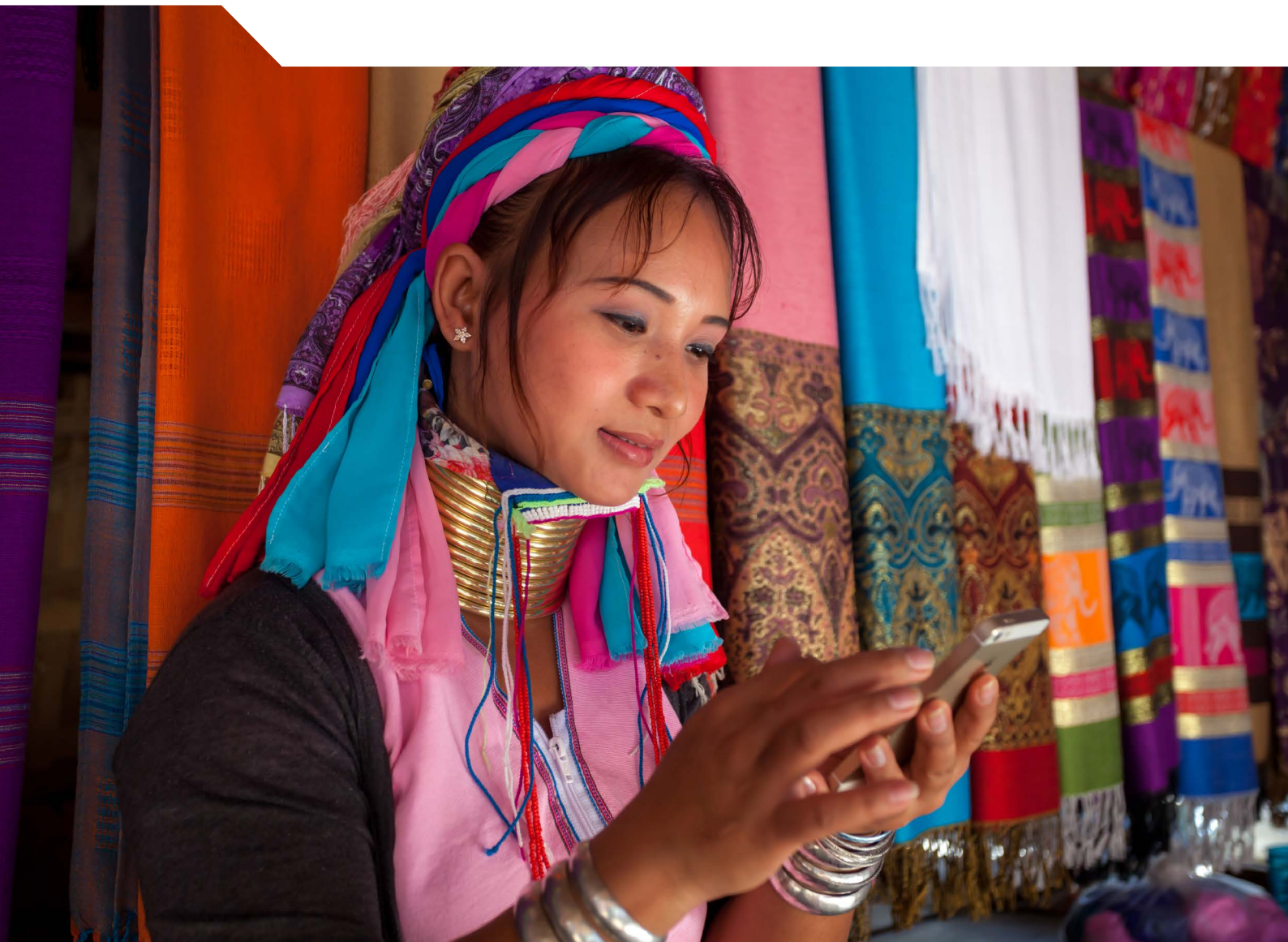




Southeast Asia Going Digital

CONNECTING SMEs



Southeast Asia Going Digital

Connecting SMEs



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Foreword

The digital transformation opens a range of opportunities for small and medium-sized enterprises (SMEs). It can encourage product and service innovation, improve their market intelligence, ease their access to talent, facilitate access to financing, and ultimately enhance their competitiveness in local and global markets. SMEs play a vital role in Southeast Asia (SEA) through their contribution to employment and inclusive growth. However, SMEs face significant barriers related to access and use of digital technologies that prevent them from achieving their full potential. They are lagging behind in the digital transition.

For SMEs to go digital, a coherent approach is required. This includes initiatives to deploy infrastructure and promote effective adoption of digital services and application, as well as to foster innovation. With this in mind, the Organisation for Economic Co-operation and Development (OECD), working with countries and stakeholders in the region and leveraging its cross-cutting Going Digital initiative on digital transformation, developed this report, *Southeast Asia Going Digital: Connecting SMEs*.

The report examines opportunities related to the access to and use of digital services by SMEs in SEA, and aims to provide sound policy analysis to foster an enabling environment for the digital transformation to flourish. Most importantly, this report is designed to share good practices in the region that harness broadband-based services for increased productivity and social welfare and, ultimately, to promote regional integration.

The report was drafted by Lorraine Porciuncula, Alexia González Fanfalone, Yuki Yokomori, Miki Naito and Jaeho Lee, from the OECD Secretariat, under the supervision of Sam Paltridge and Verena Weber, heading the Communication Infrastructures and Services Policy Unit within the Digital Economy Policy Division (DEP). The report was developed under the overall leadership of Andrew Wyckoff, Director of Science, Technology and Innovation (STI); Dirk Pilat, Deputy Director of STI; and Anne Carblanc, Head of DEP. Frédéric Bourassa from the OECD Secretariat provided statistical support. Editorial and formatting work was undertaken by independent contractor Susan Sachs and Angela Gosmann from STI. Thanks also go to OECD's Global Relations Secretariat for broader support in engaging with SEA, in particular Max Bulakovskiy and Annie Norfolk Beadle.

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of Foreign Trade Policy, Ministry of Industry and Commerce, and Sengphachanh Simangkhal, Director of Policy Research Division, Department of SME Promotion, Ministry of Industry and Commerce (Lao People's Democratic Republic); Nurezali Osman, Head of National eCommerce Strategic Roadmap, Malaysia Digital Economy Corporation, and Mohamed Aminuddin, Senior Manager, SME Corp. (Malaysia); Yee Yee Mon, Assistant Director in the Information Technology Division, Department of Trade, Ministry of Commerce, and Mu Mu Aye, Deputy Director of the Directorate of Industrial Supervision and Inspection, Ministry of Industry (Myanmar); Ma Carissa Sapera and Amara Zarah Amper, Department of Trade and Industry, Ministry of Commerce (Philippines); Yang Xinrong, Manager, International, Info-communications Media Development Authority (Singapore); Ekamong Rimcharone, Executive Director of the National Digital Economy and Society Commission; Pathomdanai Ponjan and Danaiwit Charusamorn, from the Ministry of Digital Economy and Society (Thailand); Nguyen Thi Bich Thuy, Deputy Director of the SME Development Division, Agency for Enterprise Development, Ministry of Planning and Investment, and Le The Phuc, International Affairs Division, E-commerce and Digital Economy Agency, Ministry of Industry and Trade (Viet Nam). The contributions from UNESCAP, through Mia Mikic, Director of the Trade, Investment and Innovation Division, Tengfei Wang, Economic Affairs Officer at the Trade, Investment and Innovation Division, and Atsuko Okuda, Chief of the ICT and Development Section, were also highly appreciated.

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Acronyms, abbreviations and units of measure

AI	Artificial intelligence
APAC	Asia Pacific region
APEC	Asia-Pacific Economic Cooperation
APG	Asia-Pacific Gateway
API	Application programming interface
AP-IS	Asia-Pacific Information Superhighway
APNIC	Asia-Pacific Network Information Centre
ASEAN	Association of Southeast Asian Nations
ATM	Automated teller machine
B2B	Business to business
B2C	Business to consumer
BDA	Big data analytics
CRM	Customer relationship management
DEP	Digital Economy Policy Division (OECD)
DFTZ	Digital free trade zone
DLT	Distributed ledger technology
ERP	Enterprise resource planning
ETDA	Electronic Transactions Development Agency
eWTP	Electronic World Trade Platform
Gbps	Gigabits per second
GDP	Gross domestic product
GMS	Greater Mekong Subregion
GNI	Gross national income
GSMA	GSM Association
HBI-IT	Hanoi Innovative Business Incubator of Information Technology
ICM	Information, classification and management
ICT	Information and communication technology
IDA	Infocomm Development Authority (Singapore)
IMDA	Infocomm Media Development Authority (Singapore)
IoT	Internet of Things

IP	Internet Protocol
IPv4	Internet Protocol version 4
IPv6	Internet Protocol version 6
ISP	Internet service provider
ITC	International Trade Centre
ITU	International Telecommunications Union
IXP	Internet exchange point
kbps	Kilobits per second
km	Kilometre
LPI	Logistics Performance Index (World Bank)
LTE	Long-Term Evolution
M2M	Machine to machine
Mbps	Megabits per second
MCMC	Malaysian Communications and Multimedia Commission
MDEC	Malaysian Digital Economy Corporation
MNO	Mobile network operator
ms	Millisecond
MYR	Malaysian ringgit
NBP	National broadband plan
NIA	National Information Society Agency (Korea)
OECD	Organisation for Economic Development and Co-operation
SDG	Sustainable Development Goal
SEA	Southeast Asia
SJC	South-East Asia Japan Cable System
SMEs	Small and medium-sized enterprises
STI	Science, technology and innovation
Tbps	Terabits per second
TELMIN	Telecommunications and Information Rechnology Ministers Meeting (ASEAN)
TELSOM	Telecommunications and Information Technology Senior Officials Meeting (ASEAN)
TeSA	TechSkills Accelerator
TPP	Trans-Pacific Partnership Agreement
UNCTAD	United Nations Conference on Trade and Development
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
UNESCO	United Nations Educational, Scientific and Cultural Organization
USD	United States dollar

Executive summary

The increasing use of digital technologies in Southeast Asia (SEA) is ushering in the digital transformation of economies and societies across the region. Not only does this transformation facilitate new services, products and applications. It has the power to change how people live and work. To fully realise this potential, it is important to examine how best to organise the provision and use of these services and what can be learned from the different models applied in the region and elsewhere, with the particular aim of promoting an environment conducive to fostering the growth of small and medium-sized enterprises (SMEs). This opportunity arises at a time of tremendous change in the commercial and technological environment.

To help countries to take action to make the digital transformation work for growth and well-being, the OECD has conducted an extensive Going Digital project (OECD, 2019^[1]). This project identified seven key policy areas that underpin this report: enhancing access to communication services and related technologies; increasing the use of digital services and applications; unleashing digital innovation; ensuring good jobs; promoting social prosperity; strengthening trust; and fostering market openness. These pillars are interrelated building blocks that together constitute an integrated policy framework for the digital transformation.

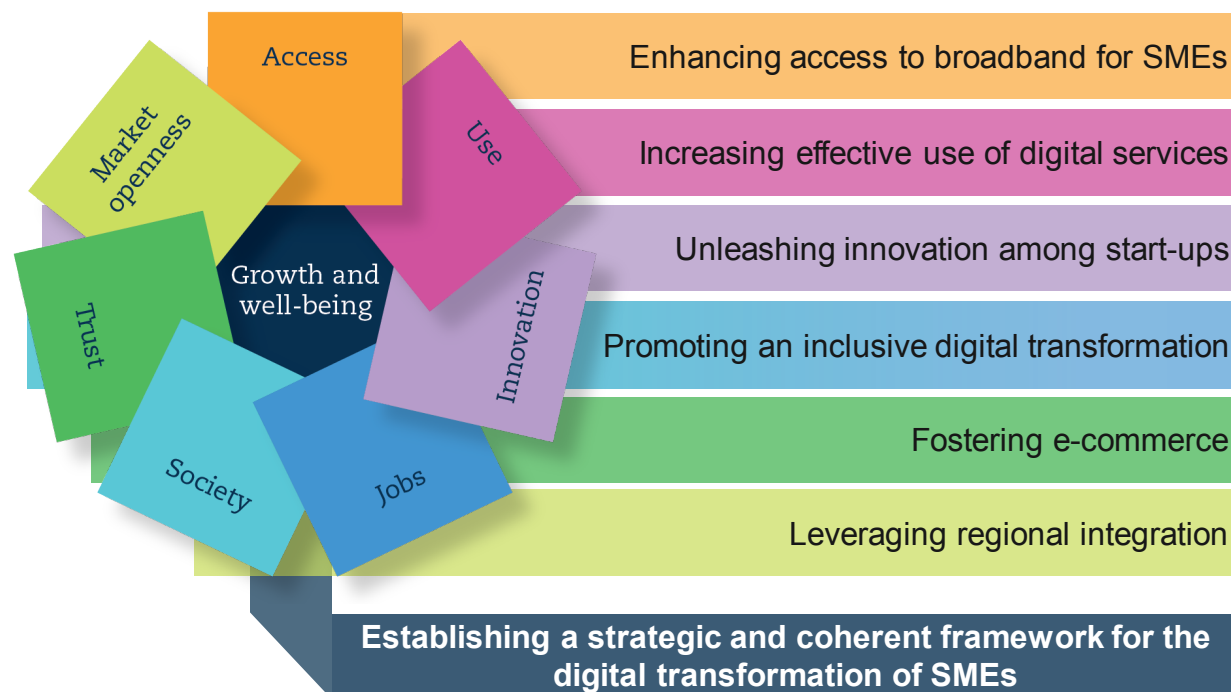
SEA Going Digital: Connecting SMEs addresses these seven policy areas through the lens of the particular needs of SMEs in SEA. An essential element to enable SMEs to “go digital” is connectivity, without which the digital transformation cannot be realised. In this regard, the report analyses the state of connectivity in SEA as well as the adoption and use of digital services. It also proposes a set of policies aimed at building connectivity in the region and spurring the adoption of digital services by SMEs.

Key areas for policy action

The SEA region faces a number of challenges that need to be overcome to fully benefit from the digital transformation, particularly with regard to the integration of SMEs in the digital economy. On the supply side, the main challenge concerns connectivity. So far, broadband deployment has not been a priority in most countries of SEA, but without it there is no possible path towards the digital transformation. Certain regulatory and policy frameworks pertaining to the communication sector in the region are not favourable for private sector investment in communication infrastructure. However, connectivity is emerging as the bridge between individuals and governments and between enterprises and innovation. Promoting the use of broadband access for all firms, small and large, should increase productivity and competitiveness in the region.

On the demand side, other regulatory frameworks inhibit innovation in digital services that are fundamental to SMEs going digital, among them policy frameworks on financial services and e-commerce. Besides the limited offer of local digital content, the lack of digital awareness and trust in digital services from both consumers and businesses further constrains the effective use of digital technologies and realisation of the digital transformation of SMEs in the SEA region. To make sure that SMEs in SEA are able to maximise the benefits of the digital transformation, it is crucial to also promote the use of digital services and tools.

Going Digital Integrated Framework for SMEs in SEA



Source: Adapted from (OECD, 2019⁽¹¹⁾) *Going Digital: Shaping Policies, Improving Lives*, <https://doi.org/10.1787/9789264312012-en>.

In short, SEA needs a comprehensive overhaul of both national and cross-border regulations and policies to enable SMEs to go digital. Key recommendations for countries in SEA include:

- Strengthen the institutional and regulatory frameworks for connectivity and implement regulatory measures and policies that are based on consistent, clear and transparent principles, to foster competition in both fixed and mobile broadband markets and extend access to affordable and high-quality communication services.
- Increase the effective use of digital services by SMEs by fostering digital skills for people and firms, supporting SMEs to overcome challenges in adopting digital tools, and harnessing the potential of digital government to promote relevant digital content.
- Unleash innovation by re-evaluating regulations that are not fit for a fast-changing digital age, promote digital start-ups and young firms with the support they need at each stage of their life cycle, and foster policy experimentation in support of the digital transformation.
- Promote inclusiveness by increasing access to and use of digital services and applications by vulnerable and rural populations, addressing gender digital divides, and preparing SME employees for the changing work environment brought about by the digital transformation.
- Strengthen trust of SMEs in digital tools and services by raising awareness about digital security risk management, developing privacy and digital security frameworks with a whole-of-society perspective, and continuing to facilitate cross-border data flows.

- Foster e-commerce by removing barriers to e-commerce, including those that distinguish between online and offline commerce, and by harmonising national regulatory frameworks in the SEA region to minimise frictions and costs for cross-border trade by SMEs.
- Leverage regional integration, regional connectivity infrastructures, cross-border data flows and sharing of experiences in the SEA region to minimise frictions and costs for cross-border trade by SMEs and to improve connectivity across countries.
- Establish and effectively implement a strategic and coherent policy framework for the digital transformation of SMEs through co-ordinating the government institutions and stakeholders dealing with both SME and digital policy issues; identifying the main challenges and policy objectives; and building an evidence-based action plan with clear milestones and allocation of responsibilities.

1. Making the digital transformation work for entrepreneurs in Southeast Asia

This introductory chapter provides background to all subsequent chapters of this report. It gives an overview of the situation in the Southeast Asia region, including core economic and socio-demographic indicators, and discusses the role of broadband in accelerating economic and social development as well as the opportunities created by connecting small and medium-sized enterprises in the region.

Economies and societies across the globe are going digital. In Southeast Asia (SEA), the uptake of digital services and applications has grown apace, and the rapid diffusion of broadband, in particular mobile broadband, is enabling more and more people to connect to communication networks. At the end of 2017, there were around 286.4 million of the approximately 647.5 million people in the SEA region¹ using the Internet – i.e. around 44% of the population, a steep increase from just over 12% of the region's population at the end of 2007.² In addition, fixed broadband subscriptions rose from 2% in 2009 to 5% in 2017, while mobile broadband subscriptions increased from 1.3% in 2009 to almost 85% in 2017 (ITU, 2018^[1]).

SEA is one of the most dynamic economic regions of the world, with an average growth of 5.1% per year from 2011 to 2015 (OECD/ERIA, 2018^[2]). To continue on this path of economic development, the countries of the Association of Southeast Asian Nations (ASEAN) have identified the fostering opportunities for small and medium-sized enterprises (SMEs) as a key policy objective, and have expressed further a sense of urgency to achieve digital inclusion across the region.³ Countries in SEA are at different stages of economic development, but all are experiencing rapid changes in their digital economies.

The increasing use of communication infrastructures in SEA facilitates new services, products and applications that can potentially transform how people live and work. It has the added benefit of offering many opportunities for enhanced growth, productivity and well-being. The digital transformation can support a more inclusive society and help to improve governance arrangements; enhance access to key services such as health, education and banking; improve the quality and coverage of public services; and expand the way individuals collaborate and create content. It can also enable SMEs to benefit from access to global markets and enable consumers to benefit from a greater diversity and choice of products and lower prices.

However, a digital transformation is as much a challenge as an opportunity. Interactions among people, firms and society are undergoing profound changes – often in an uneven way – that alter the nature and structure of organisations and markets. Such changes raise important issues around jobs and skills, privacy, security, and competition. In this respect, one of the greatest challenges is ensuring that technological changes benefit all of society and work for individuals regardless of their race, gender or age and for companies regardless of their size.

To ensure that policies harness the benefits of digital transformation while mitigating inherent risks, policy makers in the SEA region need to be proactive and implement new approaches to tackle these complex and interrelated issues in a coherent manner. More specifically, ensuring that SMEs in SEA benefit from the digital transformation requires a flexible, forward-looking and integrated policy approach that cuts across the policy silos of SME promotion policies and digital economy policies.

This chapter provides background to all other chapters, including key economic and socio-demographic indicators for SEA. It highlights the importance of broadband for accelerating economic and social development and the opportunities created by connecting SMEs in the region.

Chapter 2 provides an overview of supply side issues that are relevant for connecting SMEs. It analyses indicators and recent developments related to access, quality and affordability of broadband services in SEA. The chapter also looks at developments in communication markets in the region, emerging areas such as the Internet of Things (IoT) and machine-to-machine communication, and connectivity gaps that need to be bridged.

Chapter 3 reviews the range of steps needed to promote the adoption of communication services and digital applications by SMEs. For businesses in general, these include strengthening the effective use of the Internet and digital services; for digitally based enterprises, these include fostering digital skills and enabling innovation. The chapter also discusses the importance of strengthening trust to ensure that digital transformation supports society and inclusive job creation.

Chapter 4 explores aspects related to regional strategies and co-ordination, particularly within ASEAN frameworks, and looks at regional connectivity through mobile roaming and international cables and e-commerce.

Chapter 5 analyses the essential developments needed to enhance the connectivity of SMEs in SEA. It examines the institutional and regulatory frameworks for communication markets in SEA, as well as the enabling environment needed to foster digital entrepreneurship such as policies to promote digital start-ups and foster the use of digital services and applications by SMEs.

Chapter 6 presents the main recommendations for policy makers in SEA to harness the potential of communication services and digital applications for the transformation of SMEs.

