital connectivity, it is important to improve the security in cyberspace and prevent users from disturbing through malicious cyber activity.

Table 2.4 shows Asian emerging economies' scores and global rankings in the Global Cybersecurity Index (GCI) and National Cyber Security Index (NCSI). The GCI indicates the level of the cybersecurity commitment of countries with regard to legal measure, technical measure, organisational measure, capacity building, and cooperation. The NCSI measures a country's preparedness to prevent cyberthreats and manage cyber incidents based on security implemented by the central government on the aspects of legislation in force, established units, cooperation formats, and outcomes and products.

Based on the available data, Malaysia, Singapore, and India seem to be better prepared for cyberthreats than the others. Most of the countries show a high level of commitment to implement cybersecurity measures but the CLM countries are lagging behind. From the regional perspective, the unbalanced development in cybersecurity would hinder data flows region-wise and increase the cost and risk of doing business online. The improvement of national capabilities in the adoption and integration of cybersecurity will need effort law enforcement, education, intra-state cooperation, and public–private partnerships.

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[5] According to UN (2019), e-participation consists of enabling participation by providing citizens with public information and access to information without or upon demand (e-information), engaging citizens in contributions to and deliberation on public policies and services (e-consultation), and empowering citizens through co-design of policy options and co-production of service components and delivery modalities (e-decision-making).

<p style="text-align:center">Table 2.4: Cybersecurity: Preparedness and Commitments</p>

Country/Group	NCSI		GCI		
	Score	Ranking (/100)	Score	Ranking (/175)	Level of commitment
Brunei	38.96	54	0.62	64	medium
Cambodia	n.a.	n.a.	0.16	131	low
Indonesia	19.48	83	0.78	41	high
Lao PDR	16.88	86	0.19	120	low
Malaysia	72.73	11	0.89	8	high
Myanmar	n.a.	n.a.	0.17	128	low
Philippines	31.17	63	0.64	58	medium
Singapore	57.14	32	0.89	6	high
Thailand	n.a.	n.a.	0.79	35	high
Viet Nam	n.a.	n.a.	0.69	50	high
China	38.96	53	0.83	27	high
India	50.65	39	0.72	47	high

GCI = Global Cybersecurity Index, n.a. = not available, NCSI = National Cyvser Security Index.
Source: The author. Based on ITU (2019b).

3. Logistics

While e-commerce allows people to trade online, it still needs logistics to deliver the traded targets with goods or services. To this point, the role of logistics for e-commerce will not be much different from that for traditional wholesale or retail. Good logistics can save costs of doing business online and offline, and vice versa. Moreover, it is not only about trade cost but also about safety, security, reliability, transparency, flexibility, and efficiency. Indeed, e-commerce has higher demands on speed and transparency, posting additional challenge to storage, parcel delivery, and express postal services. From the aspect of logistic suppliers, this means additional efforts to improve both physical connectivity and trade-supporting services.

According to a survey conducted by the WEF (2017), Singapore and Malaysia are among the countries with the highest quality of overall infrastructure while others are either at or below the world average level. There are big gaps in logistics infrastructure across countries. As for the region, the development still faces obstacles from poor quality of roads, incomplete road and railway networks, inadequate ports, and low service capability (Table 2.5).

Indeed, the issue of logistics has been the bottleneck of economic development in emerging Asia. It is critical to avoid the contagion from logistics gaps to digital divide. Figure 2.7 illustrates Asian countries' logistics performance using World Bank (2019) data on Logistics Performance Index (LPI). Overall, the scores of the CLM and the Philippines are lower than the world average's while Singapore has the highest score in the LPI. Except for the Lao PDR and Myanmar, there are not so many problems existing in ASEAN when considering ease of arranging competitively priced shipments and frequency with which shipments reach consignees within the scheduled or expected time.