The SEA region

The SEA region is defined for the purposes of this report as the ASEAN countries: Brunei Darussalam, Cambodia, Indonesia, Lao People’s Democratic Republic (hereafter “Lao PDR”), Malaysia, Myanmar, the Philippines, Singapore, Thailand and Viet Nam. SEA is a large and diverse region that encompasses countries with different development levels, is home to more than 600 million people, and covers nearly 4.5 million square kilometres of islands, forests, mountains and cities. Slightly more than half of the SEA population live in rural areas, the rest urban. The population in the region is growing at an average annual rate of 1.3% (Table 1.1).

Table 1.1. SEA socio-demographic indicators

Country	Total land area (km ²)	Total population (thousand)	Population density (persons per km ²)	Annual population growth (%)
Brunei Darussalam	5 765	421	73	1
Cambodia	181 035	15 718	87	1.7
Indonesia	1 916 862	261 891	137	1.2
Lao PDR	236 800	6 753	29	2
Malaysia	331 388	32 050	97	1.3
Myanmar	676 576	53 388	79	0.9
Philippines	300 000	104 921	350	1.6
Singapore	720	5 612	7 196	0.1
Thailand	513 140	67 653	132	0.3
Viet Nam	331 231	93 672	283	1.1
ASEAN	4 493 516	642 079	143	1.2

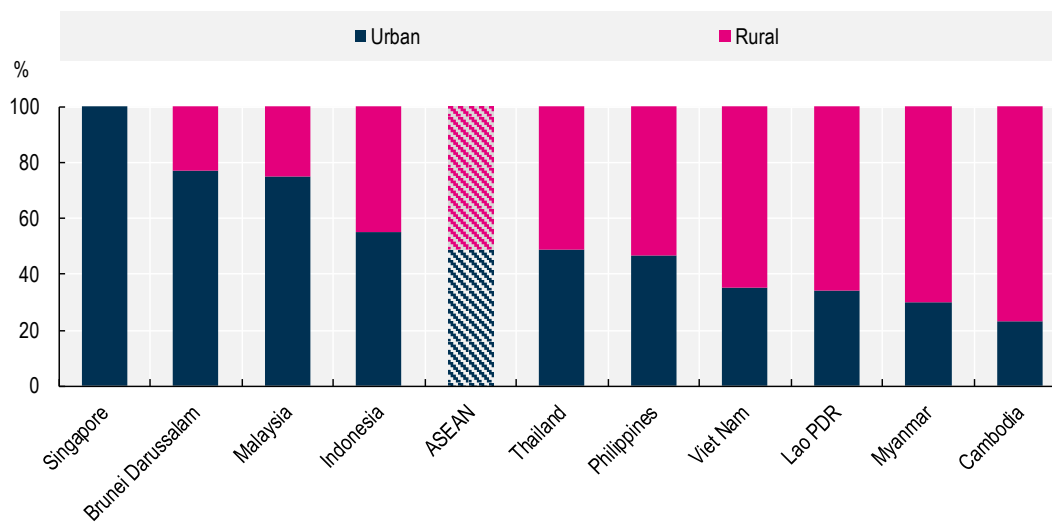
Notes: km² = square kilometre; Lao PDR = Lao People’s Democratic Republic. All data refer to 2017.

Source: ASEAN (2018^[3]), *ASEAN Statistical Leaflet 2018: Key socio-economic indicators*, https://www.aseanstats.org/wp-content/uploads/2018/10/ASEAN_Statistical_Leaflet_2018.pdf.

The population distribution varies greatly from one ASEAN country to another (Figure 1.1). In some countries, for instance, the majority of the population live in urban areas. The entire

population in Singapore lives in urban areas; the next highest proportions are in Brunei Darussalam and Malaysia, where 78% and 75% of the population, respectively, live in urban areas. In other ASEAN countries, however, the majority of the population is in rural areas, for example in Cambodia (79%), Viet Nam (66%) and Myanmar (65%). These differences in population distribution affect how households and enterprises use digital services and applications. Populations in rural areas tend to have been underserved by public services and connectivity.

Figure 1.1. Population distribution in SEA



Note: Lao PDR = Lao People's Democratic Republic.

Source: ASEAN (2018^[3]), *ASEAN Statistical Leaflet 2018: Key socio-economic indicators*, https://www.aseanstats.org/wp-content/uploads/2018/10/ASEAN_Statistical_Leaflet_2018.pdf.

Gross domestic product and education levels

The gross domestic product (GDP) of the ASEAN region amounted to over USD 2.5 trillion in 2016. In terms of size of its economy, Indonesia leads the SEA region, with a GDP of over USD 1 trillion, followed by Thailand and Singapore. In terms of GDP per capita, Singapore is considerably ahead, followed by Brunei Darussalam; Malaysia, Thailand, Indonesia and the Philippines, in descending order, rank in the intermediate range of GDP per capita, while Cambodia, Lao PDR and Myanmar have lower levels of income per capita (Table 1.2). In terms of total trade (i.e. the combination of exports and imports), Singapore is the region's leader, followed by Thailand, Viet Nam, Malaysia and Indonesia.

Despite the different economic levels, SEA has maintained an elevated economic growth in recent years. The region grew substantially in 2017 compared to the previous year, with a real GDP growth rate of 5.3% versus a 4.8% growth rate in 2016. Eight of ten economies managed to accelerate their growth (Table 1.3). The OECD (2018^[4]) estimates that SEA will continue to grow at a steady pace of 5.3% in 2018 and 2019 thanks to robust domestic demand in many countries, although trade prospects are uncertain (OECD, 2018^[2]).

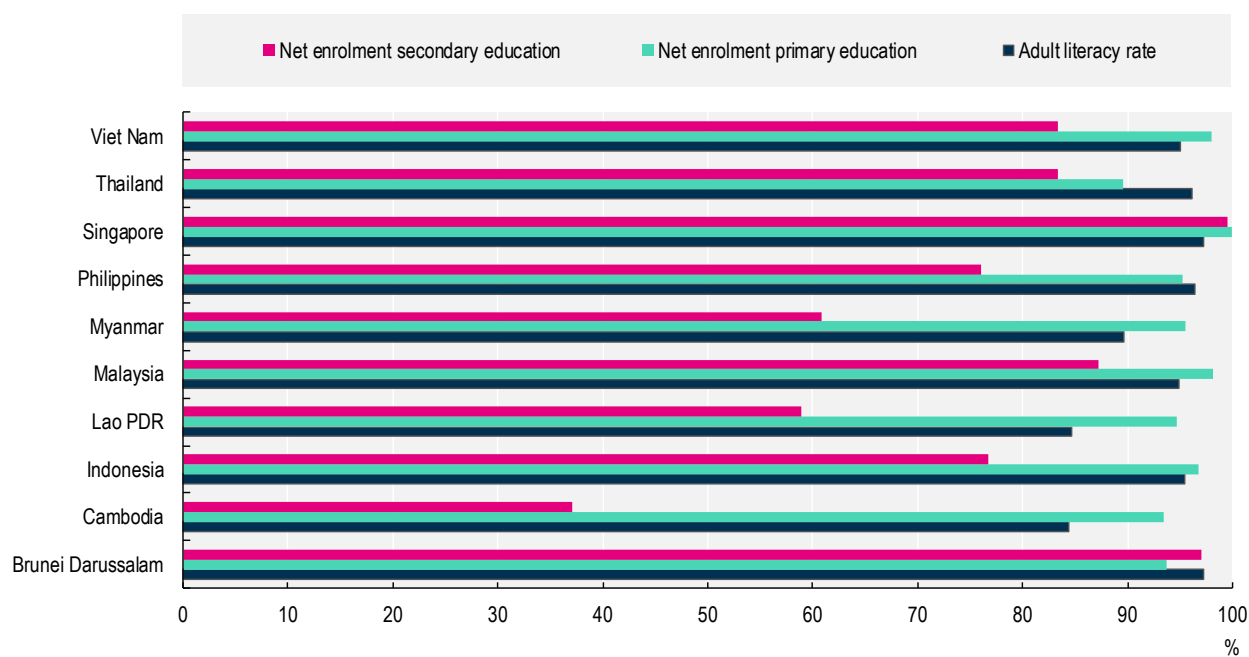
In terms of education and literacy indicators, the distribution of secondary education enrolment in the region resembles that of GDP per capita, with Singapore and Brunei Darussalam leading in secondary education. Primary education enrolment is lowest in Thailand, while adult literacy is more evenly distributed (Figure 1.2).

Table 1.2. Key economic indicators in SEA

Country	GDP at current prices (USD million)	GDP per capita at current prices		International merchandise trade (USD million)		
		USD	USD PPP	Exports	Imports	Total trade
Brunei Darussalam	12 212	28 986	76 282	4 761	3 088	7 849
Cambodia	22 340	1 421	4 104	11 278	12 285	25 563
Indonesia	1 013 926	3 872	12 332	168 811	156 986	325 796
Lao PDR	17 090	2 531	7 332	3 607	4 779	8 387
Malaysia	317 042	9 899	29 255	217 722	194 750	412 472
Myanmar	65 607	1 229	6 071	13 878	19 253	33 131
Philippines	313 875	2 992	8 359	68 251	107 879	176 130
Singapore	323 954	57 722	93 920	383 252	317 693	700 946
Thailand	455 704	6 736	18 231	236 694	222 763	459 458
Viet Nam	223 927	2 390	7 025	213 931	210 626	424 557
ASEAN	2 765 679	4 308	12 369	1 322 185	1 252 102	2 574 289

Note: GDP = gross domestic product; PPP = purchasing power parity; Lao PDR = Lao People's Democratic Republic.

Source: ASEANstats (2018^[5]), *ASEANstats Data Portal* (database), <https://data.aseanstats.org/>.

Figure 1.2. SEA education indicators

Note: Lao PDR = Lao People's Democratic Republic.

Source: ASEAN (2018^[3]), *ASEAN Statistical Leaflet 2018: Key socio-economic indicators*, https://www.aseanstats.org/wp-content/uploads/2018/10/ASEAN_Statistical_Leaflet_2018.pdf.

Table 1.3. Real GDP growth in SEA

Country	2016	2017	2018	2019
Brunei Darussalam	-2.5	1.3	1.5	2.1
Cambodia	6.9	7	7	7
Indonesia	5	5.1	5.3	5.4
Lao PDR	7	6.9	6.8	6.9
Malaysia	4.2	5.9	5.3	5.1
Myanmar	5.9	6.8	6.9	7.1
Philippines	6.9	6.7	6.7	6.7
Singapore	2.4	3.6	3.5	3
Thailand	3.3	3.9	4	3.9
Viet Nam	6.2	6.8	6.9	6.6
ASEAN	4.8	5.3	5.3	5.3

Notes: Lao PDR = Lao People's Democratic Republic. The final date for data used in this report is 18 June 2018. ASEAN growth rates are the weighted averages of the individual economies subsumed. The 2017 data for Cambodia and Myanmar are preliminary estimates.

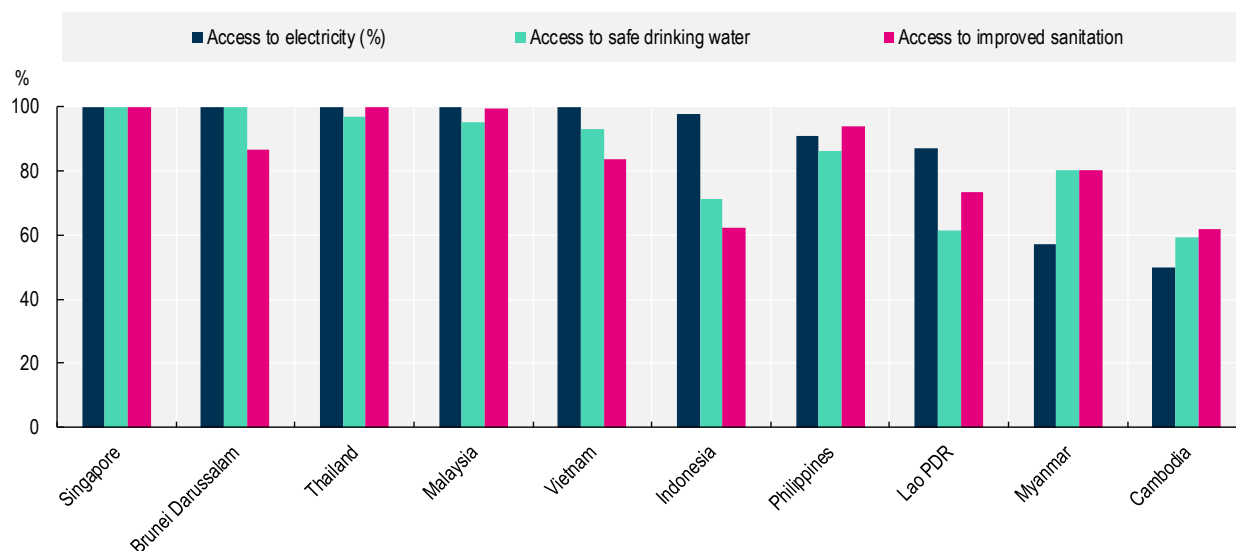
Source: OECD (2018^[6]), *Economic Outlook for Southeast Asia, China and India 2018 – Update: Promoting Opportunities in E-commerce*, <https://doi.org/10.1787/9789264302990-en>.

Access to infrastructure

Electricity, water and sanitation

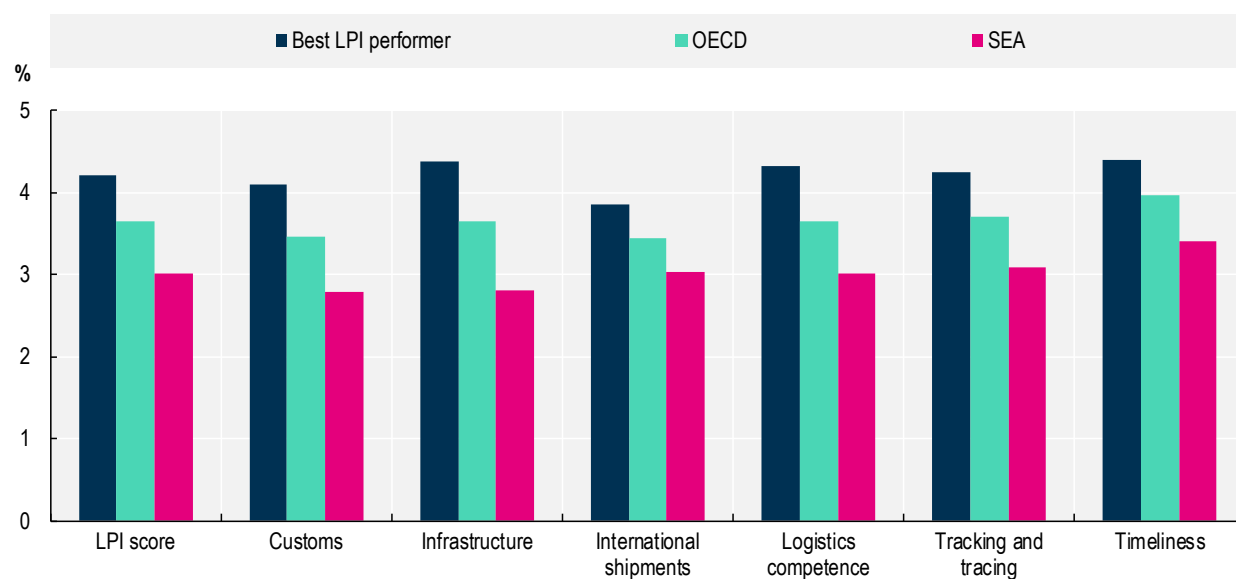
In recent years, SEA has experienced significant improvements in its electricity generation capacity, transportation network, and sanitation and communication infrastructures. However, over 40 million people in SEA still lack electricity, roughly 120 million have no access to safe drinking water and 130 million still lack access to sanitation (Figure 1.3). In addition to the lack of access to infrastructure, the poor quality of service levels is a persistent problem. In several countries in the region, power outages constrain economic growth. Lack of sanitation and access to safe water causes child mortality and raises health costs. City traffic congestion alone costs economies huge amounts every day in lost productivity, wasted fuel and human stress (OECD, 2018^[6]). These critical infrastructure challenges require an estimated investment in basic infrastructure of more than USD 2.7 trillion, and when adjusted for climate, more than USD 3.1 trillion (ADB, 2018^[7]).

SEA also faces important challenges concerning logistics. In addition to being a constraint to competitiveness, logistics costs and performance are a key hindrance to the delivery of e-commerce goods, the expansion of the digital economy and the deployment of communication infrastructure (OECD/IDB, 2016^[8]). The SEA region lags behind OECD countries in this regard, according to the World Bank Logistics Performance Index (LPI), which aggregates indicators on infrastructure, costs, logistics quality, tracking and tracing, timeliness and international shipment (Figure 1.4). In 2018, Singapore scored high on the LPI, ranking seventh in the world, the picture was different for other SEA countries: Cambodia and Myanmar, for instance, ranked 98th and 137th out of 160 countries, respectively. Some countries in the region have made efforts to ensure better logistics. One example is Myanmar, where postal services were improved as a result of international co-operation (Box 1.1).

Figure 1.3. Access to basic infrastructure in SEA (2016)

Note: Lao PDR = Lao People's Democratic Republic.

Sources: World Bank (2019^[9]), *World Development Indicators* (database), <https://databank.worldbank.org/data/reports.aspx?source=world-development-indicators>; ASEAN (2018^[3]), *ASEAN Statistical Leaflet 2018: Key socio-economic indicators*, https://www.aseanstats.org/wp-content/uploads/2018/10/ASEAN_Statistical_Leaflet_2018.pdf.

Figure 1.4. Comparison of best performer LPI scores, OECD and SEA (2018)

Note: The Logistics Performance Index (LPI) scores countries on a scale of 1 to 5, with 5 indicating the best logistics performance. The best overall LPI performer in 2018 was Germany.

Source: World Bank (2018^[10]), *International LPI* (database), <https://lpi.worldbank.org/international/global>.

Box 1.1. Sharing Japan’s postal know-how with Myanmar

To meet the challenging task of improving the quality of postal services in Myanmar, the Myanmar government sought assistance from the Japan Post Company in 2014. The technical assistance consisted of carrying out a comprehensive review of Myanmar’s postal operations from collection through sorting and delivery. Based on the review, a technical management system for arrival and departure times and to clarify operation times at post offices was introduced. The aim of the system is to optimise schedules for accurate and efficient delivery. By reviewing all the collection and delivery routes and adjusting them to train timetables, Myanmar was able to considerably improve its postal services. Delivery times for express registered mail between the three principle cities were shortened from 2 to 3 days to 1.1 days, and ordinary mail between the cities from 4 to 5 days to an average of just 1.6 days. The 10-day delivery ratio (the percentage of mail delivered within 10 days) rose from 87.8% to 99.3% in just eight months from the start of the project.

Source: Government of Japan (2018^[11]), *Japan: Helping to improve Asia’s infrastructure*, https://www.japan.go.jp/tomodachi/2015/autumn-winter2015/postal_know-how_with_myanmar.html.

Communication infrastructure

Connectivity is a critical building block of the digital economy

A fundamental challenge for SEA today and in the future is connectivity. Connectivity is an essential element for enabling digital transformations and, in this function, is a building block for digital economies. Connectivity needs to be efficient, reliable and widely accessible for economic development to flourish in SEA. Individuals, businesses and governments in the region need reliable and widespread access to communication networks and services – in particular to broadband – to benefit from the opportunities the digital transformation can offer.

The role of communication networks as an accelerator of development has been recognised globally, as has their critical importance to economic development, social inclusion and environmental protection – the three pillars of development. This was underscored by the setting of a specific target (Target 9.c) of the Sustainable Development Goals (SDGs) of universal and affordable Internet (Table 1.4). The Asian Development Bank, as part of its indicators for monitoring progress in meeting the SDGs, uses mobile broadband network coverage to track progress towards this target in the Asia Pacific region (ADB, 2018^[12]).

Among the main benefits of rolling out high-speed broadband services are time savings, enhanced communications, increased sales and productivity gains. Deployment of broadband services can encourage foreign direct investment by making regional locations outside the main urban centres more attractive; the availability of broadband services also helps to facilitate more flexible working arrangements, creating, indirectly and directly, new jobs. Other positive effects include better access to education services and to labour markets and improved delivery of digital government services such digital health.