Table 2.5: Quality of Logistics Infrastructure

Country	Overall infrastructure	Roads	Railroad	Air transport	Port
Brunei	4.14 (67)	4.70 (41)	2.07 (88)	4.08 (84)	3.67 (87)
Cambodia	3.43 (95)	3.38 (93)	1.62 (98)	3.85 (99)	3.85 (76)
Indonesia	3.79 (80)	3.86 (75)	3.82 (39)	4.52 (62)	3.91 (75)
Lao PDR	3.74 (81)	3.42 (91)	n.a.	3.77 (100)	2.01 (132)
Malaysia	5.48 (19)	5.46 (20)	5.06 (15)	5.70 (20)	5.44 (17)
Myanmar	2.42 (135)	2.33 (136)	1.79 (96)	2.62 (132)	2.62 (123)
Philippines	3.04 (112)	3.07 (107)	1.97 (89)	3.25 (116)	2.92 (113)
Singapore	6.39 (2)	6.28 (2)	5.74 (5)	6.85 (1)	6.66 (2)
Thailand	4.03 (72)	4.21 (60)	2.52 (77)	4.95 (42)	4.18 (65)
Viet Nam	3.63 (85)	3.47 (89)	3.15 (52)	4.06 (86)	3.84 (77)
China	4.55 (43)	4.77 (39)	5.07 (14)	4.81 (49)	4.59 (43)
India	4.45 (51)	4.43 (51)	4.48 (23)	4.49 (63)	4.53 (48)
World	4.06	4.05	3.38	4.41	4.04

Note: Numbers in the brackets indicate a country's global ranking.
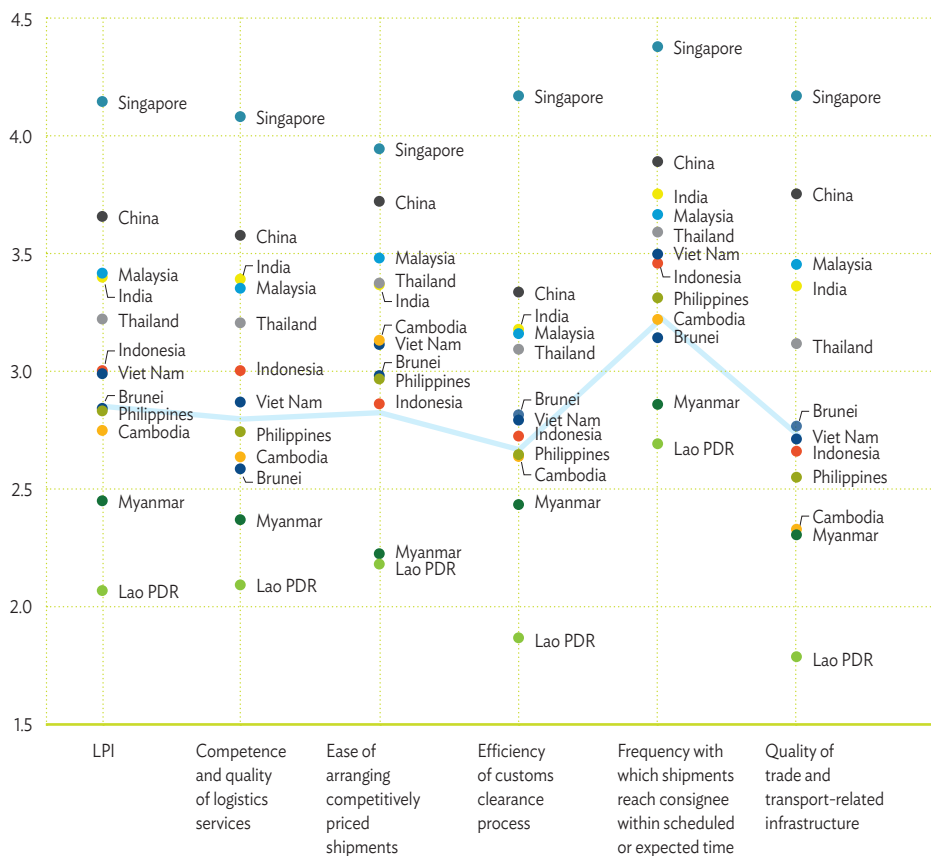Source: The author. Raw data from WEF (2017) Executive Opinion Survey 2016.

Relatively speaking, more problems exist in (i) competence and quality of logistics services, (ii) efficiency of customs clearance process, and (iii) quality of trade and transport-related infrastructure. That is, compared to physical infrastructure, Asian countries need to pay more attention to develop the software of infrastructure – services.

This has particular implications for e-commerce. As Chen (2017, 2019) points out, the role of services is vital to both the physical and cyber connectivity to support e-commerce. Improving services is at least equally important as building infrastructure in many aspects – from speed and accuracy to transparency and reliability. As for e-commerce, service efficiency will save trade cost, increase credibility and reliability, and therefore promote online business activities.