Table 1.4. SDGs and information and communication technologies

 <p>1 NO POVERTY</p>	<p>Target 1.4: By 2030, ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services [...], appropriate new technology and financial services, including microfinance.”</p>	 <p>9 INDUSTRY, INNOVATION AND INFRASTRUCTURE</p>	<p>Target 9.c: Significantly increase access to information and communications technology and strive to provide universal and affordable access to the Internet in the least developed countries by 2020.</p>	
 <p>2 ZERO HUNGER</p>	<p>Target 2.a: Increase investment [...] in rural infrastructure, agricultural research and extension services, technology development and plant and livestock gene banks [...].”</p> <p>Target 2.c: Adopt measures to ensure the proper functioning of food commodity markets [...] and facilitate timely access to market information, including on food reserves, in order to help limit extreme food price volatility.</p>	 <p>10 REDUCED INEQUALITIES</p>	<p>Information and communication technologies (ICTs), especially through mobile-based services, can help reduce inequality by drastically expanding access to information, contributing to individual empowerment and social inclusion of individuals who used to fall outside the reach of traditional services.</p>	
 <p>3 GOOD HEALTH AND WELL-BEING</p>	<p>The use of ICTs in the health sector can result in higher quality health care that is safer and more responsive to patients’ needs. E-health can be particularly important in rural and remote areas, facilitating innovative models of care delivery, such as telemedicine and mobile health. (*)</p>	 <p>11 SUSTAINABLE CITIES AND COMMUNITIES</p>	<p>ICTs can be leveraged to organise cities and communities more efficiently. Smart cities use ICTs and big data to improve public service delivery and to advance broad policy outcomes such as energy savings, safety, urban mobility and sustainable development. (*)</p>	
 <p>4 QUALITY EDUCATION</p>	<p>Target 4.b: By 2020, substantially expand globally the number of scholarships available to developing countries [...] for enrolment in higher education, including vocational training and information and communications technology, technical, engineering and scientific programmes, in developed countries and other developing countries.</p>	 <p>12 RESPONSIBLE CONSUMPTION AND PRODUCTION</p>	<p>ICTs, and especially broadband, have directly connected consumers and producers and given rise to “on-demand” markets of products that can be customised and localised, saving time, reducing transport costs and contributing to more efficient and sustainable consumption. (*)</p>	
 <p>5 GENDER EQUALITY</p>	<p>Target 5.b: Enhance the use of enabling technology, in particular information and communications technology, to promote the empowerment of women.</p>	 <p>13 CLIMATE ACTION</p>	 <p>14 LIFE BELOW WATER</p>	 <p>15 LIFE ON LAND</p> <p>Use of the IoT can help make monitoring the environment cheaper, faster and more convenient. (*)</p>
 <p>6 CLEAN WATER AND SANITATION</p>	<p>7 AFFORDABLE AND CLEAN ENERGY</p> <p>ICTs can contribute to improving water and energy access by using mobile solutions, smart grids and meters to advance efficiency, manage demand and develop new ways to expand access. (*)</p>	 <p>16 PEACE, JUSTICE AND STRONG INSTITUTIONS</p>	<p>The use of ICTs in the public sector can improve the range and uptake of digital government services; strengthen the performance of public institutions and enhance transparency and the participation of all citizens. (*)</p>	
 <p>8 DECENT WORK AND ECONOMIC GROWTH</p>	<p>Target 8.2: Achieve higher levels of economic productivity through diversification, technological upgrading and innovation.</p> <p>Target 8.3: Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation, and encourage the formalisation and growth of micro-, small and medium-sized enterprises, including through access to financial services.</p>	 <p>17 PARTNERSHIPS FOR THE GOALS</p>	<p>Target 17.8: Fully operationalise the technology bank and science, technology and innovation capacity-building mechanism for least developed countries by 2017 and enhance the use of enabling technology, in particular information and communications technology.</p>	

Note: Not all SDGs had an ICT component officially included in a corresponding target by the United Nations. In those cases, identified in this figure by an asterisk (*), the OECD identified examples to depict how ICT could contribute to that particular Goal.

Source: OECD/IDB (2016^[8]), *Broadband Policies for Latin America and the Caribbean: A Digital Economy Toolkit*, <http://dx.doi.org/10.1787/9789264251823-en>, based on UN (2015^[13]), *Transforming Our World: The 2030 Agenda for Sustainable Development*, <https://sustainabledevelopment.un.org/post2015/transformingourworld/publication>.

Benefits of connecting SMEs in SEA

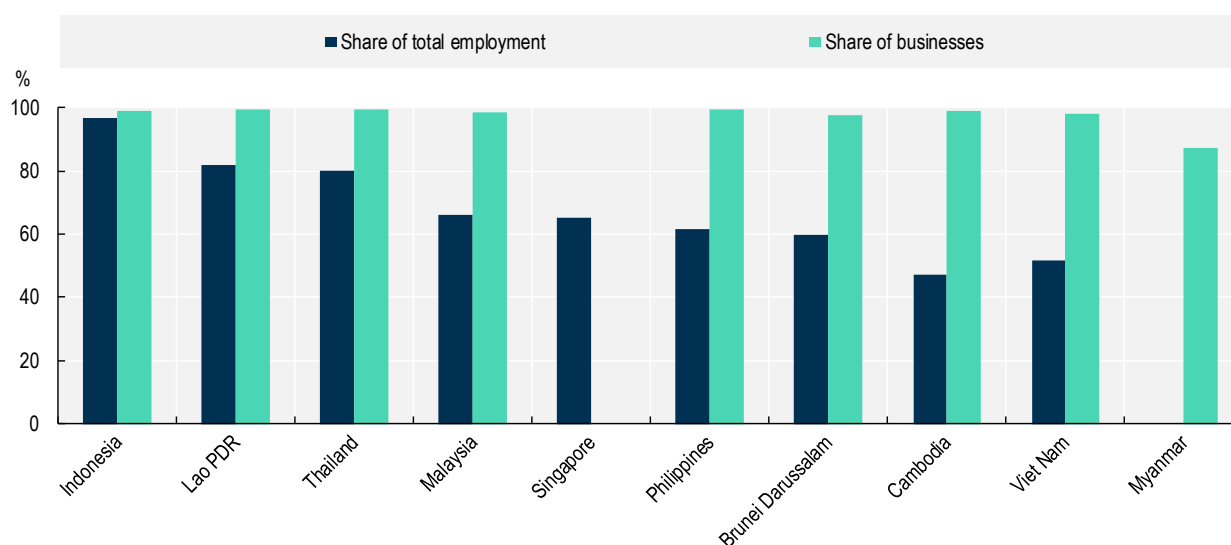
Rapid digital transformation is taking place everywhere in the world. It is crucial to ensure that SMEs are connected and are able to effectively use digital tools so they are equipped to reinvent themselves through innovations in their business models and products and expand to new markets. In today's increasingly globalised business environment, connectivity also is a matter of resilience.

To achieve the goal of connecting SMEs in SEA, a better understanding is needed of what the term “SME” means in the region and the specific needs of SMEs.

In SEA, each country defines SMEs differently (ADB, 2014, pp. 300-303^[14]). Most ASEAN countries define SMEs in terms of some combination of turnover, capital/fixed assets and employment, but set different qualifying thresholds (Wai-chung Yeung, 2016^[15]). For example, in Cambodia, a “micro firm” is one with up to ten employees while in Malaysia, the comparable threshold is fewer than five employees; in Myanmar, a “small” enterprise has 10 to 50 employees while in the Philippines, the definition is an enterprise with 10 to 99 employees (ADB, 2014^[14]).

Analysing digital divides in terms of firm size in SEA helps policy makers to identify firms that do not have the same access to the opportunities offered by digital transformation and determine the reason. Understanding the state of connectivity of SMEs also is important because they play a fundamental role in the region's economy. Notwithstanding the lack of a consistent definition of what constitutes an SME in ASEAN countries, it is estimated (based on national sources with their corresponding definitions) that SMEs account for the vast majority of enterprises in SEA – between 87% and 99% – and a substantial share of employment – approximately 47% to 97%.⁴ Their importance is further illustrated below (Figure 1.5). Therefore, unequal access to the Internet may have negative effects on SMEs in SEA countries.

Figure 1.5. SME share of total employment and businesses (establishments) in SEA (2016)



Note: Lao PDR = Lao People's Democratic Republic.

Sources: The figure is based on OECD/ERIA (2018^[2]), “SME Policy Index”, <https://doi.org/10.1787/9789264305328-en>. Data from the SME Policy Index are based on national sources and ASEAN (2015^[16]), *ASEAN Strategic Plan for SME Development 2016-2025*, <https://asean.org/wp-content/uploads/2015/12/SAP-SMED-Final.pdf>.

Small firms in SEA on average are less productive than large firms and have limited involvement in innovative activities (OECD, 2013^[17]). They also have weak participation in trade-related activities (i.e. their contribution to exports is estimated to be around 10% to 30%)⁵ (ASEAN, 2015^[16]).

To achieve the goal of connecting SMEs in the region and enable them to make the most of the digital transformation, the multi-sided policy framework needs to be adapted. Although Internet adoption and use are highly correlated to the level of economic development of a given country, these are not the only factors that drive the take-up of digital services and applications among individuals and firms (Internet Society/TRPC, 2015^[18]). The availability and affordability of communication services are also influenced by a number of structural factors (e.g. competition, regulation, universal service policies and taxes), as well as by issues around skills, inclusiveness, innovation, and e-commerce ecosystem and regional integration. Establishing a strategic and coherent vision for the digital transformation of SMEs is essential to realise the potential of these digital tools for the prosperity of SMEs and the SEA region.

Notes

¹ This report defines the Southeast Asia region as the ten countries of the Association of Southeast Asian Nations (ASEAN).

² The figures are based on ICT statistics from the International Telecommunication Union and are estimated using the variable “Individuals using the Internet (% of the population)” multiplied by the country’s population of the given year. This estimate is based in survey data per country, and does not reflect the amount of broadband subscriptions in a given country or in the region as a whole.

³ ASEAN leaders adopted the Master Plan on ASEAN Connectivity at the 17th ASEAN Summit in Hanoi on 28 October 2010, to enhance intra-regional connectivity. For further information, see Internet Society/TRPC (2015^[18]).

⁴ The relative importance of SMEs as a source of employment generation varies across countries in Southeast Asia. For example, what ASEAN defines as micro, small and medium enterprises account for 97% of employment in Indonesia but only 51.7% of employment in Viet Nam, according to ASEAN (2015^[16]). For statistics on the contributions of SMEs to employment, exports, and GDP across different SEA economies, see ADB (2014^[14]).

⁵ As noted by López González (2017^[19]), Singaporean SMEs make a higher contribution to total exports of their country than do SMEs in Indonesia, Thailand and Viet Nam (these reflect the limited size of the domestic market as well as a favourable policy environment).

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2. Enhancing connectivity in Southeast Asia

This chapter provides an overview of supply side issues that are relevant for connecting small and medium-sized enterprises. It analyses indicators and recent developments related to access, quality and affordability of broadband services in Southeast Asia. The chapter also looks at developments in communication markets in the region, emerging areas such as Internet of Things and machine-to-machine communication, and connectivity gaps that need to be bridged.

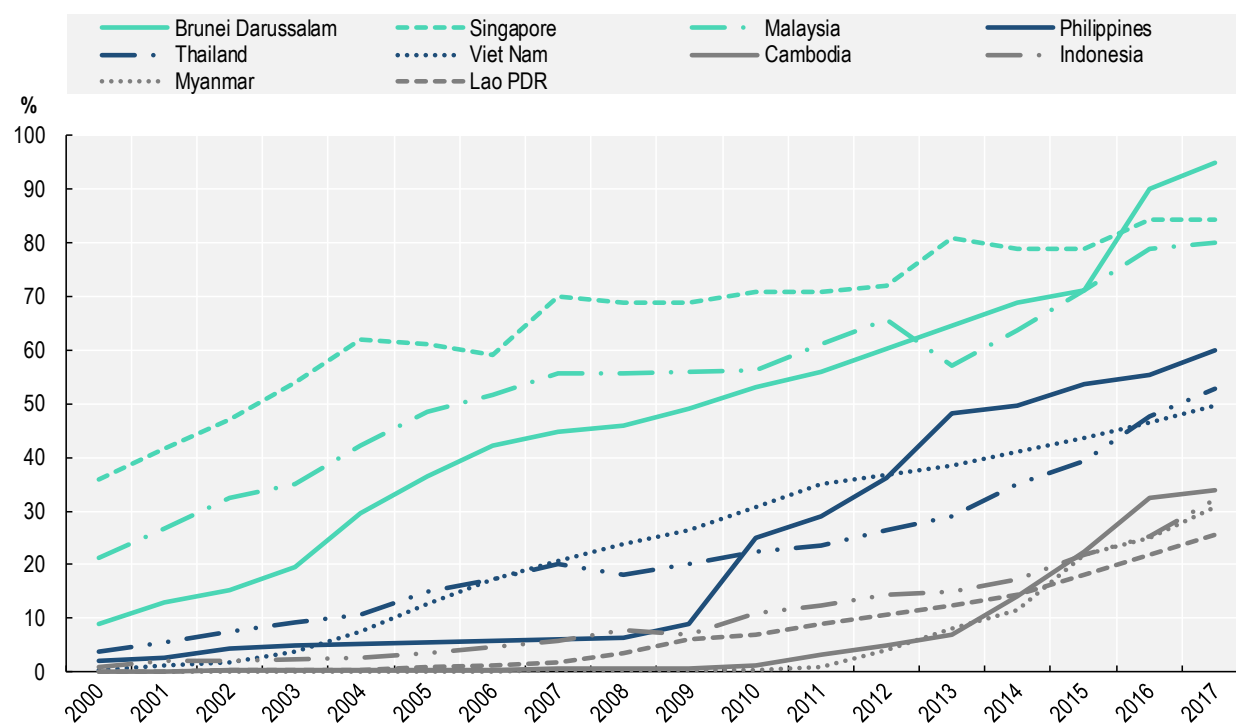
Connectivity is a critical tool to enhance opportunities for individuals, private firms and the public sector. Access to broadband networks and services is pivotal for the success of digital entrepreneurs, as well as for small and medium-sized enterprises (SMEs) in traditional sectors in Southeast Asia (SEA). Therefore, it is essential that governments foster competition in the provision of reliable broadband services; promote investment in infrastructure deployment for the digital economy (e.g. fibre backhaul, towers, last-mile access); make spectrum readily available; and strengthen key enablers of Internet growth, for example by advancing the take-up of Internet Protocol version 6 (IPv6) addresses. This chapter provides an overview of connectivity in terms of broadband availability, quality and affordability in the SEA region.

Connectivity in SEA

There are digital divides in SEA – among and within most countries – and connectivity indicators are lower on average than in the OECD area. In 2017, for example, 54.5% of individuals on average used the Internet in the countries of the SEA region, compared to the OECD average in the same year was 86.2% and the average of 42% in low- and middle-income economies (OECD, 2019^[1]) (ITU, 2019^[2]).

Due to differences in economic development and historical conditions, connectivity in terms of the percentage of people on line has advanced at different rates in SEA countries (Figure 2.1). For illustrative purposes, and to highlight the various ways connectivity evolved in the region, this chapter places SEA countries in three clusters: those with high Internet usage, partial Internet usage and low Internet usage.

Figure 2.1. Percentage of individuals using the Internet in SEA (2000-17)



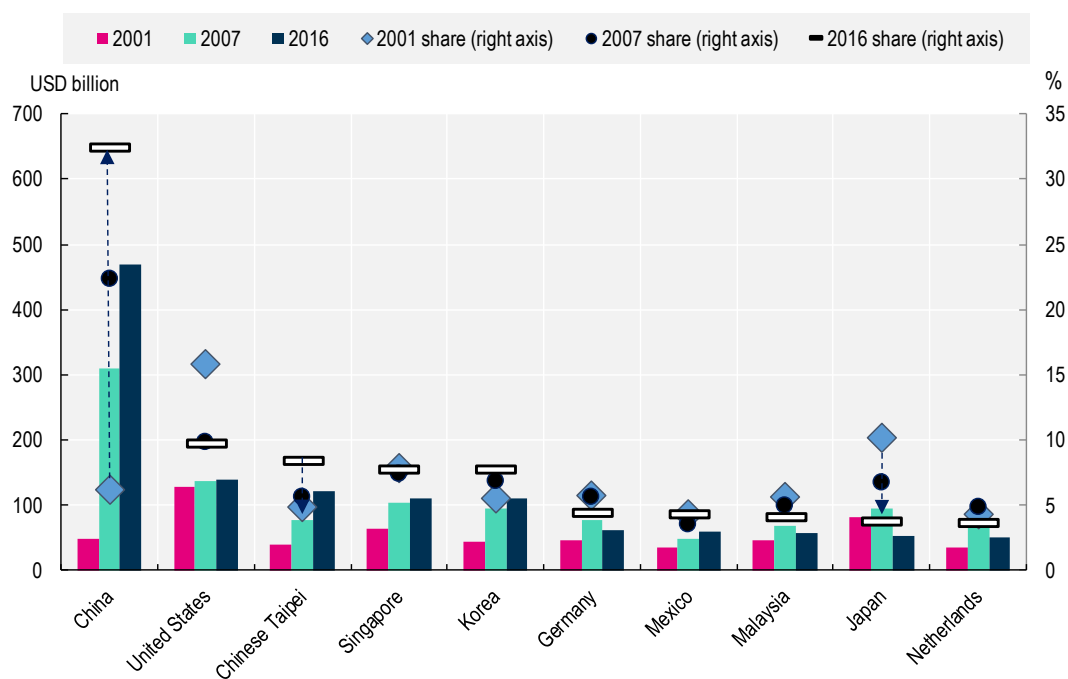
Notes: Lao PDR = Lao People's Democratic Republic. SEA countries are divided into three clusters defined by the percentage of individuals using the Internet. Those with high usage are presented in green, partial usage in blue, and low in grey. No data on Internet use in Myanmar are available for 2000.

Sources: ITU (2019^[2]), *ITU World Telecommunication/ICT Indicators* (database), <https://www.itu.int/en/ITU-D/Statistics/Pages/default.aspx>.

As Figure 2.1 shows, the high usage cluster (shown in green) comprises Brunei Darussalam, Malaysia and Singapore, as more than 80% of their populations are on line. Both Brunei Darussalam and Singapore are high-income economies and Malaysia is an upper middle-income country, in according to the World Bank’s classification (World Bank, 2019^[3]). The partial Internet usage cluster (shown in blue) comprises Thailand (upper middle income), the Philippines and Viet Nam (lower middle income), with roughly 50% to 60% of their population using the Internet. The low usage cluster (shown in grey) comprises Cambodia, Indonesia, Myanmar and Lao People’s Democratic Republic (hereafter “Lao PDR”) (all lower middle income), with roughly 25% to 35% of their population on line.

As noted, countries in each of the three clusters also are similar in national income (Table 2.1). There is a positive correlation between the level of economic development and the prevalence of digital services and applications in a country, although causality is difficult to determine. Exceptions include Viet Nam and Myanmar, which the World Bank classifies as lower middle-income economies but also have undergone a deep digital transformation in recent years that may allow them to leapfrog in the near future.

Figure 2.2. Top ten world exporters of ICT goods (2001, 2007 and 2016)



Notes: Estimates of the top ten exporters are calculated based on declarations of all economies that reported ICT exports in 2001, 2007 and 2016, excluding re-imports of the People’s Republic of China (hereafter “China”) and re-exports of Hong Kong (China). China’s ICT exports are adjusted for re-imports. The 2016 data for China and the Netherlands are estimates based on reported values in 2015.

Source: OECD (2018^[4]), *Bilateral Trade in Goods by Industry and End-use Category* (database), <http://oe.cd/btd>.

Access to broadband can enhance the opportunities that the digital transformation offers all firms. Malaysia and Singapore illustrate this: not only are 80% to 85% of their populations on line, but the two countries also rank among the world’s top ten exporters of information and communication technology (ICT) goods (Figure 2.2). Moreover, Singapore is one of the SEA countries that has focused on establishing incubators to promote innovation in ICT start-ups and SMEs.

Table 2.1. SEA countries classified by percentage of population using the Internet

	Country	Share of population using the Internet (%) (2017)	GNI per capita (2018)	Income classification
High usage cluster (above 80%)	Brunei Darussalam	95	USD 31 020	High income
	Singapore	85	USD 58 770	High income
	Malaysia	80	USD 10 460	Upper middle income
Partial usage cluster (35% to 80%)	Philippines	60	USD 3 830	Lower middle income
	Thailand	53	USD 6 610	Upper Middle Income
	Viet Nam	50	USD 2 400	Lower middle income
Low usage cluster (below 35%)	Cambodia	34	USD 1 380	Lower middle income
	Indonesia	32	USD 3 840	Lower middle income
	Myanmar	31	USD 1 310	Lower middle income
	Lao PDR	26	USD 2 460	Lower middle income

Notes: GNI = gross national income; Lao PDR = Lao People's Democratic Republic. The table uses the World Bank classification of countries by income level (2017-18). GNI per capita corresponds to the World Bank's Atlas method (current USD) for the year 2018.

Sources: OECD elaboration with data from World Bank (2019^[5]), *World Development Indicators – overview*, <https://datacatalog.worldbank.org/dataset/world-development-indicators>; ITU (2019^[2]), *ITU World Telecommunication/ICT Indicators* (database), <https://www.itu.int/en/ITU-D/Statistics/Pages/default.aspx>.

Digital divides among SMEs

Measuring the digital divide among SMEs in the SEA region is challenging because there is no single, harmonised definition of these firms. Moreover, only a few SEA countries, among them Singapore, collect information specifically related to enterprises and separate from the indicators on fixed and mobile broadband penetration routinely collected for individuals and households (Figure 2.3). Such information for all Association of Southeast Asian Nations (ASEAN) countries would help to identify connectivity gaps in terms of both firm size and geographic location.