Technically, to most end users, the quality of Internet access relies more directly on services provided by Internet service providers compared to the undergoing capacity of fibre-optic cables or the number of Internet exchange points. Moreover, in the digital era, consumers tend to be more 'demanding of information' on logistics services – they want to be able to track their goods from shipment preparation to the last-mile delivery, get updated on matters when anything unexpected occurs, and receive solutions or plans to solve the problems.

To facilitate online business and e-commerce, not only the establishment of logistic facilities – such as mega e-fulfilment centres, parcel sorting centres (hubs), local parcel distribution centres for last-mile supply chains, local city logistics depots, and returns centres – is needed but also service development, which is a key to improve the efficiency of the regional distribution networks.

Figure 2.7: Logistics Performance

Note: the blue line stands for the world average value of the index.
LPI = Logistics Performance Index.
Source: The author. Raw data from World Bank (2019).

4. Financial Connectivity

Payment is the vital link that can bridge the cyber and the physical parts of e-commerce. For e-commerce, the minimum requirement is to have a means of payment for goods and services bought online, regardless of whether the money transactions are conducted online or offline. Currently, various payment solutions for online business coexist in the Asian market, such as cash on delivery, prepaid, credit cards, debit cards, e-banking, mobile payment, smartcard, e-wallets, etc. Such variety gives users more options in paying for online business. This thus promotes the growth of e-commerce considering that in many Asian counties, the development in the banking and finance sector still lags behind. Problems such as low coverage of banking network, the premature personal and/or household credit system, and the lack of an efficient capital market also prevail.

According to the World Bank (2019), by the end of 2017, a significant number of adults aged 15 and above still do not have a bank account (Figure 2.8). In this regard, e-commerce development could, as an externality, accelerate the adoption of financial innovation, such as e-payment and Internet financing, and provide alternative lower cost (and easier-to-use) solutions to the market.

In the long term, the e-payment system[6] that can support the high efficiency and convenience of e-commerce is desirable. E-payments and other financial alternatives can be either complementary to or independent of the traditional banking and financial architecture. Even traditional financial service providers have become eager to adopt these new models (Chen, 2017).

In Asia, e-payments have been rising along with the growth of e-commerce and the adoption of smartphones. Total transaction value of digital payments by ASEAN in 2018 had reached US$73 billion. The size is expected to double by 2023 (Figure 2.9).

By 2023, over 460 million, or two-thirds of users will use digital payments, increasing from about 260 million in 2017 and about 300 million in 2018. Payments over the Internet, i.e. using online credit and/or debit card payment or e-wallet, are the major means. But mobile point of sale (POS) payments are becoming more popular over time. According to data published by Statista (2019),[7] in 2017, less than one-fifth of ASEAN e-payment users made mobile POS payments. The group of users is projected to be expanding at the rate of nearly 15% per year. By 2023, as over one-fourth of e-payment users will choose payments via mobile POS, the value of mobile POS transactions will reach around US$9 billion, accounting for over 6% of total transaction value of digital payments.

Similar to the other aspects of connectivity, there are wide gaps of countries' readiness to adopt and use. Table 2.6 shows the values of the APEC E-payment Readiness Index of ASEAN countries as well as their scores in each sub-index based on available data.[8] Singapore comes out as best positioned in e-payment development, with the value of 59.6, while Viet Nam scores 22.9 at the other end. The wide dispersion of e-payment readiness exists mainly in the pillar of regulatory and policy environment and of innovative products and services.

When looking forward, Internet financial innovations come with opportunities and challenges. In general, financial technology or fintech tends to be a market changer and creates new opportunities for leap-forward development. The process can be market driven and self-enforced. Secure and reliable e-payment systems will increase financial inclusiveness and make digitalisation more beneficial to the middle- and low-income households.

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[6] The European Central Bank defines e-payments as payments initiated, processed, and received in the form of digital information.
[7] The data do not include those of B2B payments and e-banking transactions.
[8] No data available for Cambodia, the Lao PDR, and Myanmar.
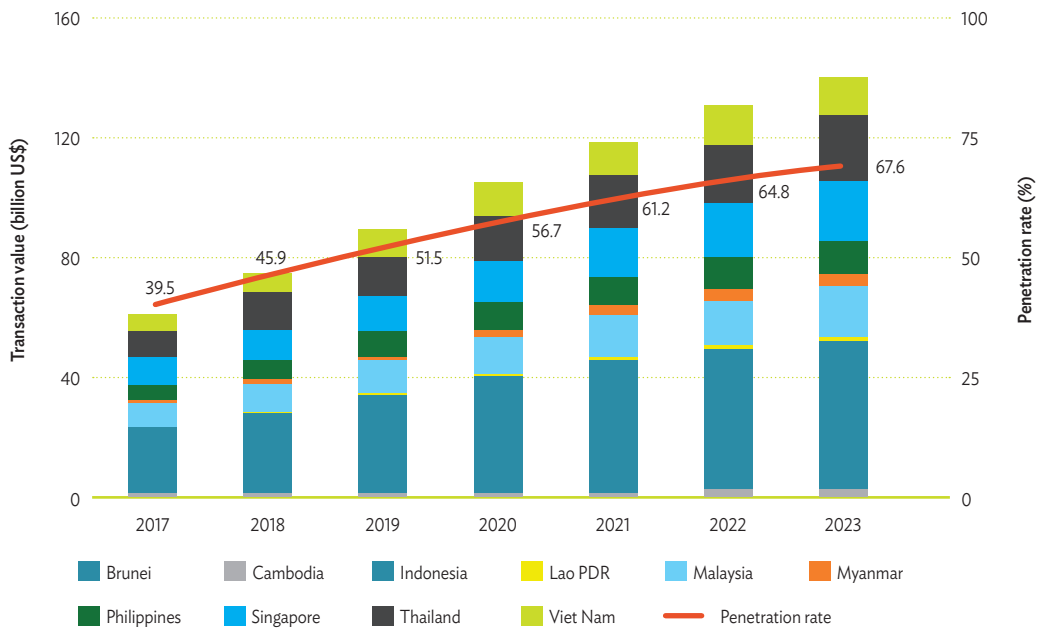
Figure 2.8: **The Share of Adults Without a Formal Account (as % of all adults age 15+)**
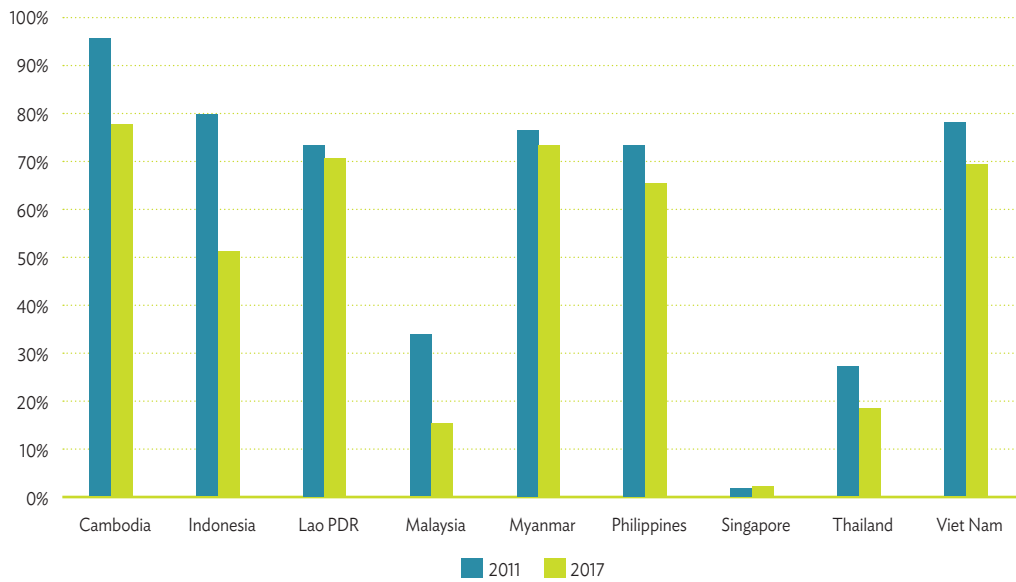
Note: Data for Myanmar are for 2014 and 2017.

Source: The author. Raw data derived from the World Bank's Global Findex database.

Figure 2.9: **E-payment Transaction Value and Penetration**

Source: The author. Raw data from Statista database.