Figure 2.3. Percentage of Singapore enterprises using the Internet, by number of employees (2012-16)

Source: Government of Singapore (2018^[6]), *Internet Usage Amongst Enterprises by Employment Size* (database), <https://data.gov.sg/dataset/internet-usage-amongst-enterprises-by-employment-size>.

In addition to quantitative data, qualitative research is needed to understand the specific needs, experiences and expectations of SMEs regarding communication markets. Research in OECD countries has found that SMEs often do not access Internet services that are optimal for their business, particularly as regards bandwidth, affordability, upload speeds and/or use in peak times (BDRC, 2018^[7]). Moreover, SMEs may not always get the most appropriate and advantageous terms in their business communication contracts. Among the challenges for SMEs in their relationship with service providers are first the awareness of the availability of business contracts that could service them, service continuity and reliability, length and structure of contracts, customer service, and other obstacles to switching providers.

Broadband in SEA

Access and reliability of communication services and networks can be measured by assessing the availability of services, their quality, and their prices for businesses and individual consumers. A number of metrics can be used to assess broadband availability as part of broader digital transformation strategies and more targeted broadband plans that aim to ensure access. As discussed in this section, these include the number of broadband subscriptions per 100 inhabitants (i.e. the broadband penetration rate), the number of households or businesses with access to broadband (data that are typically collected through surveys), and coverage by geographical area such as urban, rural or remote area. Broadband also is assessed by the quality of communication services, which can be measured by the download speed of a connection, latency, reliability and so on. Availability of competitively priced rates is another key indicator of the opportunities created by digital economies.

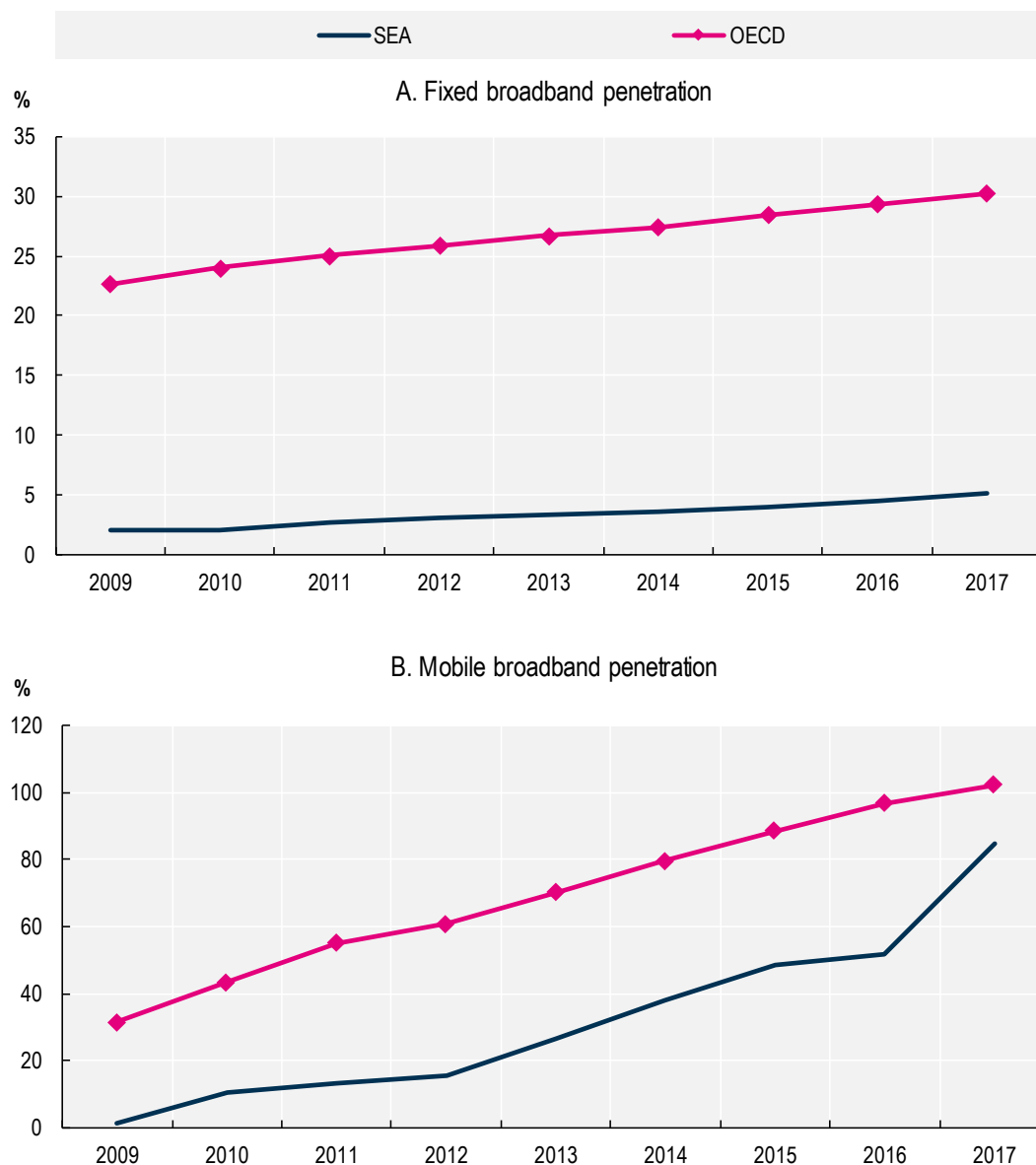
Availability

A key indicator for the availability of broadband is the level of access to fixed and mobile networks, measured in terms of the number of subscriptions per 100 inhabitants (i.e. broadband penetration). Unlike indicator related to the percentage of Internet users as measured by surveys (i.e. demand side), this indicator on access is considered a measure of network uptake from the supply side perspective, as communication operators report their subscriptions to ministries, regulators or other national authorities. Other measures of network availability are indicators related to geographical or population network coverage (e.g. percentage of the population covered by 3G or 4G networks).

Connectivity rates in SEA remain far lower than in OECD countries. In particular, there is a wide gap in fixed and mobile broadband penetration rates (broadband subscriptions per 100 inhabitants). In 2017, the SEA average fixed broadband penetration rate was 5.2% compared to the OECD average of 30.2% (Figure 2.4, panel A).

While mobile broadband access has increased in SEA, regional averages remain much lower than the average of OECD countries. For instance, the SEA average mobile broadband penetration in 2017 was 84.9%; the OECD average was more than 102% (Figure 2.4, panel B). Nevertheless, mobile broadband has evolved differently than fixed broadband in SEA. Beginning in 2012, mobile broadband has grown rapidly: penetration grew from 15% in 2012 to almost 27% in 2013, and, to almost 85% in 2017 – a compound annual growth rate of 40.8% over the 2012-17 period. The expansion was undoubtedly an effect of the liberalisation of the telecommunication market in Myanmar, which brought millions of people on line for the first time.

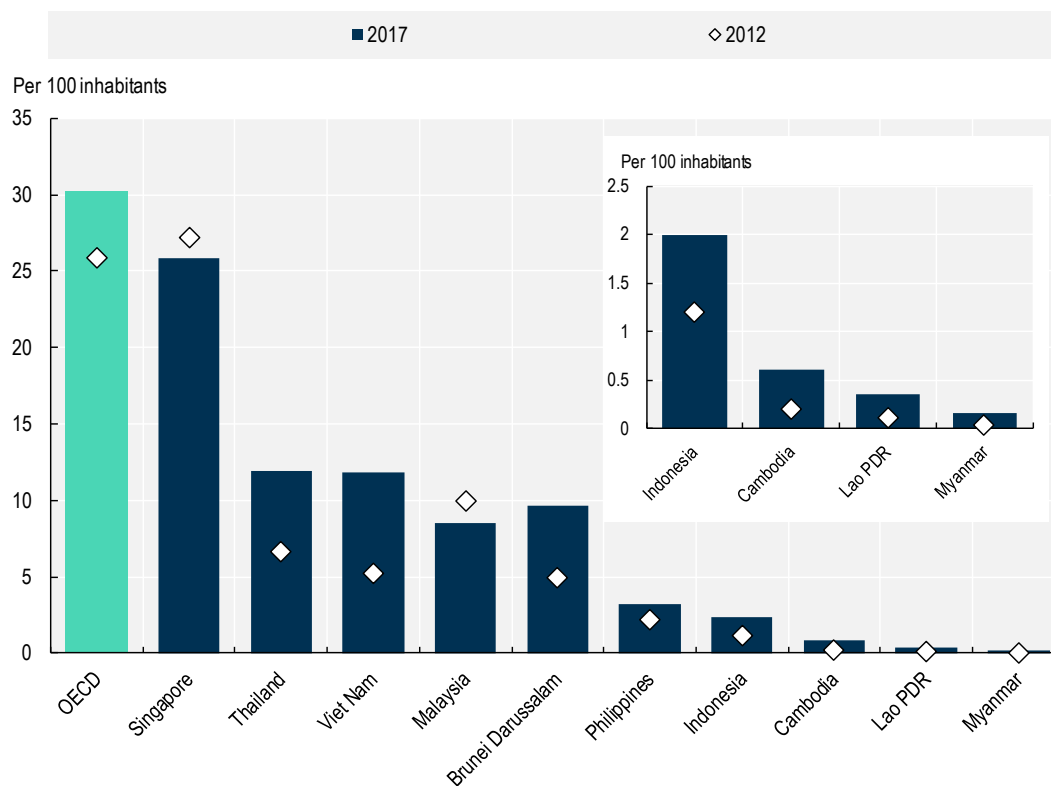
Figure 2.4. Evolution of share of broadband subscriptions per 100 inhabitants in SEA vs. OECD (2009-17)



Sources: ITU (2019^[21]), *ITU World Telecommunication/ICT Indicators* (database), <https://www.itu.int/en/ITU-D/Statistics/Pages/default.aspx>; OECD (2019^[8]), *Broadband Portal* (database), <https://www.oecd.org/sti/broadband/broadband-statistics/>.

A quite wide connectivity gap exists between the most developed countries in SEA (i.e. those in the high access cluster) and those that are lagging behind (i.e. those in the low access cluster) in terms of fixed broadband subscriptions. In 2017, for instance, the penetration rate in Singapore was close to the OECD average of 30.23%, with almost 26% fixed broadband subscriptions rate per 100 inhabitants. Singapore is a clear outlier in the region. The next highest fixed broadband penetration rates in 2017 were 11.9% (Thailand), 11.8% (Viet Nam) and 8.5% (Malaysia). The SEA average in 2017 was 7.47%. Rates were lower in five countries in the region: in the Philippines (3.2%), Indonesia (2%), and Cambodia, Lao PDR and Myanmar with less than 1% (Figure 2.5).

Figure 2.5. Fixed broadband subscriptions per 100 inhabitants in SEA and OECD (2012 and 2017)



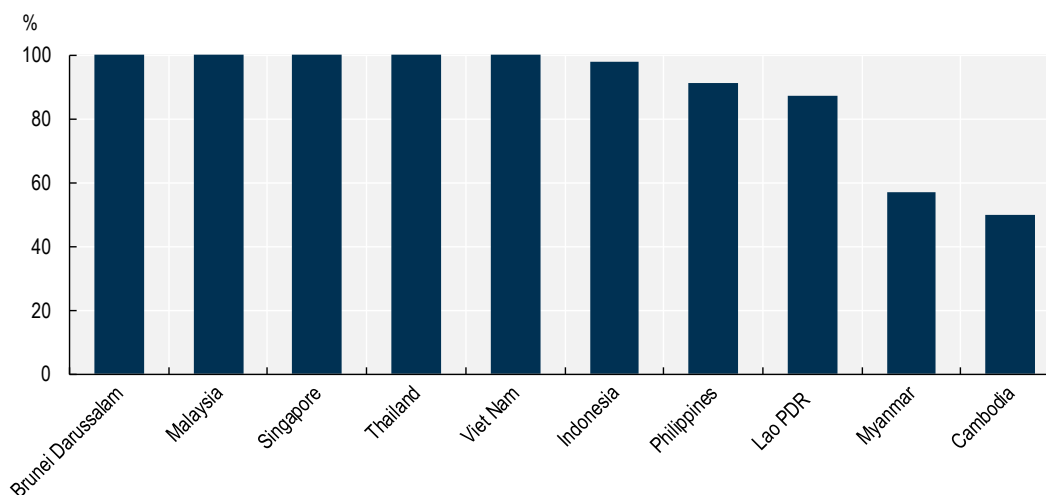
Notes: Lao PDR = Lao People's Democratic Republic. The 2012 number for Myanmar corresponds to 2011 data. Source: ITU (2019^[2]), *ITU World Telecommunication/ICT Indicators* (database), <https://www.itu.int/en/ITU-D/Statistics/Pages/default.aspx>.

The underdevelopment of fixed broadband networks in some SEA countries is due in part to lack of access to other infrastructure such as the electrical grid. The energy demand in SEA has been growing by 60% in the past 15 years, however meeting the rising demand in a secure, affordable and sustainable manner has been a common challenge (IEA, 2017^[9]). In OECD countries, 100% of individuals have access to electricity; the average in SEA in 2016 was 88%. In SEA 65 million people remain without electricity and 250 million are still reliant on solid biomass as a cooking fuel (IEA, 2017^[9]). In Myanmar and Cambodia, only 57% and 50% of the population had access to electricity in 2016, respectively (Figure 2.6). Additionally, existing infrastructure must often face natural phenomena, such as extreme climate events, that disrupt the availability and quality of basic services. The lack of resilience of basic infrastructure directly effects the development of fixed (and wireless) broadband networks.

Mobile networks in SEA are far more developed than fixed broadband networks. Mobile broadband penetration in the region in 2017 was highest in Singapore, with over 147% subscriptions rate per 100 inhabitants, followed by Brunei Darussalam and Malaysia and rates of all three countries above the OECD average of 102.3%. The high rates reflect that it is common for users in these countries to have multiple SIM cards to maximise network coverage and choose between different data plans. Penetration rates in Viet Nam and Lao PDR, in contrast, were just 47% and 40%, respectively (Figure 2.7).

Mobile voice penetration rates on average were equivalent in SEA and OECD in 2017, at about 125% (SEA) and 124% (OECD). Most ASEAN countries have mobile voice penetration of over 100%; Myanmar and Lao PDR, the exceptions, had penetration rates in 2017 of 89.8% and 54.1%, respectively (Figure 2.7).

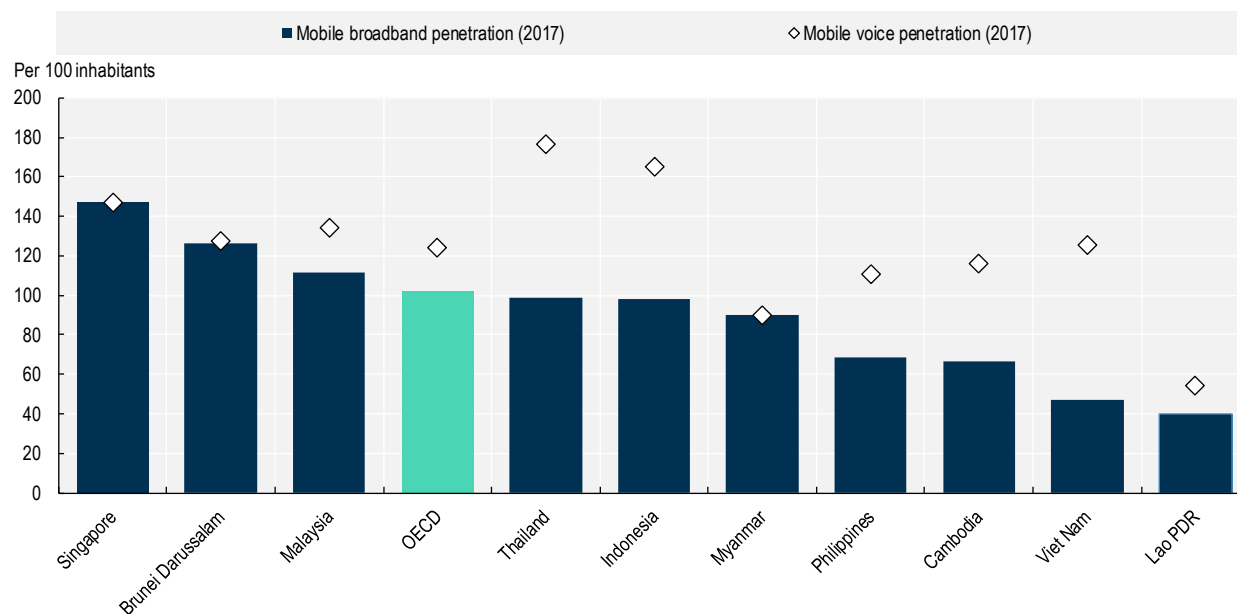
Figure 2.6. Percentage of population with access to electricity in SEA (2016)



Note: Lao PDR = Lao People's Democratic Republic.

Source: ADB (2018^[10]), *Basic 2018 Statistics*, <https://www.adb.org/publications/basic-statistics-2018>.

Figure 2.7. Mobile broadband subscriptions per 100 inhabitants in SEA and the OECD (2017)



Note: Lao PDR = Lao People's Democratic Republic.

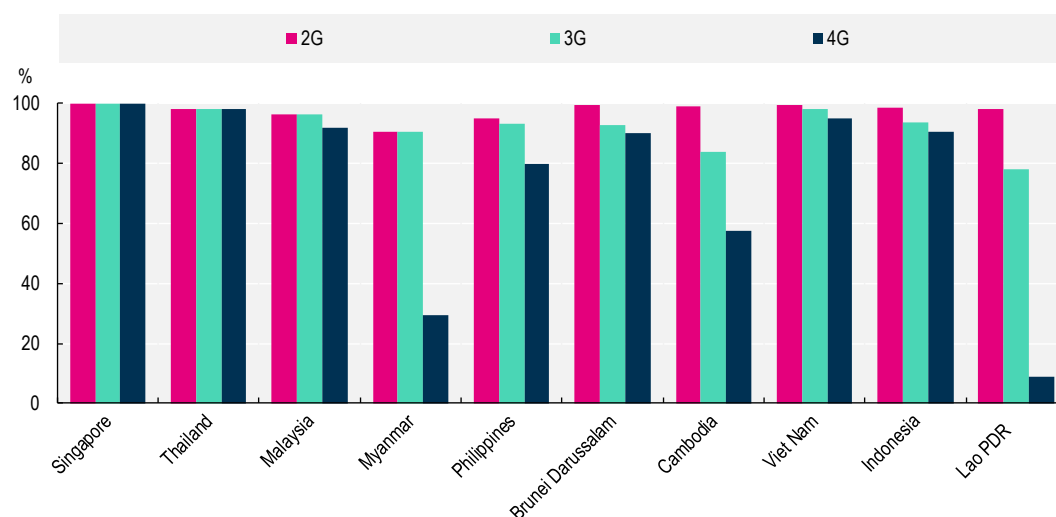
Source: ITU (2019^[2]), *ITU World Telecommunication/ICT Indicators* (database), <https://www.itu.int/en/ITU-D/Statistics/Pages/default.aspx>.

Mobile network coverage

For convenience, different generations of mobile networks are often referred to as 2G, 3G, and 4G, although a range of different technologies are associated with their evolution (OECD, 2017^[11]). While all three generations are in use today in most countries, some operators (e.g. Telstra in Australia and AT&T in the United States in 2016) are starting to switch off 2G GSM networks that have been in service for more than two decades. Trials of 5G are underway in many OECD countries and, in some, deployment of 5G networks has already started (OECD, 2019^[12]). Singapore was one of the first countries to shut down all 2G networks at the same time, in April 2017 (OECD, 2017^[11]).

Coverage of wireless networks can be measured by the portion of the population covered by each type of network, whether 2G, 3G or 4G Long-Term Evolution (LTE). Within SEA, geographical network coverage of cellular wireless networks differs among countries. For example, the availability of network technologies that allow mobile broadband (3G and 4G) provision varies from country to country, although more than 95% of the population in every SEA country were covered by 2G technology in 2017. Also in 2017, 3G coverage in SEA countries ranged from 78% to 100% of the population, and deployment of 4G (or LTE) networks was still at an early stage in Cambodia, Lao PDR and Myanmar, and Cambodia (Figure 2.8).

Figure 2.8. Percentage of population in SEA covered by mobile networks, by technology (2017)



Note: Lao PDR = Lao People's Democratic Republic.

Source: ITU (2019^[2]), *ITU World Telecommunication/ICT Indicators* (database), <https://www.itu.int/en/ITU-D/Statistics/Pages/default.aspx>; ADB (2018^[10]), *Basic Statistics 2018*, <https://www.adb.org/publications/basic-statistics-2018>.