However, e-payment is more likely a service platform, rather than a payment network, that can ensure transaction security, trace credit records, and offer consumer protection. Security, privacy, creditability, reliability, and efficiency are among the factors to be considered as well. In this regard, building and maintaining the e-payment system is a resource-intensive (i.e. capital, technology, human capital) project, which could be a challenge to countries whose domestic banking and financial sectors are still at the early stages of development. Moreover, difficulties in mindset changes and policy resistance could also be the main obstacles to digital adoption. Policy efforts at the regional level, such as establishing industrial standards and harmonising regulations, could help the industry realise the scale of economy and support its development (Chen 2019, Chen et al., 2019).

Table 2.6: E-payment Readiness

		ERI	Regulatory & Policy Environment	Infrastructure	Demand	Innovative Products & Services
Cluster 1: advanced e-payment ecosystems	Singapore	59.6	93.9	59.7	37.9	57.4
Cluster 2: transitioning e-payment ecosystems	Malaysia	44.5	80.7	41.6	27.4	38.2
	Brunei	37.2	46.6	42.4	37.4	19.6
Cluster 3: Nascent e-payment Ecosystems	Thailand	29.7	33.1	37.5	23.8	23.5
	Indonesia	28.8	43.4	29.2	17.8	29.9
	Philippines	26.4	32.8	31.4	20.5	21.2
	Vietnam	22.9	28	28.3	20	14
(Degree of dispersion)		12.8	25.8	10.9	8.3	14.7

ERI = E-payment Readiness Index
Source: RMIT and TRPC (2015)

5. Integrating Connectivity

Extra effort is needed to smoothen connections between networks of different countries and coordinate the interactions among the three functioning networks (information, logistics, and cash flows) cited earlier. Seamless links between the virtual and physical parts are vital to the functioning of the whole digital ecosystem of economy. The establishment of international rules and regulations will enhance the market drivers and strengthen such connectivity. This calls for multilayer cooperation, including public–private partnership, inter-institutional cooperation, subregional cooperation, and coordination among different duty departments of the government.

Table 2.7 lists some government strategy policies that have been published or drafted by ASEAN countries. Many common targets of ICT development – such as telecommunication infrastructure for high-speed Internet, higher Internet coverage, high level of Internet access and affordability, and higher human capacity – can provide the solid foundation of regional cooperation in promoting digital connectivity.

Table 2.7: National ICT Authority and Plan

	Ministry/Regulatory authority	Key plan/policy
Brunei	• The Ministry of Communications • The Authority of Info-communication Technology Industry (AITI) • The Brunei Darussalam National IT Council (BIT Council)	• Wawasan Brunei 2035 • National Broadband Blueprint (2014) • National ICT Manpower Masterplan (2016)
Cambodia	• The Ministry of Posts and Telecommunications (MPT) • Telecommunication Regulator of Cambodia (TRC)	• The Law on Telecommunications 2015 • Policy for the Development of Telecommunication/ICT 2020
Indonesia	• The Ministry of Communication and Information Technology (MCIT) • The Indonesian Telecommunication Regulatory Authority (BRTI)	• Long-Term National Development Plan 2005-2025 • Indonesia Broadband Plan
Lao PDR	• The Ministry of Posts and Telecommunications (MPT) • Lao Telecommunication Regulatory Authority	• Telecommunications law (2011) • 2nd 5-Year Development Plan of Posts and Telecommunications Sector 2016-2020 • ICT Vision 2030
Malaysia	• The Ministry of Communication and Multimedia	• National Broadband Implementation Strategy (National Broadband Initiative – NBI, 2010) • The Malaysian Public-Sector ICT Strategic Plan 2016-2020
Myanmar	• The Ministry of Transport and Communications • Myanmar Communications Regulatory Commission	• Telecommunications law (2013) • Telecommunications Master plan (draft) • Universal Service Strategy for Myanmar 2018-2022 (draft) • Myanmar e-Governance Master Plan 2016-2020
Philippines	• The Department of Information and Communication Technology (DICT) • National Telecommunications Commission (NTC)	• RA 10894 - Dept. of Information and Communications Technology (DICT) Act of 2015 • RA 10929 Free Internet Access in Public Places Act • The Philippine Digital Strategy Transformation 2.0 (2011) • National Broadband Plan (2017) • E-Government Master Plan 2.0 (2016-2022)
Singapore	• Info-communications Media Development Authority • Smart Nation and Digital Government Office • Government Technology Agency (GovTech)	• Telecommunications Act (2000) • Infocomm Media 2025 (2015) • Digital Government Blueprint (2018)
Thailand	• The Ministry of Digital Economy and Society (MDES) • The National Broadcasting and Telecommunications Commission (NBTC)	• The 12th National Economic and Social Development Plan 2017-2021 • Thailand Digital Economy and Society Development Plan • National Broadband Policy
Viet Nam	• The Ministry of Information and Communication (MIC) • The Authority of Telecommunications	• National Telecommunications Development Plan • Master Plan of Broadband Infrastructure Development to 2020