Singapore had the most extensive mobile broadband network coverage in the region in 2017, with 100% of the population covered by 3G and 4G networks. Its geography doubtless favoured a faster roll-out and upgrading of networks than might be possible in SEA countries with larger rural areas. In Thailand, however, 98% of the population had both 3G and 4G network coverage. In Viet Nam, 98% of the population had 3G network coverage and 95% were covered by 4G networks. In Malaysia, 96.2% of the population had 3G coverage and 92% had 4G coverage. Myanmar had notably high coverage (95%) by both 2G and 3G networks in 2017, reflecting the fast deployment of wireless networks following the liberalisation of its telecommunication market in 2012. In addition, 29.5% of the population

in Myanmar were covered by 4G networks. Elsewhere in SEA, 4G coverage is growing: 9% of the population in Lao PDR and 57.5% of the population in Cambodia had this coverage in 2017 (Figure 2.8).

Measuring network coverage by percentage of population differs from other measures of coverage that factor in a geographical component. The latter distinction can be important when coverage targets are circumscribed. For example, specifications in spectrum licenses, if expressed in terms of population, may be more readily achievable if the country in question has highly dense urban areas.

In countries with large rural areas, mountainous areas, archipelagos and so forth, measuring coverage by percentage of population may be misleading as a large part of the territory may have little access at all to wireless networks. For example, in Cambodia, 99% and 84% of the population were covered with 2G and 3G networks, respectively, in 2017, according to Telecommunication Regulator Cambodia. But only 73.7% and 29.5% of Cambodia's land mass were covered by 2G and 3G networks, respectively, in the same year (Government of Cambodia, 2018_[13]). With regard to faster mobile broadband networks relying on LTE technology, it should be noted that 57.5% of the population in Cambodia had access to 4G coverage in 2017 while just 12.7% of the country's land mass was covered by 4G networks in 2017 (Government of Cambodia, 2018_[13]).

Complementarity of fixed and wireless networks

Fixed and mobile networks in OECD countries are complementary, as most users are connected to WiFi technology for more than half of their day and they download far more data over WiFi than on cellular networks (OECD, 2019_[12]). Moreover, the offloading of this traffic improves the performance of cellular access for other users because fixed networks are doing what the OECD (2017_[11]) calls the "heavy lifting". Nevertheless, the substitution between fixed and wireless services may be greater in countries with emerging digital markets, including in SEA countries with underdeveloped fixed broadband networks.

In emerging communication markets in Asia, such as in India, smartphone users are connected to WiFi less than one-fifth of their smartphone use time (18.4% in 2017), and in Myanmar, they are connected to WiFi less than one-sixth (14.6% in 2017), according to OpenSignal (OECD, 2017_[11]). The lack of development in fixed networks is one of the reasons average speeds tend to be much lower in SEA than in OECD countries.

In emerging countries, substitution between mobile and fixed networks has taken a different form than in OECD countries. In a 2G and even a 3G era, typified by voice and SMS rather than data, this substitution was less of a constraint. With the growing demand for data over 4G networks, the substitution, or rather complementarity, between mobile and fixed networks could change (OECD, 2017_[11]). As the demand for mobile data traffic increases, however, wireless networks rely more and more on fixed broadband infrastructure. In a way, wireless networks become extensions of fixed networks. Thus, it is crucial for emerging countries to deploy fixed network infrastructure, as there is an increasing need for fibre backhaul deployment. This is the case in Asia, as noted by Reliance Jio when launching its 4G network in India. As an integral part of its network deployment plans, the company decided to establish WiFi hotspots connected to fixed networks (OECD, 2017_[11]). As other companies that adopt this strategy, Reliance Jio makes sure WiFi use is part of its tariff plans and that users can seamlessly transfer from cellular to WiFi to maximise the amount of data traffic offloaded onto fixed networks (OECD, 2017_[11]).

Although the complementarity of fixed and wireless networks tends to be higher in developed economies, mobile networks in many countries in SEA rely on offloading a significant amount of data traffic onto WiFi networks. Because WiFi can be used for more data intensive services and applications, WiFi networks can be said to complement mobile broadband regarding data usage (Ericsson, 2015^[14]). While in Singapore, some 80% of mobile traffic was offloaded using WiFi networks in 2015, in countries with lower mobile broadband penetration, such as Indonesia, around 33% of smartphone data was consumed via mobile broadband networks and the remaining 66% through WiFi (Ericsson, 2015^[14]).

Affordability

Consumers and SMEs need clear, transparent and readily accessible information on communication services to make informed decisions, and any comprehensive list of broadband metrics developed by policy makers and regulators should therefore include indicators on prices. Access to this information empowers consumers and SMEs, provides useful insights about the level of competition in a given market, and complements other metrics used to assess the sector's overall efficiency and performance (OECD, 2013^[15]). In many emerging countries, one of the main barriers to access and use of ICTs is linked to affordability issues.

Prices of communication services depend greatly on the competitive conditions of the market in each country and, in some instances, on regulation for specific services. In a sector with high fixed costs and barriers to entry, as is often the case for some telecommunication segments, the institutional and regulatory framework effects the resulting market structure and, this has a direct influence on the affordability of communication services and the disciplines applied to prices by competition. In this sense, the prices of communication services and levels of investment provide useful indicators of competition and framework conditions in communication markets in the SEA region. Chapter 5 discusses regulatory and institutional framework conditions affecting communication market and prices.

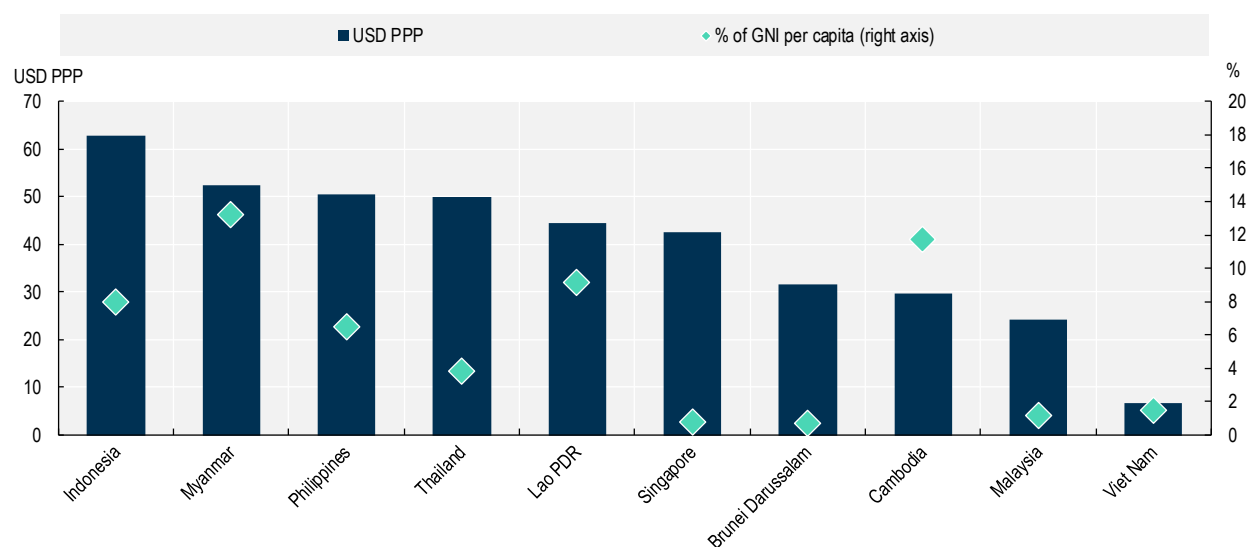
Affordability remains an important hurdle to broadband adoption in the SEA region, as prices are high relative to income levels and wealth distribution, especially for the most economically disenfranchised segments of the population. As affordability is a relative measure, prices should be examined on a regular basis to better track market trends in the region. The International Telecommunications Union (ITU) assesses prices of communication services by comparing packages of fixed and mobile broadband and their prices as a percentage of the monthly gross national income (GNI) per capita in a given country. The United Nations Broadband Commission for Sustainable Development has defined affordability of broadband as services priced below 5% of GNI per capita (Broadband Commission for Sustainable Development, 2017^[16]). This section presents a snapshot of pricing trends for 2017.

Fixed broadband prices in SEA are relatively high, which may contribute to digital divides among and within countries. In particular, prices in 2017 were highest in Myanmar, Lao PDR, Cambodia, Indonesia and the Philippines, ranging from 13.2% of GNI per capita in Myanmar to 6.5% of the monthly GNI per capita in the Philippines (Figure 2.9). This means that five of the ten ASEAN countries do not have affordable fixed broadband, as prices all exceed the 5% threshold set as an affordability target by the Broadband Commission (Broadband Commission for Digital Development, 2010^[17]).

The most affordable fixed broadband plans in the SEA region in 2017 were in Singapore, Brunei Darussalam and Malaysia, where broadband subscription prices range from about 1% in Malaysia to 0.7% of GNI per capita in Brunei Darussalam (Figure 2.9). Not surprisingly, these three countries lead in the region not only in terms of affordability but also in terms

of the proportion of population on line (i.e. they also are in the high Internet usage cluster). This underscores the importance of affordability to expanding the use of digital services. In Viet Nam, prices for fixed broadband in terms of USD purchasing power parity (PPP) were the lowest in SEA and in the Asia-Pacific Economic Cooperation (APEC) region in 2017, at USD PPP 6.8. However, in terms of the share of GNI per capita, the relative price of a broadband package in Viet Nam was 1.5% in 2017 (Figure 2.9).

Figure 2.9. Price of fixed broadband monthly subscriptions in SEA (2017)

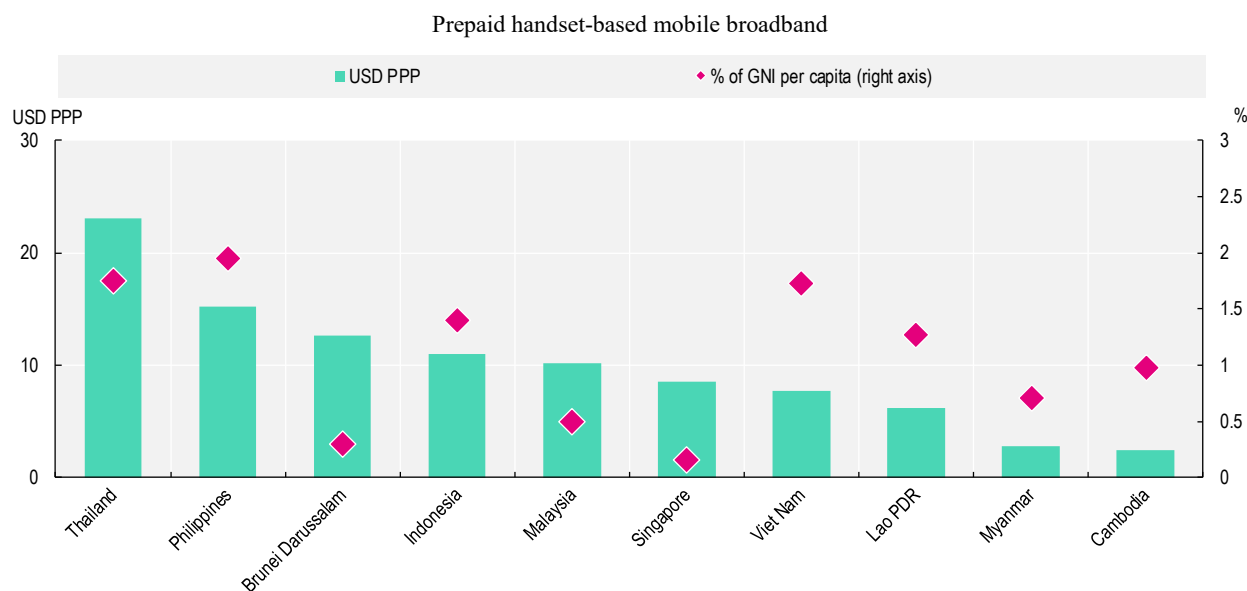


Notes: PPP = purchasing power parity; GNI = gross national income; Lao PDR = Lao People's Democratic Republic. Prices refer to fixed (wired) broadband monthly subscription charges. The ITU defines fixed (wired) broadband as any dedicated connection to the Internet at downstream speeds equal to – or greater than – 256 kilobits per second (kbps). If several offers are available, preference is given to the lowest connection speed. *Source:* ITU (2019^[2]), *World Telecommunication / ICT Indicators* (database), <https://www.itu.int/en/ITU-D/Statistics/Pages/default.aspx> (accessed July 2019).

Naturally, mobile broadband is much more affordable in SEA because; mobile networks have higher penetration than fixed networks in the region and in many SEA countries, mobile markets are highly competitive. All countries in the region have achieved the affordability target for handset-based mobile broadband set by the Broadband Commission. For instance, in 2017, regional prices of handset-based mobile broadband range from 0.2% of GNI per capita in Singapore to 1.9 % of GNI per capita in the Philippines (Figure 2.10).

As was the case in fixed broadband prices, the leading SEA countries in terms of affordability of handset-based mobile broadband were Singapore, Brunei Darussalam and Malaysia, which also are in the cluster of high usage countries. In terms of GNI per capita, prices in Thailand were 1.8% and in Viet Nam, comparable to prices in Peru and India (1.8%). The Philippines, Thailand and Viet Nam have the most expensive handset-based mobile broadband packages in the region, measured as a share of GNI per capita (Figure 2.10). Some mobile broadband packages are dongle or computer-based. For these plans, the least affordable countries measured in terms of the price as a share of GNI per capita are Viet Nam, Lao PDR and Malaysia, and the most affordable are Singapore, Brunei Darussalam and Indonesia (Figure 2.11).

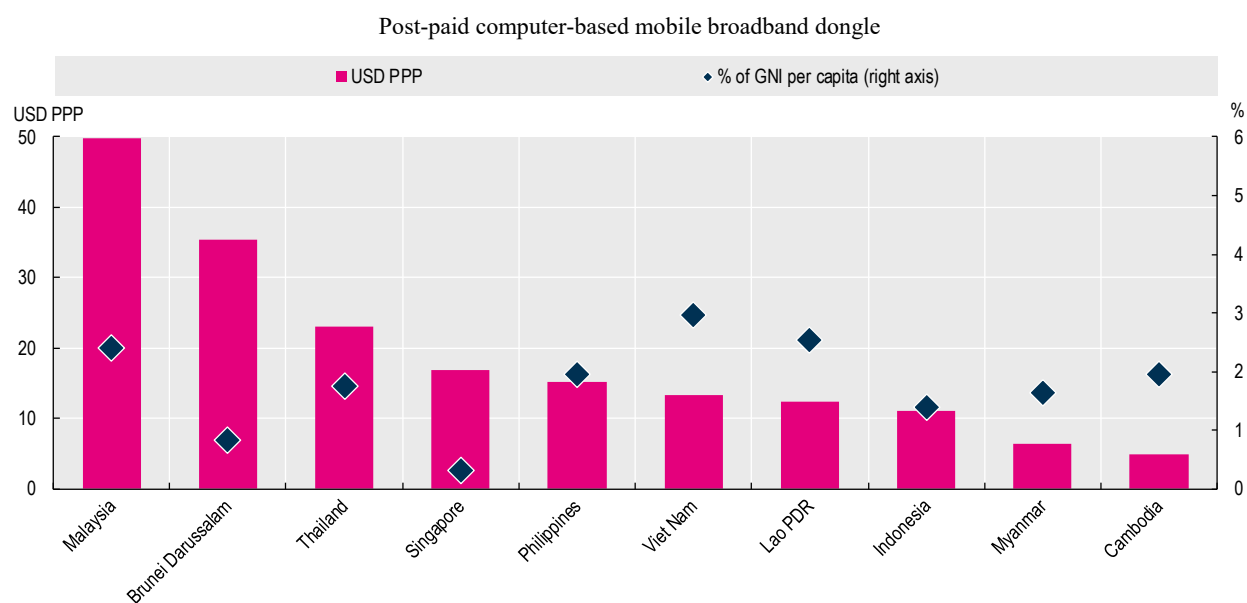
Figure 2.10. Price of mobile broadband monthly subscriptions (500 MB) in SEA (2017)



Notes: PPP = purchasing power parity; MB = megabyte; GNI = gross national income; Lao PDR = Lao People's Democratic Republic. Prices refer to mobile broadband, handset-based prepaid plan tariffs with 500 MB volume of data, including the tax rate applied to the price of the plan.

Source: ITU (2019^[2]), *ITU World Telecommunication/ICT Indicators* (database), <https://www.itu.int/en/ITU-D/Statistics/Pages/default.aspx> (accessed in July 2019).

Figure 2.11. Prices of USB mobile broadband subscriptions (1 GB) in SEA (2017)



Note: PPP = purchasing power parity; GB = gigabyte; GNI = gross national income; Lao PDR = Lao People's Democratic Republic. Prices refer to mobile broadband, USB and/or dongle-based, post-paid plan tariffs with 1 GB volume of data, including the tax rate applied to the price of the plan.

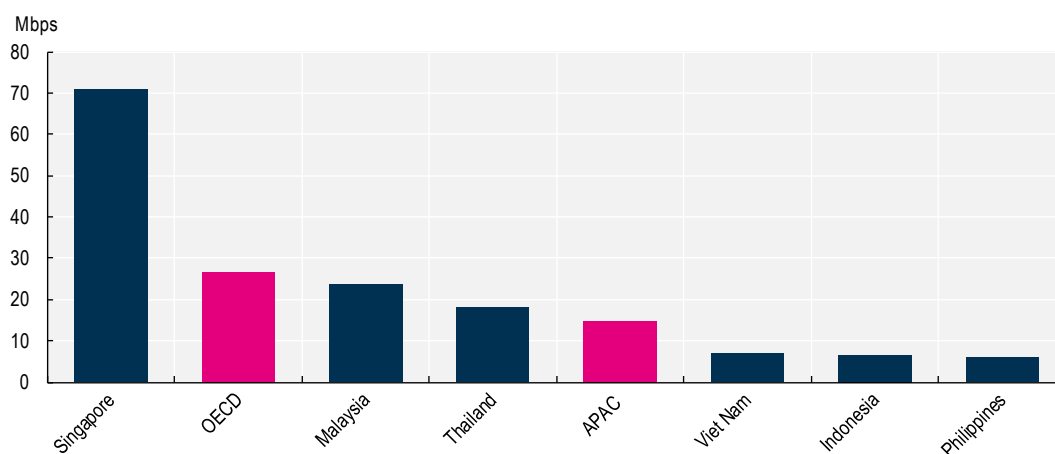
Source: ITU (2019^[2]), *ITU World Telecommunication/ICT Indicators* (database), <https://www.itu.int/en/ITU-D/Statistics/Pages/default.aspx> (accessed on 16 July 2019).

Quality

A key indicator associated with assessing the quality of fixed and mobile broadband services is the speeds experienced by users. Internet speeds are always measured from the perspective of the networks involved. The content distribution networks, M-Lab and Akamai, are valuable sources for measuring broadband speeds.

According to M-Lab data, which tracks broadband data in 207 countries, including the Asia Pacific region (APAC),¹ Singapore leads the SEA region in terms of download speeds for fixed broadband, or 70.8 megabits per second (Mbps), whereas the Indonesia and the Philippines exhibit low fixed broadband speeds of 6.7 and 6 Mbps, respectively (Figure 2.12).

Figure 2.12. M-Lab measurement of mean download speeds (fixed broadband) in selected SEA countries vs. and APAC and OECD (2019)



Notes: Mbps = megabits per second. The APAC average refers to 40 economies, including the People's Republic of China and Chinese Taipei.

Source: Cable (2019_[18]), *Worldwide Broadband Speed League 2019* (database), <https://www.cable.co.uk/broadband/speed/worldwide-speed-league/>.

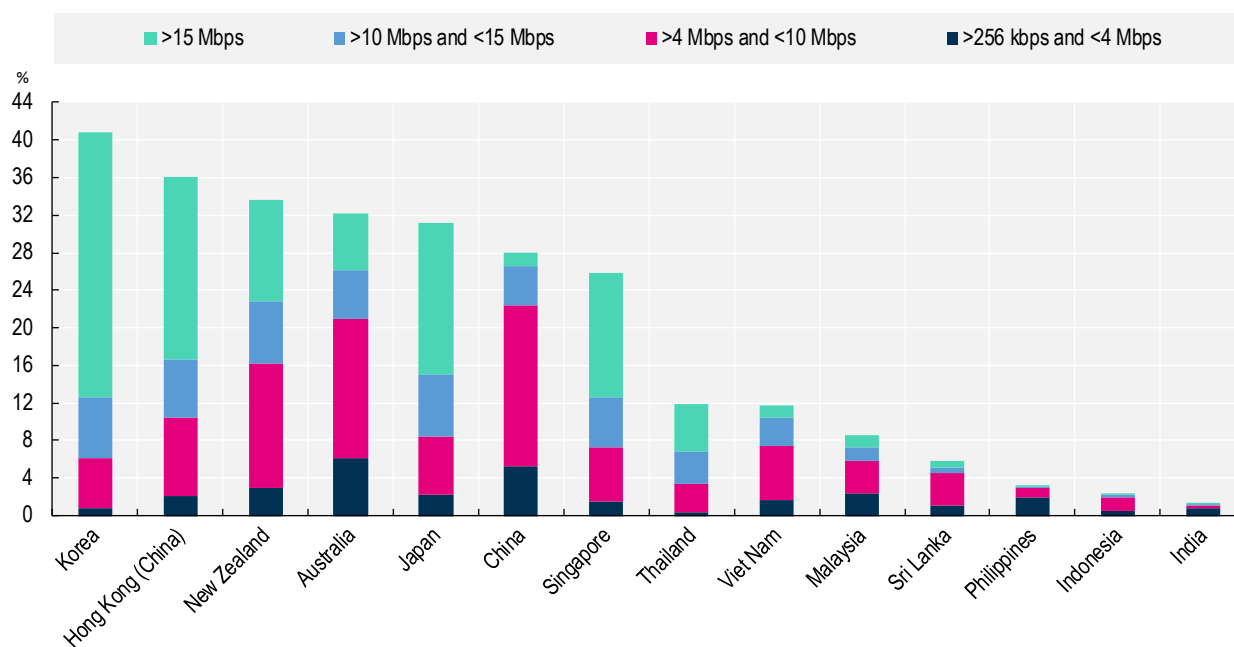
Akamai (2017_[19]) data regarding fixed network connections_[19] in selected countries show the OECD average speed in 2017 was 15.3 Mbps, which was similar to the APAC regional average of 13.6 Mbps. Among SEA countries in the sample, average fixed broadband connection speeds were highest in Singapore (20.8 Mbps), followed by Thailand (16 Mbps), Viet Nam (9.5 Mbps) and Malaysia (8.9 Mbps). Fixed broadband speeds in Indonesia and the Philippines were 7.2 Mbps and 5.5 Mbps, respectively (Akamai, 2017_[19]).

Notwithstanding the positive developments that many APAC and OECD countries have experienced in terms of both advertised baseline speeds for broadband and actual speeds experienced by users, delivering broadband at this quality to all geographical locations remains a challenge even in leading OECD countries such as Korea. This is illustrated by the variation in average speeds vary across countries, and suggests why it may be preferable to look at speeds relative to broadband penetration rates.

The combination of data provided by ITU on broadband subscriptions by 100 inhabitants and by Akamai on the actual download speeds by speed tiers, allows the analysis of the percentage of subscriptions by speed tiers in selected APAC countries (Figure 2.13). For example, 51% of fixed broadband subscriptions in Singapore exhibited speeds higher than 15 Mbps; the percentage of connections with those speeds were lower in Malaysia (14%),

Viet Nam (11%) and Indonesia (Akamai, 2017_[19]). In the Philippines, the vast majority of fixed broadband subscriptions (59%) fall into the lowest speed tier, as measured by Akamai (2017_[19]), of 256 kbps to 4 Mbps. Surveys by LIRNEasia (2018_[20]) found that it is precisely poor Internet service speeds that inhibit greater use of the Internet by consumers in some Asian countries, particularly Cambodia.

Figure 2.13. Fixed broadband subscriptions per 100 inhabitants in selected Asia Pacific countries (2017), per Akamai speed tiers (Q1 2017)

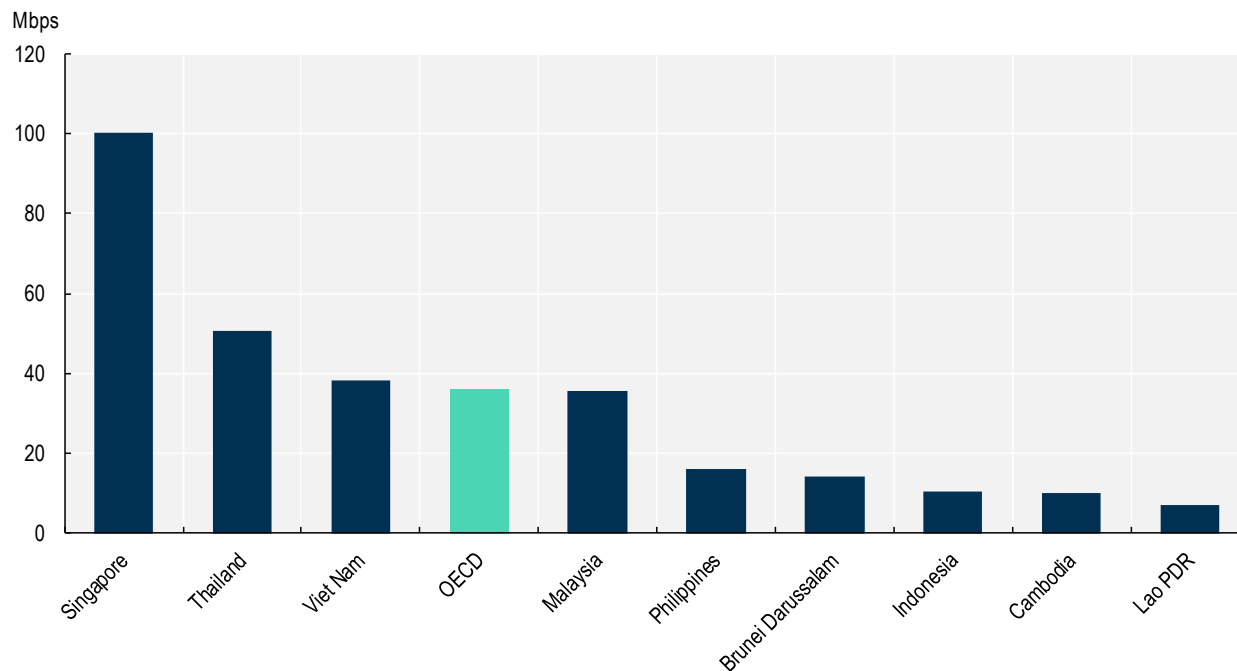


Notes: Mbps = megabits per second; kbps = kilobits per second; China = People's Republic of China. In Korea, 96.2% of subscriptions have a speed above 50 Mbps.

Sources: For fixed broadband penetration rates for OECD countries, July 2017 data in OECD (2019_[8]), *Broadband Portal* (database), <https://www.oecd.org/sti/broadband/broadband-statistics/>; for data on fixed broadband penetration in other Asia Pacific countries that are not OECD countries, 2017 data in ITU (2019_[2]), *ITU World Telecommunication/ICT Indicators* (database), <https://www.itu.int/en/ITU-D/Statistics/Pages/default.aspx>; for speed tiers of all countries, Akamai (2017_[19]), *State of the Internet Q1 2017 Report*, <https://www.akamai.com/us/en/multimedia/documents/state-of-the-internet/q1-2017-state-of-the-internet-connectivity-report.pdf>.

Another way to assess average download speeds as an indicator of quality is to look at one of the most Internet Protocol (IP) traffic-intensive applications: online games (OECD, forthcoming_[21]). One source is the platform Steam, which provides data on network performance for online games for one of the most demanding groups of Internet users (Steam, 2019_[22]). As shown in Figure 2.14, the average download speed for games played during a sample period (3-10 July 2019), was highest in Korea among all OECD countries, at 106.5 Mbps, followed by Japan (69.6 Mbps) and Sweden (68 Mbps). The average download speed in Singapore – 100 Mbps, according to Steam data – was similar to that of OECD's top performers. Thailand exhibits speeds of 50.6 Mbps, slightly higher than the OECD average of 36 Mbps.

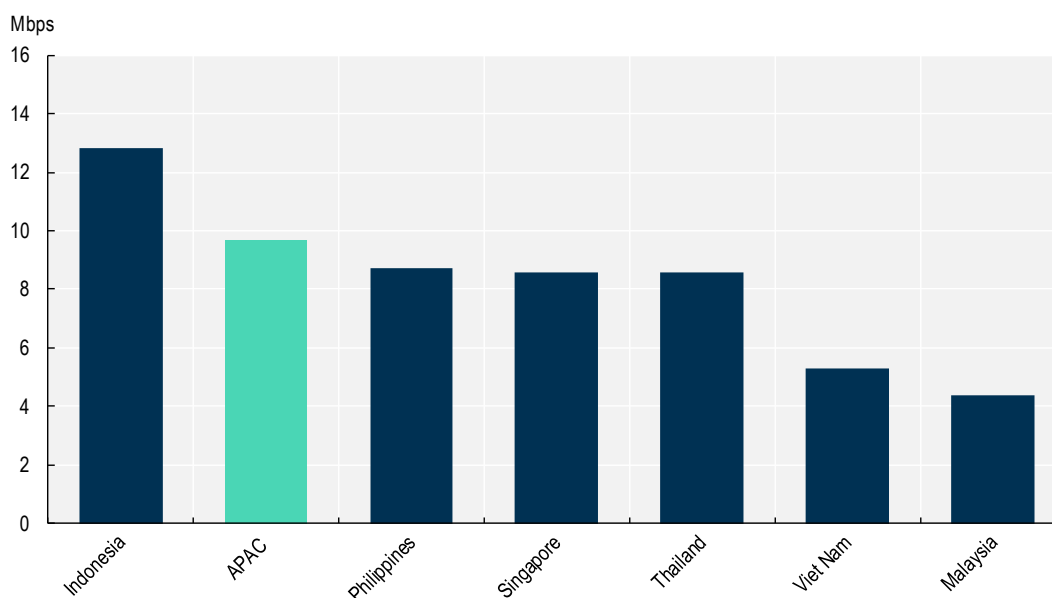
Figure 2.14. Average download speed of Steam Games, selected SEA countries vs. OECD (July 2019)



Notes: Mbps = megabits per second; Lao PDR = Lao People's Democratic Republic. Data were retrieved on 10 July 2019, and cover the average download speed during the seven-day period from 3 to 10 July 2019.

Source: Steam (2019^[22]), *Steam Download Statistics*, <http://store.steampowered.com/stats/content/> (accessed on 10 July 2019).

Figure 2.15 Akamai's average mobile broadband download speed in selected SEA countries vs. APAC (Q1 2017)



Note: Mbps = megabits per second.

Source: Akamai (2017^[19]), *State of the Internet Q1 2017 Report*, <https://www.akamai.com/fr/fr/multimedia/documents/state-of-the-internet/q1-2017-state-of-the-internet-connectivity-report.pdf>.

Mobile broadband is more pervasive than fixed broadband networks in the SEA region. In 2016, Akamai updated its speed methodology to tease out mobile network statistics from the traditional metrics on broadband download speeds (Akamai, 28 September 2016^[23]). The latest data collection from Akamai for download speeds dates to 2017 but remains one of the few sources that allows assessment of mobile broadband network speeds. Given how extensive these networks are in SEA, these data also show a comprehensive picture of the experience of users in SEA countries. Notably, connection speeds in Indonesia reach 12.8 Mbps, a performance similar to that recorded in Korea (11.8 Mbps). The APAC average in the sample is 9.7 Mbps, similar to the mobile broadband speeds experienced in Singapore (8.6 Mbps). Mobile broadband speeds in Viet Nam and Malaysia are 5.3 Mbps and 4.4 Mbps, respectively (Figure 2.15).

Box 2.1. Towards a gigabit society: The case of Singapore

One of the most striking examples of a structurally separated network is that of Singapore. The wholesale infrastructure company in the country provides dark fibre to ISPs, who are free to provide any layer of service above that level. As a result, Singapore is among the first countries with commercial 10 Gbps services for consumers; it also is one of the first where ISPs are able to configure broadband access in ways that, in their assessment, will most drive the take-up of services. One example is the offer to customers of having two 1 Gbps fibre connections to a single household. Many countries have more than 100% mobile penetration, thanks to the fact that users commonly have multiple SIM cards. Singapore, however, is the first, and so far, only country to have more fixed line subscriptions than households. The reason is not that more than 100% of households are connected, but rather that there are more fixed line subscriptions in Singapore than household premises. In other words, ISPs in a very competitive market have been tremendously successful at assessing demand in ways that may not have been obvious to a wholesale provider. For example, MyRepublic, an ISP in Singapore, sells 1 Gbps Internet access at USD 59 and two such connections for just an additional USD 10 (MyRepublic, 2018^[24]).

Clearly, both retail providers and consumers are attracted by the marginal cost and the wholesale arrangements that enable such an innovative approach. In addition to offering multiple 1 Gbps connections, MyRepublic assures service quality relies on a method that distinguishes between different traffic types in the assignment of transmission priority. It has been suggested that this offering would violate net neutrality non-discrimination rules in some other countries.

Another notable feature of the landscape in Singapore is subscription plans aimed at users who want 1 Gbps connections prioritised for playing games. Users who believe latency is critical to their online gaming experience can opt for MyRepublic's GAMER plan, which allows them to request custom routing with the aim of optimising an individual game's performance. Features such as custom routing can generally only be found in business plans with specific service-level agreements, and not residential plans.

Policy makers and regulators should not be asking why users would need a 1 Gbps connection or two such connections in different rooms of a residence, or why some users would pay more to optimise one of their connections to gain what they see as an edge in game playing. Market demand in the way broadband connections are used, and the elements that can stimulate their greater adoption and use, evolve rapidly. The challenge for policy makers and regulators is to ensure that the market is responsive to such demand by promoting competition between end-to-end infrastructure providers and ensure that wholesale providers maximise the ability of retailers to respond to this demand in the same manner as end-to-end providers in a competitive market.

Source: OECD (2017^[11]), *OECD Digital Economy Outlook 2017*, <http://dx.doi.org/10.1787/9789264276284-en>.

These indicators show the actual download speeds experienced by communication users in different countries. Speeds may differ from communication operators' commercially advertised speeds. Consumer offers that are marketed at 1 gigabit per second (Gbps) for fixed networks are increasingly common across OECD countries, particularly where fibre-to-the-premises or upgraded cable broadband networks exist. This is the case in countries with high population densities, such as Japan and Korea, as well as in an increasing number of cities in New Zealand, Sweden and the United States (OECD, 2017^[11]).

Residential offers at 1 Gbps are most common where there is either strong infrastructure competition between operators or competition between retail providers using wholesale networks. In Korea, for example, there is widespread infrastructure competition with residential apartments commonly being able to access three so-called "fibre to the basement" providers. This means the building residents, who own the inside wiring, are in a strong position to jointly negotiate very competitive prices for connections to all residences. As a result, 1 Gbps services, with unlimited data usage, are available in Korea at around USD 25 per month (OECD, 2017^[11]). Singapore has taken the lead in this area, and is one of the first countries with commercial offerings of 10 Gbps (Box 2.1). Internet service providers (ISPs) in Singapore also are pioneering new approaches to market Internet access, for example to serve gaming customers, and are expanding their service to other countries including Indonesia (Tan, 2017^[25]) (TeleGeography, 2015^[26]). Two of these firms, MyRepublic and Singtel in Singapore, have graduated to business customers from offering services targeted at residential users with high demand (MyRepublic, 2018^[24]; Singtel, 2018^[27]).

Rural digital divide

In SEA countries other than Singapore and Brunei Darussalam, people living in rural and island areas make up a high proportion of the overall population. Of the 630 million people in the SEA region, many live outside of urban areas (Table 2.2). As is often the case in many regions around the world, these parts of SEA experience a substantial digital divide that is characterised by lack of availability or reduced choice of quality and affordable broadband services. This divide stems from the generally higher investment costs needed to establish communication infrastructures in rural areas compared to the cost in urban locations.

Table 2.2. Capital area population ratio in SEA countries (2017)

Country	Population (million)	Population density (persons per km ²)
Brunei Darussalam	0.42	73
Cambodia	15.4	87
Indonesia	258.7	137
Lao PDR	6.6	29
Malaysia	31.63	97
Myanmar	52.92	79
Philippines	100.98	350
Singapore	5.61	7 796
Thailand	65.93	132
Viet Nam	92.69	283
SEA	630.88	143

Note: km² = square kilometre; Lao PDR = Lao People's Democratic Republic.

Source: ASEAN (2018^[28]), *ASEAN Statistical Leaflet 2018: Key socio-economic indicators*, www.aseanstats.org/wp-content/uploads/2018/10/ASEAN_Statistical_Leaflet_2018.pdf.

Given that a high proportion of the population live and work in rural areas of many parts of SEA, it is important to address and bridge the rural digital divide. Some OECD countries have already noted that poor provision of broadband is detrimental to SMEs in areas outside major cities and urban centres (Box 2.2). More broadly, providing greater access to high-speed broadband in rural areas also is critical to ensuring that people living in these locations are able to enjoy the benefits of digital transformation and to fostering growth in rural economies. Despite the admirable efforts in SEA countries and elsewhere, a digital divide nevertheless persists in areas with lower population densities, indicating that more needs to be done to tackle it.

Rural digital divides impact SMEs and rural areas in SEA in many ways. They hamper SMEs from acquiring timely information regarding demand that can help them reach markets and from more broadly accessing other information they need to flourish. As different regions often face similar challenges in this area, sharing knowledge and experience among SEA countries can help developing important new approaches to improve communication services in rural areas.

Box 2.2. SMEs in rural areas

United Kingdom

A 2018 report prepared by BDRC Continental (2018^[7]) for Ofcom, the communication regulator in the United Kingdom, stated that SMEs in rural areas are generally less satisfied than their urban counterparts with the availability, connection speed, speed paid for and reliability of their fixed broadband service. The report was based on a 2016 survey of 1 501 SMEs in the United Kingdom that found only 62% of SMEs in rural areas were satisfied with the broadband connection compared to 85% of SMEs in urban areas. Businesses interviewed in rural areas identified “limited choice of providers” and lack of “customer services” as the main causes for concern. Subsequent to the survey, the United Kingdom government has implemented several programmes to address these issues. An example is the Building Digital UK programme, which achieved the goal of connecting 95% of households and businesses in every county with 25 Mbps broadband connections in 2017. Another government programme, started in May 2019, is the Rural Gigabit Connectivity programme, which aims to connect the final 10% of unconnected premises in the country with full fibre connections by 2023 (Government of the United Kingdom, 2019^[29]).

Ireland

In a nationwide survey in Ireland of more than 250 business owners and managers regarding ICTs, 56% of respondents cited broadband as the single most important challenge facing Irish SMEs. In addition, 96% of the businesses surveyed agreed with the statement that “businesses in rural Ireland are at huge competitive disadvantage due to poor quality broadband” (O’Donnabhain, 2018^[30]). The National Broadband Ireland plan seeks to address this concern by connecting every remaining home and business in the country with a minimum of 30 Mbps by 2020 (Government of Ireland, 2019^[31]).

In a sense, there will always be a digital divide, as it takes time and resources to roll out new networks including new generations of wireless technologies and the fixed backhaul required to support them. Roll-out is all the more challenging in SEA, given the geographical challenges such as in archipelagos. At the same time, however, new technologies offer the potential to provide service for the first time in some locations, improve existing services in others, and do so at a lower cost in some cases than has previously been possible.

Communication markets in SEA

The ASEAN region has become one of the most dynamic in terms of mobile broadband penetration. A report by Ericsson (2017^[32]) noted that three countries of the top ten countries in the world for adding net mobile subscribers are in SEA (Myanmar, Indonesia and the Philippines). ITU data show that mobile broadband penetration rates from 2012-17 grew more than 100% annually in some SEA countries and, notably, in Lao PDR and Myanmar, the compound annual growth rates were 146% and 109%, respectively. The mobile broadband penetration rate in the ASEAN region as a whole has grown about 41% annually from 2012 to 2017. In comparison, this grew at a rate of 11% per year in the OECD over the same period.

Individuals and firms in SEA countries were connected mostly through mobile broadband in 2017, when average regional mobile broadband penetration was 85%; the fixed broadband penetration rate that year was 5.2%. On average in 2017, 3G networks covered 92% of the population and 4G networks covered 74% of the population. Some countries in the region had especially high smartphone penetration that year, including Myanmar and Singapore at about 80% penetration. As noted, mobile broadband is affordable (against UN targets) in SEA, and speeds for mobile broadband networks are relatively high, according to Akamai data, with an average of 8.1 Mbps for countries in the region (Table 2.3).

Table 2.3. SEA availability indicators at a glance, mobile and fixed networks (2017)

Country	Mobile voice penetration (%)	Smartphone penetration (%)	Unique mobile subscribers (%)	Mobile broadband penetration (%)	Fixed broadband penetration (%)	3G coverage (%)	4G coverage (%)
Brunei Darussalam	127	..	..	127	9.6	93	90
Cambodia	116	..	..	67	0.8	84	58
Indonesia	165	40	58	98	2.4	94	90
Lao PDR	54	..	..	40	0.4	78	9
Malaysia	134	65	76	111	8.5	96	92
Myanmar	90	80	50	90	0.2	90	30
Philippines	110	..	..	69	3.2	93	80
Singapore	147	78	72	147	25.6	100	100
Thailand	176	59	85	99	11.9	98	98
Viet Nam	126	28	50	47	11.8	98	95
ASEAN	141	..	..	85	5.2	92	74

Notes: .. = not available; Lao PDR = Lao People's Democratic Republic. Smartphone penetration rates are from Telenor data.