Source: The author. With references to ITU (2019a, 2019b), EIU (2019) and the official websites of ASEAN member states.

Many of them have established a special authority unit under the ministry to regulate the development of ICT. The possible direct partnerships between these national authorities could increase the efficiency of cooperation in various areas related to the improvement of cross-border digital connectivity, from Internet infrastructure to rule setting for regulations. Moreover, coordinating sectoral bodies, such as the ASEAN Coordinating Committee of E-Commerce, the ASEAN Coordinating Committee of Connectivity, and the ASEAN Coordinating Committee of Small and Medium Enterprises, could facilitate collaboration amongst member states from the dimension of regional institution.

At the regional level, ASEAN leaders have signed the E-ASEAN Framework Agreement in 2000 and announced the strategic goal to promote a productive ASEAN 'e-space' via (i) enhancing ICT sector competitiveness, (ii) reducing the digital divide within and amongst individual ASEAN member states, (iii) promoting partnerships between the public and the private sectors, and (iv) trade and investment liberalisation in ICT goods and services (ASEAN Secretariat, 2000: Article 3). The ASEAN Economic Community (AEC) Blueprint 2025 further highlights ICT development to be 'a key driver in ASEAN's economic and social transformation' (ASEAN Secretariat 2015: Articles C2, C3, and D1). The ASEAN Digital Integration Framework and the ASEAN Agreement on e-Commerce[9] were signed in October and November 2018, respectively. In October 2019 during the 18th AEC meeting, ministers ratified the completion of the 2019–2025 Digital Integration Framework Action Plan.[10]

However, implementing these agreements and action plans will have challenges. For instance, a most fundamental issue is how to govern data flows, especially those of personal data. ASEAN countries have no common position in regulating cross-border data flow, and are taking different speeds in domestic rule setting. Indonesia, Malaysia, the Philippines, and Singapore have recently passed new laws; Thailand is considering such rules; and Brunei and the CLM have no personal data protection laws and regulations.

While countries like Singapore are strongly against data localisation, many others, such as Indonesia, Malaysia, and Viet Nam, have adopted or are considering laws that require data generated locally on their citizens and residents to be kept within their geographic boundaries and to remain subject to domestic law. For instance, the cybersecurity law that came into effect in Viet Nam in early 2019 allows the government to regulate data processing methods of technology companies that operate in the country and restrict the Internet connections of users who post 'prohibited' content online. Improving regional digital connectivity needs countries to change mindset and adopt a more open policy on data.

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[9] The ASEAN Agreement on e-Commerce covers a wide range of topics and is composed of 17 articles.
[10] The ASEAN Digital Integration Framework Action Plan will emphasise (i) trade facilitation, (ii) data protection for digital trade, (iii) digital payment, (iv) digital workforce, and (v) digital entrepreneurship.

All in all, as for digital connectivity, the region needs substantial effort on (i) rules and regulations to support digital connectivity, (ii) policy action plans to let new technologies and business models serve for inclusiveness, and (iii) the combination of countries' national strategies and regional cooperation.

6. Policy Suggestions

Improving digital connectivity to support e-commerce development needs multiple efforts. Most importantly, ASEAN and East Asian countries are recommended to (i) increase the supply of public goods to improve connectivity infrastructure in both physical world and cyberspace, (ii) establish rules and regulations to ensure dynamics and competition of online marketplace, (iii) improve connectivity-derived services to generate more value added, (iv) prioritise smartphone economy and Internet financial innovation, and (v) collaborate in regional rule-setting for digital connectivity.