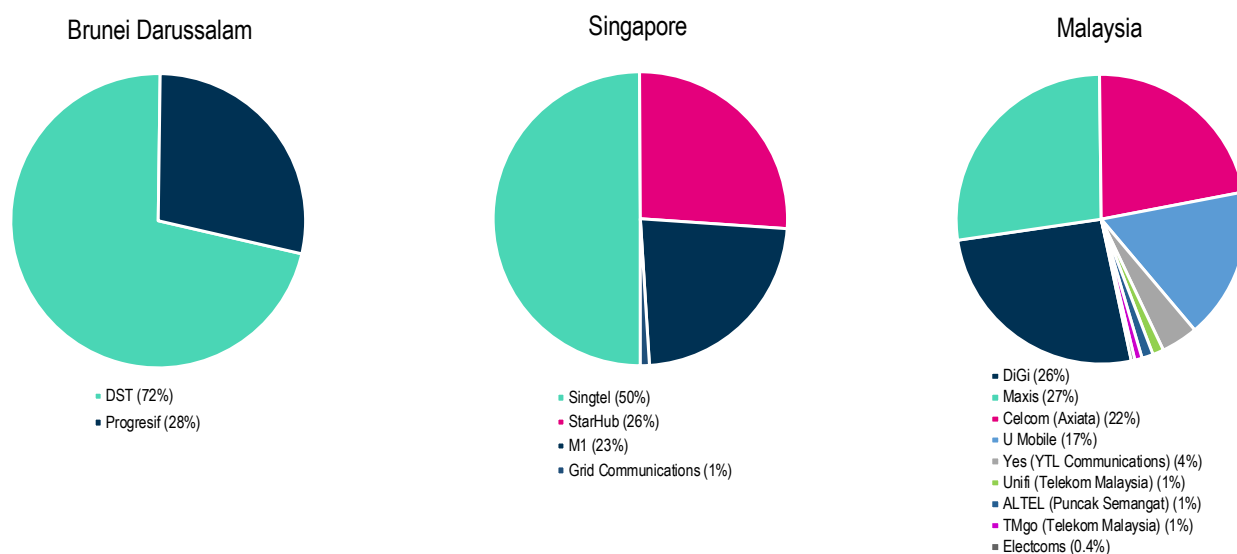
Sources: ITU (2018^[33]), *ITU World Telecommunication/ICT Indicators* (database), <https://www.itu.int/en/ITU-D/Statistics/Pages/default.aspx> (accessed on 16 July 2018); Telenor (2018^[34]), *Releasing Digital Myanmar: Leapfrogging to an Inclusive Digital Economy*, <https://www.telenor.com/wp-content/uploads/2018/02/Telenor-Realising-Digital-Myanmar-Report-06-February.pdf>.

Communication market structures

The structure of communication markets – that is, the level of competition in them – has direct consequences for the availability, quality and affordability of broadband. A focus on mobile networks is especially warranted in SEA as these are more pervasive than fixed broadband networks in many countries in the region. With the exception of Brunei Darussalam and the Philippines, which have only two major players in their markets, SEA countries feature four or more operators (Figures 2.16, 2.17 and 2.18). Mobile markets in SEA, then, are generally very competitive in terms of prices, availability and the presence of several players in the market.

Some heterogeneity is apparent in the mobile market structures of countries in the high Internet usage countries (Brunei Darussalam, Malaysia and Singapore). For instance, only two players are present in the Brunei Darussalam mobile communication market, with one dominant mobile network operator (MNO), DST, holding 72% of market share measured in terms of percentage of subscriptions. The incumbents in Singapore (Singtel) and Malaysia (DiGi), meanwhile, hold less than 50% of the markets. Furthermore, Malaysia has a highly competitive mobile market, with nine players in the second quarter of 2019 and the incumbent DiGi holding 26% of the market (Figure 2.16). Notably, a fourth MNO was launched in Singapore in 2018.

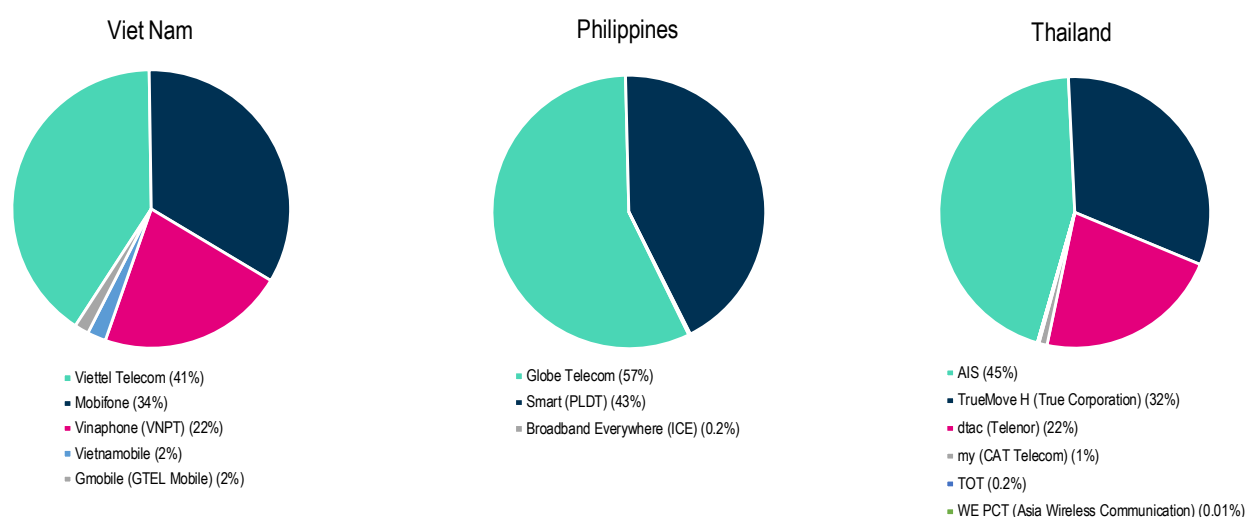
Figure 2.16. Mobile voice market structure in high Internet usage countries (Q2 2019)



Notes: Market shares are measured in terms of subscriptions. The incumbent operator in each of these three countries is shown in bold.

Source: GSMA Intelligence (n/d_[35]), *GSMA Intelligence* (database) <https://www.gsmaintelligence.com/data/>.

Figure 2.17. Mobile voice market structure in partial Internet usage countries (Q2 2019)

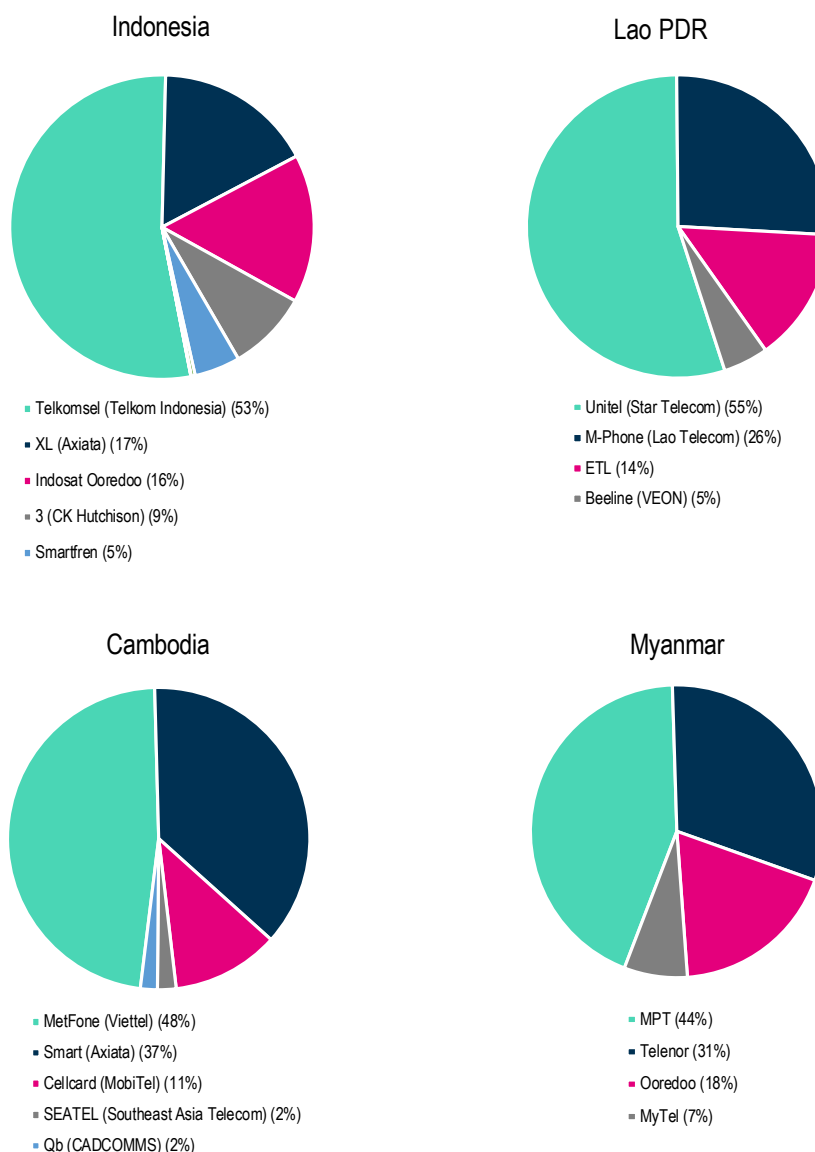


Notes: Market shares are measured in terms of subscriptions. The incumbent operator in each of these three countries is shown in bold.

Source: GSMA Intelligence (n/d_[35]), *GSMA Intelligence* (database), <https://www.gsmaintelligence.com/data/>.

In all three of the partial Internet usage countries (the Philippines, Thailand and Viet Nam), the incumbent also has a market share of about 41% to 57% or less in the second quarter of 2019. Both Thailand and Viet Nam have five to six players in their mobile market; the Philippines has only three MNOs, and the largest, Globe Telecom, has a 57% market share (Figure 2.17).

Figure 2.18. Mobile voice market structure in low Internet usage countries (Q2 2019)



Notes: Lao PDR = Lao People's Democratic Republic. Market shares are measured in terms of subscriptions. The incumbent operator in each of these three countries is shown in bold font.

Source: GSMA Intelligence (n/d_[35]), *GSMA Intelligence* (database), <https://www.gsmainelligence.com/data/>.

The four lower Internet usage countries of Cambodia, Indonesia, Lao PDR, and Myanmar have multiple players in their mobile market. In Indonesia and Lao PDR, the incumbents hold more than half, or 53% and 55%, respectively, of market share). In Cambodia and Myanmar, the incumbent MNOs account for less than half of market share, or 48% and 44%, respectively. A new MNO (MyTel) entered the Myanmar market in 2018, and accounted for 7% of the country's mobile market share in the second quarter of 2019 (Figure 2.18).

Most individuals and firms in SEA now access the Internet through mobile connections. However, as noted, wireless networks are extensions of fixed networks. Given the advantages in speeds and reliability that fixed broadband can offer, underdevelopment of fixed broadband networks in the region likely impacts small and large businesses first. In other words, while mobile networks to date have been playing a leading role in SEA, policies to foster deployment of fixed broadband and increase competition in fixed markets are crucial as well. Not all fixed connections will be entirely over fixed networks. But as long as sufficient fixed backhaul capabilities exist, there is tremendous potential in the future to use fixed wireless in urban and rural areas.

The SEA region in general lags in terms of fixed network infrastructure. The exception is Singapore, which by all measures is similar to Korea, Japan and other leading OECD countries. Infrastructure improvement is especially important given the complementarity of fixed and mobile networks. More fibre is needed in the backhaul (e.g. to support 4G and, in the future, 5G networks) and in the access segment to enable WiFi offloading and higher fixed and mobile broadband speeds (OECD, 2019^[12]). Measures to promote incentives for fixed network upgrades and deployment in SEA would be welcome.

Developments in communication markets

Several countries in the region have gone through important institutional changes that have resulted in bringing millions of new users on line for the first time. Myanmar, for example, experienced a mobile revolution after liberalising its telecom market in 2011, which rapidly expanded mobile subscription. As discussed in the following section, Indonesia and Singapore also offer interesting examples of developments in the communication market.

Myanmar

Reforms in the telecommunication market starting in 2011 have spurred a mobile revolution in Myanmar as shown by the unprecedented growth in the use of mobile services. Between 2011 and 2017, mobile voice penetration in Myanmar rose from 2 to 90 mobile broadband subscriptions per 100 inhabitants (ITU, 2019^[2]). Prior to the reforms, the monopoly provider had little incentive (or capital) to expand services. Liberalisation of the market made it attractive to foreign players, and these new players not only brought investment and experience to compete with the incumbent, but also collaborated with it.

Myanmar's transformation occurred at a time when smartphones had become more affordable, resulting in an extraordinary uptake of mobile broadband: subscriptions per 100 inhabitants rose from 0.01 in 2011 to 90 in 2017. Thus, in 2017, smartphone penetration in Myanmar (about 80%) was the highest in the region, with some handsets costing less than USD 20 (Ericsson, 2017^[32]). In 2010, prior to liberalisation, a single SIM card was priced at USD 1 500, and only the Democratic People's Republic of Korea had fewer mobile telephones (ITU, 2019^[2]). In 2011, the two foreign operators who entered the market, Telenor (Norway) and Ooredoo (Qatar), started to charge around USD 1.50 for a data-enabled SIM card (Tongwaranan, 2016^[36]). Myanmar now has drastically transformed its communication services, with high availability of mobile broadband enabled by the introduction of higher-speed LTE networks.

In 2011, when the government ended the state-owned telecommunication monopoly, it auctioned mobile spectrum licenses with important coverage objectives. By 2014, Telenor and Ooredoo had heavily invested in mobile networks to cover the whole country including its many mountainous areas. In addition, the Japanese carrier KDDI and Sumitomo Corporation entered into a partnership with the state-owned mobile company, Myanmar Posts and Telecommunications (Heijmans, 2017^[37]).

In a country such as Myanmar, where 43% of the population has no access to the electrical grid and 32% live below the national poverty line, building mobile towers requires creative and traditional ways of getting the job done. As noted in a Telenor (2018^[34]) report, rural sites with no electricity rely on diesel generators and create environmental and noise pollution that has attracted the attention of the Ministry of Transport and Communications. Each tower requires a power source, and operators also have stated that manual labour, oxen and even elephants were used to deliver generators to often-challenging locations (e.g. up hills) of the cellular sites. These solutions underline the determination of the people of Myanmar to go digital to create the opportunities a digital transformation can bring to their communities.

There are numerous examples of positive externalities in Myanmar from mobile expansion. For example, banking infrastructure is severely limited in the country. The World Bank has estimated that only 5% of the population have a bank account, which limits the use of banking payment platforms by SMEs and acts as a barrier to e-commerce. However, apps such as Wave Money by Telenor, a mobile money payment platform, are allowing people to transfer money and pay bills on line.

Indonesia

The Indonesian telecommunication industry is characterised by a highly competitive mobile market. Beginning in 2007, strong price competition has contributed to a steep rise in mobile voice subscriptions. These increased from 40 per 100 inhabitants in 2007 to 165 in 2017. As is the case in other SEA countries, however, these numbers may include a substantial proportion of multiple SIM users. Mobile broadband penetration has increased from less than 1% in 2009 to 98% in 2017. The government has favoured competition to lower prices, and it has taken a number of policy initiatives including lowering interconnection fees, issuing a relatively high number of mobile licenses (i.e. to eight mobile operators in 2018) and promoting infrastructure sharing among network operators.

Fixed broadband penetration is much lower than that of mobile broadband. In 2017, according to ITU data, broadband subscriptions in Indonesia amounted to 2.35 per 100 inhabitants. The geography of the country, with the population spread across some 6 000 islands, is challenging in this respect. A severe digital divide exists between urban and rural areas. Authorities in Indonesia took into consideration these challenges to Internet access and, beginning in 2010, have awarded WiMAX licenses to several operators and commercial services with the aim of expanding broadband coverage and lowering prices (OECD, 2013^[15]).

Under the existing universal service framework, operators receiving financial aid from the government-managed universal service fund are required to provide rural areas with basic telecommunication services including low-speed Internet access. The government has undertaken an optical fibre backbone development project called Palapa Ring, consisting of 35 280 kilometres (km) of undersea optical fibre and 21 708 km of underground fibre optics (OECD, 2013^[15]).

Singapore

The leading communication infrastructure project in Singapore is the Next Generation Nationwide Broadband Network, a national open access, wholesale broadband network. In 2008, the Infocomm Media Development Authority selected OpenNet to design, build and operate the passive infrastructure of the network and chose Nucleus Connect to do the same for the active layer of the network (Government of Singapore, 2018^[38]).

In 2014, following a restructuring, NetLink Trust became the designer, builder, owner and operator of the passive fibre network infrastructure, including ducts and manholes, and provider of services over a fibre-to-the-premises network. Through this network, NetLink is providing a number of services to requesting licensees. Requesting licensees provide fibre services to retail service providers who in turn provide retail fibre services to end users (NetLink Trust, 2018_[39]). Another important project is Wireless@SG, a free nationwide WiFi network with 20 000 hotspots across Singapore and speeds up to 5 Mbps.

Singapore is among the leaders in the Internet of Things (IoT). In 2017, Singapore rolled out ASEAN's first nationwide IoT network based on Low Power Wide Area (LPWA) network technology (Sigfox), which covers 95% of the population. Also in 2017, the Government Technology Agency (GovTech) started development of a nationwide sensor network called the Smart Nation Sensor Platform, with common infrastructure and services such as a data sharing gateway and video and data analytics capabilities (Tan, 2018_[40]). During the first phase of the project, GovTech worked with other public agencies to deploy security cameras in public areas, environmental sensors and connectivity infrastructure. GovTech plans to work with the Land Transport Authority to leverage its lamppost infrastructure to test the feasibility of deploying a shared network of sensors (Tan, 2018_[40]). This latter initiative will likely play a role for 5G network deployment in the near future.

Emerging technologies

The IoT represents the next step in convergence – of ICTs, economies and societies, on an unprecedented scale – after the convergence of fixed and mobile networks and telecommunication and broadcasting. The IoT holds out the promise to contribute substantially to further innovation, growth and social prosperity. As is the case with any such development, policy makers and other stakeholders need evidence to inform the decisions they will take in the coming years. As discussed in Box 2.3, a first and crucial step to measure the effects of adoption of the IoT in different policy areas is to develop metrics (OECD, 2016_[41]).

Box 2.3. Measuring IoT

Monitoring the use of devices is an important tool to help understand the development of the IoT in SEA. Measuring can be done in a number of ways:

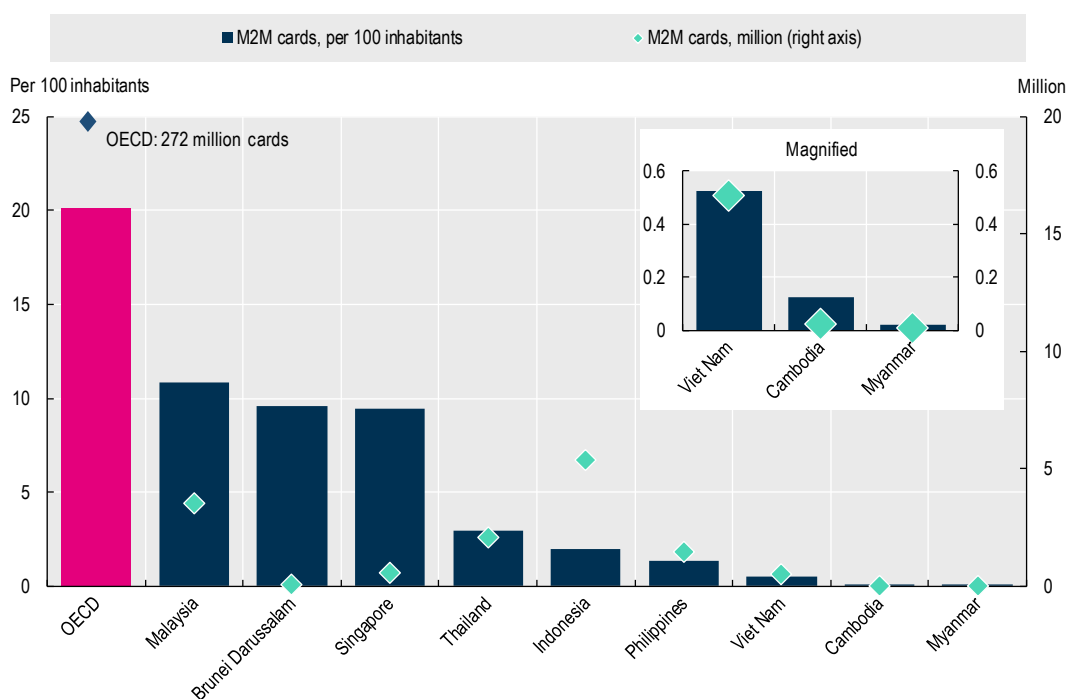
- **A proxy measure** such as the number of SIM cards dedicated to IoT services (e.g. machine to machine [M2M]).¹ While this represents just one part of the IoT, it is an indicator of the use of the IoT and makes subscriptions aimed at traditional mobile services more relevant for the intended use. Using proxy measures such as this is only possible if subscription data used for people and M2M are reported separately.
- **Measures of market developments and spectrum use.** Keeping track of these in licensed and unlicensed frequency bands can help to ensure that sufficient spectrum is available to meet the increasing demand for M2M and IoT services.