First, better connectivity will increase the supply of public goods in both quantity and quality, and reduce the likelihood of digital divide. The public sector should lead in building infrastructure, but the private sector's involvement will be equally important to make the development sustainable. For ASEAN and East Asia, the improvement of infrastructure and connectivity to support growth and development has been widely discussed. Broadly, all related policy instruments will apply to strenthen digital connectivity, such as public–private partnerships, intergovernmental cooperation, foreign investment, and so on.

A particular issue to highlight is capacity. As for digital infrastructure, obstacles may come from capacity and resource limits, either capital or technology or both. Enhancing regional cooperation will provide a solution. For instance, when Japanese and Chinese construction companies compete in exploring overseas markets, both governments are willing to provide low interest rate loans or other forms of financial assistance to the host country in support of infrastructure projects with their companies' participation.

Second, in addition to physical infrastructure, the online marketplace needs rules and regulations to ensure the free movement and accuracy of information; the fairness to access to information; the protection of consumers and producers; the security of payment, free trade, and investment, and thus market dynamics and fair competition. The related regulations will cover traditional trade issues (i.e. tariffs and non-tariff measures, trade facilitation, consumer protection, intellectual property rights, etc.) as well as new issues (i.e. cross-border information flow, privacy protection, data localisation, source codes disclosure, etc.).

Asian countries are active in pushing forward World Trade Organization (WTO) talks on digital trade. For instance, at the 11th WTO Ministerial Conference in Buenos Aires in December 2017, Australia, Japan, and Singapore, with the support of 67 other WTO members, launched the E-Commerce Joint Statement Initiative. On 25 January 2018, 76 WTO members including China agreed to commence e-commerce talks. However, reaching agreements on some core issues about e-commerce will never be an easy task. It will have to balance the interests of the economy, society, national security, as well as the long-term gains and short-term costs. This again calls for collaboration among governments, especially involvement of the private sector in rule setting.

Third, improving services is equally important as building physical infrastructure in various aspects of connectivity – from speed and accuracy to transparency and reliability. For instance, service is a key determinant of the overall efficiency of distribution networks. Online consumers could be more demanding, particularly regarding information. Such users' demand motivates supply chain operations to create a greater focus on near-sourcing, omnichannel, and faster transport solutions (Inbound Logistics, 2014).

Meanwhile, connectivity-derived service can generate extra value added. It tends to have extensive implications on regional development because of its externality to the economy. First, development of the services sector can create more jobs to absorb labour. Second, service efficiency will save trade cost, increase reliability, and therefore promote e-commerce activities. Third, the resulting increase in government revenue will then provide additional resources to further improve connectivity. This could make the development of e-commerce–supporting services a self-enforcing process.

Fourth, Asian countries should focus on new technologies that can provide new solutions to improve regional connectivity, especially smartphone economy and fintech. Smartphones and mobile applications (apps) provide a powerful new platform for e-commerce growth. A smartphone today can replace many other devices and integrate their functions by simply adding apps to its memory chip. More people now use it as their daily companion, not just as phone but also as 'personal assistant in the pocket'. Google and Temasek (2019) state that 90% of Southeast Asians connect to the Internet primarily through their smartphones, which represent the primary gateway to search information, social media and messaging applications, and music and video entertainment. The so-called 'M-commerce' (e-commerce based on smartphone and related mobile devices) tends to provide the solution that will be cheaper, more convenient, more user-friendly, and global in scope for the digital economy.

E-payments and fintech are also active components of the digital economy. In particular, e-payments are flourishing in many newly developed and developing countries and are reducing transactions costs as a strong substitute of traditional payment system. Various forms of fintech are also developing rapidly. How to incorporate these new digital services in the traditional system of monetary and financial regulations is an important urgent topic for many countries.

Finally, in a broader picture, the development of e-commerce needs a suitable environment that covers both the physical world and the cyberspace. When e-commerce goes international, it is subjected to almost all issues that apply to other forms of international trade. Particularly, restrictions on cross-border data flows may damage cross-border e-commerce since trade protectionism harms international trade. Asian countries shall eliminate this potential threat to free trade and collaborate in the region-wide e-commerce–supporting environment.

Finally, from a broader picture, the development of e-commerce needs a suitable environment that covers both the physical world and the virtual cyberspace. When e-commerce goes international, it is subjected to almost all issues that apply to other forms of trade. Restrictions on data flows may damage cross-border e-commerce since trade protectionism harms international trade. Asian countries shall eliminate this potential threat to free trade and collaborate in the region-wide e-commerce–supporting environment.

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