1. The GSM Association (GSMA) uses the following definition of M2M: “A unique SIM card registered on the mobile network at the end of the period, enabling mobile data transmission between two or more machines. It excludes computing devices in consumer electronics such as e-readers, smartphones, dongles and tablets.”
Source: OECD (2018_[43]), “IoT measurement and applications”, <https://dx.doi.org/10.1787/35209dbf-en>.

The IoT is expected to grow exponentially, connecting many billions of devices in a relatively short time (OECD, 2015_[42]). M2M-connected devices are a small subset of the IoT. Increasingly, IoT-connected devices are becoming IP-based and platform-agnostic (i.e. operating on mobile, fixed and other networks). M2M devices are characterised by autonomous data communication with little or no human interaction (OECD, 2015_[42]).

In both SEA and in OECD countries, the IoT and M2M subscriptions have grown in recent years. Singapore and Malaysia are leaders in SEA in M2M-connected devices. According to the GSMA and using its M2M definition, M2M penetration in Singapore is higher than the OECD average and in Malaysia, is only slightly lower. However, in some ASEAN countries, IoT applications are still largely under development. For example, M2M subscriptions per 100 inhabitants are less than 0.5% in Viet Nam, Cambodia and Myanmar (in descending order) (Figure 2.19).

Figure 2.19. M2M-embedded mobile cellular subscriptions in SEA (2018)



Notes: M2M = machine to machine. Figures for the OECD average and total M2M SIM cards correspond to data collected from OECD countries' communication regulators.

Source: For SEA countries: GSMA Intelligence (n/d_[35]), *GSMA Intelligence* (database), <https://www.gsmainelligence.com/data/>. For OECD countries, OECD (2019_[8]), *Broadband Portal* (database), <https://www.oecd.org/sti/broadband/broadband-statistics/>.

SEA countries are advancing in terms of the IoT and M2M, although Singapore, one of the first countries in the world to have a national IoT platform, clearly stands apart. The Smart Nation programme in Singapore, launched in 2014, is intended to be what Ericsson (2017_[32]) termed a “living laboratory” for testing smart solutions in an urban context – including connected vehicles, smart homes and wearables.

Remote sensing – IoT solutions using wireless sensor network systems – in combination with cloud and machine learning support for the provision of new services in less developed and remote areas in SEA, is already proving its worth for SMEs. In Indonesia, 80% to 90% of cocoa production comes from small, family-run remote farms. While international demand

for cocoa is on the rise, “cocoa production in Indonesia is affected by climate change; the ageing of trees prone to pests and diseases; and the lack of on-farm scientific knowledge that is mostly due to the difficulty of agronomists to access the fields” (Jouanjean, 2019^[44]). Players in the region are responding to challenges such as these with innovative, IoT solutions.

For example, a Singapore-based company providing IoT solutions called BioMachines has designed a wireless network sensor system to monitor environmental parameters in cocoa fields in Indonesia (Libelium, 2015^[45]). The tool collects data from labs and fields, and facilitates knowledge transfer to the farmers, thereby acting to enhance the sustainability and commercial viability of the cocoa global value chain (Jouanjean, 2019^[44]).

Other examples of IoT projects in SEA countries include so-called smart grid applications in Indonesia, smart farmers Thailand and smart mangroves projects in Malaysia. Indeed, as noted in a mobility study by Ericsson (2017^[32]), Indonesia has connected 90 000 lampposts in Jakarta as part of a smart city project, and in Malaysia a “connected mangroves” project allows villages to better manage these areas by combining cloud, M2M and mobile broadband connectivity solutions. In Thailand, as part of the Thailand 4.0 initiative, the government launched the Smart Farmer project that aims to enhance traditional agricultural techniques with digital tools. The project has launched other Thai innovations that rely on sensors and M2M communication, among them applications that rely on sensors that monitor humidity and climate conditions and activate irrigation (Government of Thailand, 2017^[46]).

Internet infrastructure in SEA

IXPs and data centres

The Internet is essentially a network of different networks around the world that are interconnected at various places. Internet exchange points (IXPs), where Internet traffic is exchanged between networks based on agreements between network operators, play a significant role in this Internet ecosystem. Not only do they connect networks. The location of IXPs also can determine the distance between networks and the cost of sending information from one network to another. The development of a commercialised Internet led to the development of IXPs in OECD countries and elsewhere around the world (OECD/ISOC/UNESCO, 2013^[47]).

Box 2.4. Measuring IXPs

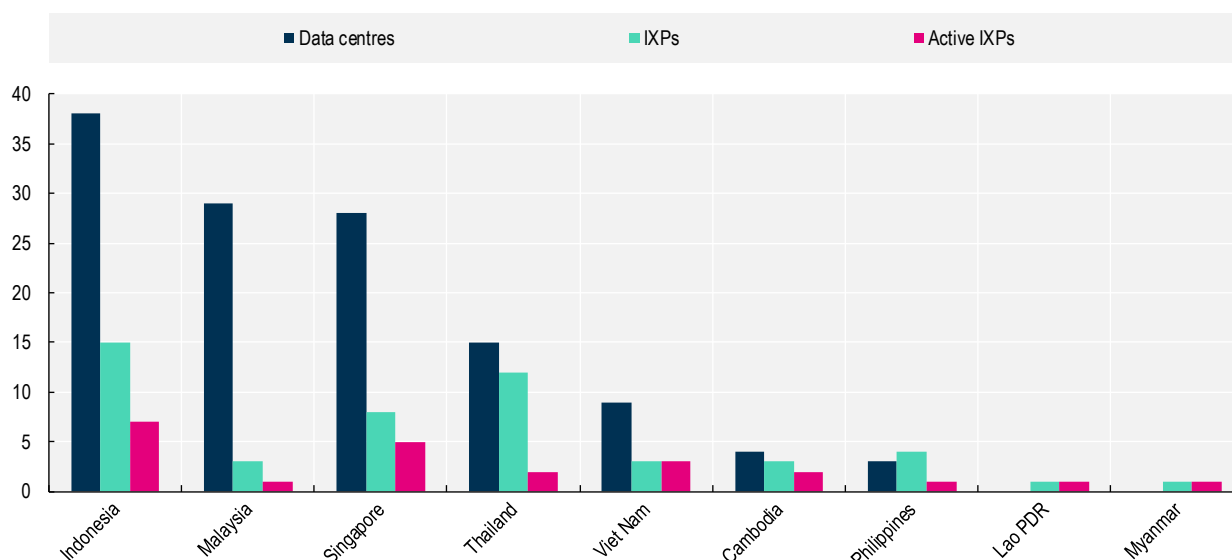
Measurement of IXPs should include the following:

- **Data collection and benchmarking** of the generation of domestic Internet bandwidth at IXPs over time relative to other countries, within the region and internationally. This is especially useful to support the needs of all stakeholders are data on total available capacity at the IXP, total number of connected autonomous system numbers and overall data traffic.
- **Monitoring of membership fees and the conditions for participating** in IXPs to ensure a competitive and neutral interconnection platform.
- **Establishment of measurement points**, either at IXPs or within ISPs, to analyse the overall performance of the IXPs.

The key benefit of a domestic IXP is that it allows domestic Internet traffic – an Internet subscriber reading a local online newspaper, for instance – to be handled locally. This reduces the costs and latency of the communication and increases the speed for users. In countries without IXPs, the handoffs between networks take place in another country or take place between large operators. To understand the enabling Internet ecosystem in a given country or region, it is necessary to measure the development and functioning of IXPs (Box 2.4).

IXPs and data centres are two important elements enabling efficient management of Internet traffic. Indonesia, Malaysia and Singapore are faring better in terms of co-location facilities and IXPs relative to other ASEAN countries while Myanmar, Lao PDR and the Philippines lag regional peers (Figure 2.20).

Figure 2.20. Number of co-location sites (data centres) and IXPs in SEA (2018)



Notes: IXP = Internet exchange point; Lao PDR = Lao People’s Democratic Republic. At the time of writing, data were not available for IXPs and data centres in Brunei Darussalam or for co-location sites in Lao PDR and Myanmar. *Sources:* PCH (2019^[48]), *Internet Exchange Point Growth by Country* (database), https://www.pch.net/ixp/summary_growth_by_country; Data Center Map (2018^[49]), *Data Center Map* (database), www.datacentermap.com/.

An Internet Society/TRPC report (2015^[50]) found that the lack of carrier-neutral IXPs in the SEA region means that smaller ISPs sometimes transit their traffic through the larger network players, even when this traffic could be exchanged directly and locally. Therefore, according to the report, fostering carrier-neutral exchanges should enhance a more competitive playing field. At present, there are several initiatives for carrier-neutral IXPs, including in the Philippines and Thailand.²

The development of a country’s Internet infrastructure can be impeded when an incumbent so dominates the market for backhaul and co-location that it prevents independent co-location facilities from emerging (OECD, 2014^[51]). As discussed in the above-referenced Internet Society/TRPC (2015^[50]) report, a traditional carrier remains dominant in the fixed line market in most ASEAN telecommunication markets despite liberalisation. The incumbents in SEA tend to engage in bilateral arrangements with local carriers rather than peering agreements with these players. In some cases, these arrangements reflect the contributions of different parties towards infrastructure and may reward investment. In other cases, independent, carrier-neutral IXPs act as disciplines on all providers because they provide alternatives for ISPs

to exchange traffic. Where it makes commercial sense to buy transit, such IXPs do so; where they can lower costs by directly exchanging traffic through peering arrangements, they are also free to do so. A lack of carrier-neutral IXPs in the SEA region, however, can mean the competitive dynamics are less than they should be (Internet Society/TRPC, 2015_[50]).

Indonesia has recently boosted development by increasing the number of IXPs from four to seven. Similarly, Cambodia and Thailand have each added a new IXP, increasing their totals from one to two. New IXPs have also opened in Malaysia and the Philippines. The number of IXPs in the SEA region as a whole was expected to increase to 23 in June 2018 from 14 in June 2017, a 64% rise. This high growth rate in SEA is due to the spread of broadband, which is more extensive than in other regions. As a result, IXP growth in the SEA region and increased cable capacity, including undersea fibre optic cables, are expected to support overall broadband development (Table 2.4).

Table 2.4. Growth in the number of IXPs by SEA country

Country	June 2017	June 2018	Net change	% change
Indonesia	4	7	3	75
Singapore	4	5	1	25
Viet Nam	3	3	0	0
Cambodia	1	2	1	100
Thailand	1	2	1	100
Malaysia	0	1	1	100
Philippines	0	1	1	100
Lao PDR	1	1	0	0
Myanmar	0	1	1	100
Brunei	0	0	0	0

Note: Lao PDR = Lao People's Democratic Republic.

Source: PCH (2019_[48]), *Internet Exchange Point Growth by Country* (database), https://www.pch.net/ixp/summary_growth_by_country.

Table 2.5. Best and worst traffic in SEA countries

	Download speed (Mbps)	Latency (ms)
Worst	0.15	230
Best	50.1	7.5

Note: Mbps = megabits per second; ms = millisecond.

Source: Lee (2016_[52]), *A Pre-Feasibility Study on the Asia-Pacific Information Superhighway in the ASEAN Sub-region: Conceptualization, International Traffic & Quality Analysis, Network Topology Design and Implementation Model*, <https://www.unescap.org/sites/default/files/ASEAN%20report%20final.pdf>.

The increase in IXPs in SEA should help to advance the routing of Internet traffic in the region, improve network performance and lower costs for all stakeholders. A survey conducted in 2015 by Korea's National Information Society Agency (NIA) identified IXP growth as one of the key issues for the region (Table 2.5). The report noted large variations in the transmission speeds and delay times experienced in SEA depending on the measurement location (Lee, 2016_[52]). The best result was 50.1 Mbps with latency of 7.5 milliseconds (ms); the poorest result was only 0.15 Mbps with latency of 230 ms. The least performing routes could only support basic services such as text-based web services. Considering the performance recorded for these international links, it is not easy for SMEs to take advantage of broadband services such as artificial intelligence, big data, blockchain, e-commerce platforms and so forth. The study for the NIA concluded that in order to enhance broadband

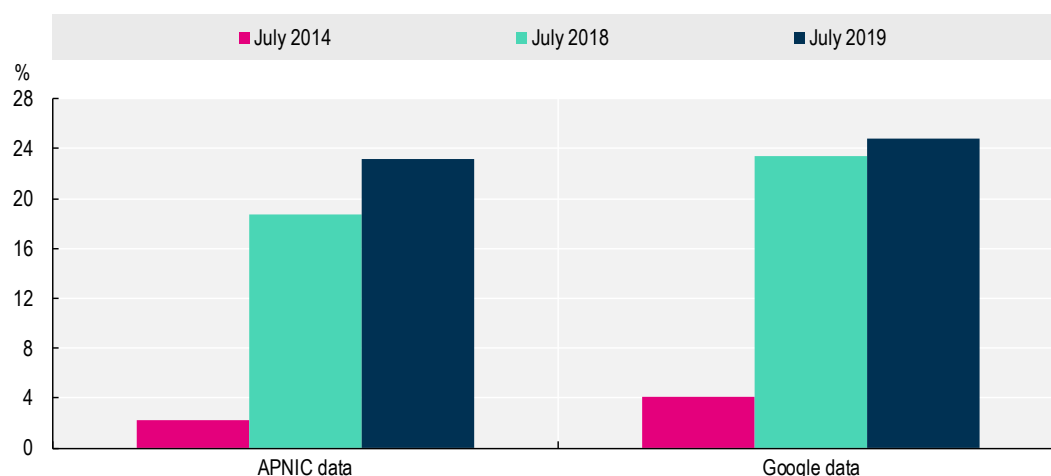
service quality among SEA countries, it would be necessary to establish better local and international backbone connectivity and make IXPs more efficient (Lee, 2016^[52]). In addition, the report cited the importance of education programmes to develop operation and management skills of IXP staff to improve reliable and cost-effective services.

IPv6 adoption

The ability of the Internet to scale to connect tens of billions of devices and machines is a potential, and a critical aspect of that scalability is the use of the IP. The IP specifies how communication takes place from one device to another through an addressing system (Perse, 2010^[53]). Two versions of the IP are in use – one that is largely exhausted in terms of the distribution of unassigned addresses (Internet Protocol version 4 [IPv4]) and a second that is plentiful but has had a slower than desirable adoption (IPv6).

Increasing the deployment of IPv6 has been a long-standing goal for OECD countries (OECD, 2008^[54]), and one that has been achieved with varying degrees of success across countries.³ At present, the exhaustion of IPv4 is one reason new entrants with large numbers of users, such as Reliance Jio in India, have emphasised the use of IPv6 in establishing their network (Ghosh, 7 February 2017^[55]). This also is the reason that traditional players such as Verizon have ceased assigning fixed IPv4 addresses to business customers (Sharwood, 2017^[56]). Such developments have contributed to the substantial progress in global IPv6 adoption from 2014 to 2019 (Figure 2.21).

Figure 2.21. Global IPv6 adoption (2014-19)



Sources: Google (2018^[57]), *Statistics – IPv6 adoption* (database), www.google.com/intl/en/ipv6 (accessed in July 2018); APNIC (2018^[58]), *IPv6 Capable Rate by country (%)* (database), <http://stats.labs.apnic.net/ipv6> (accessed in July 2018).

Establishing metrics to trace the progress of IPv6 adoption in the Internet is not simple (Box 2.5). Measuring an evolving process such as the adoption of IPv6 requires the use of different methodologies to assess different layers of the Internet infrastructure (OECD, 2014^[59]).

In two different sources measuring IPv6 adoption, India is the Asian leader, out of a sample of 50 economies, with almost 70% IPv6 adoption (as measured by APNIC and Akamai data), followed by Malaysia and Japan. Adoption levels are lowest in Indonesia, Cambodia and Lao PDR, which all have less than 0.2% IPv6 adoption (Figure 2.22).

Box 2.5. Measuring IPv6 adoption

Over the years, many approaches and associated measurements have been used, reflecting the fact that the Internet is not a single, integrated system. Rather, it is a superposition of component subsystems, meaning that IPv6 measurements can be taken in any one subsystem or in many. The following list, drawn from Perset (2010_[53]), describes several possible measurements in different subsystems, that can provide a sample of the transition to and adoption of IPv6 (Perset, 2010_[53]):

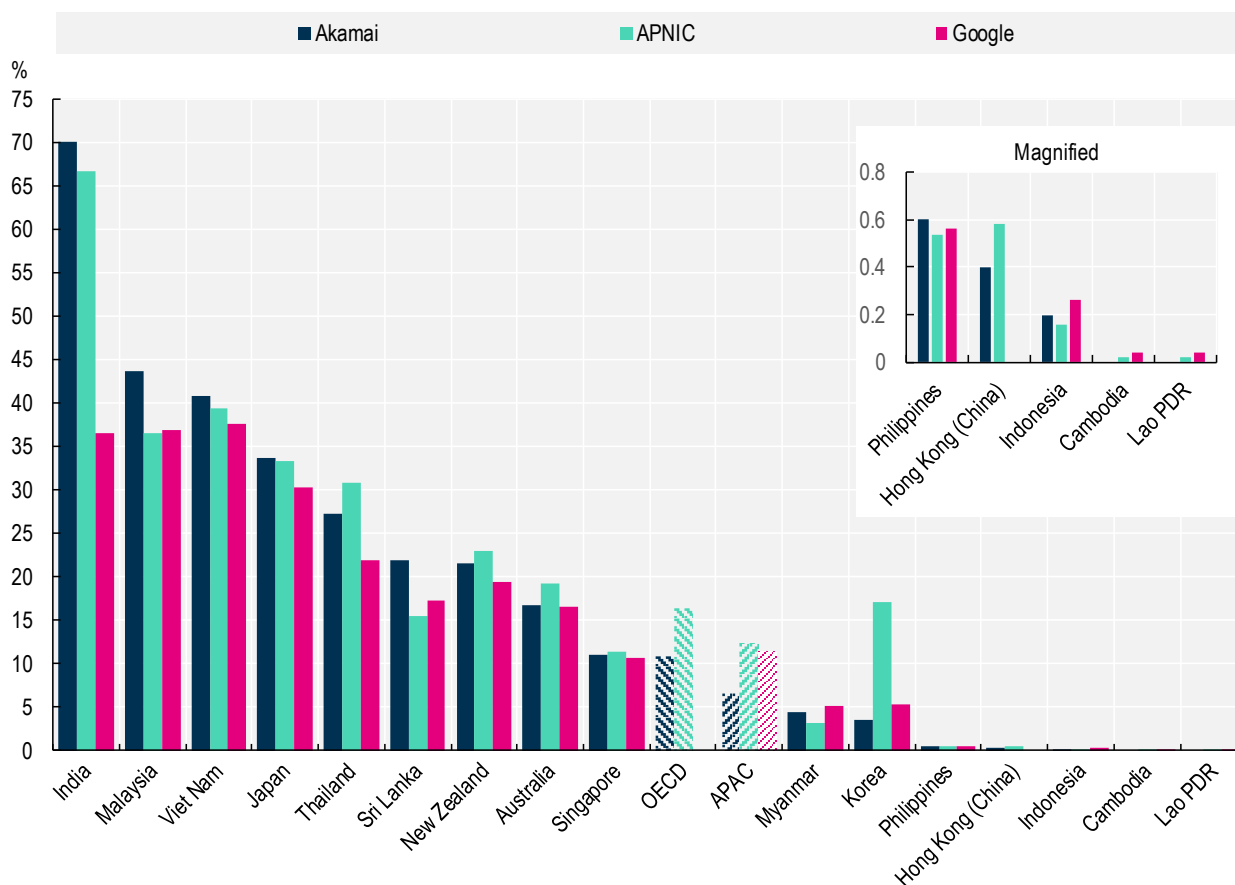
- **Measurements using the routing system.** The Internet routing table can be used to track the number of advertised routes that constitute the IPv4 Internet, and compare this with the number of routes in the IPv6. A complementary measure is to compare the number of unique autonomous system numbers contained in the routing table that indicate the number of entities that have IPv6 networks interconnected to the Internet. The Asia-Pacific Network Information Centre (APNIC) has a portal to assist with IPv6 deployment that includes statistics for the region.
- **Measurements using the domain name system.** The domain name system can provide a useful measurement, since only domain names that can be resolved to an IPv6 address can be accessed. One approach is to use a common source of popular domain names and query this set of domains over time to establish the proportion of the names that have an IPv6 address.
- **Measurements using Internet traffic statistics.** This option looks directly at traffic volumes in IPv4 and IPv6. Although most such data are generally considered to be proprietary and are not publicly released, an increasing number of IXPs publish data about their volume of IPv6 traffic, to make it possible to estimate the number of adoptions over time SEA regulators could request this type of information from IXPs.
- **Measurements of end client capabilities.** For a client end system to be able to make a connection using IPv6, all the Internet subsystems must also be able to support Ipv6. One simple way of measuring the number of Ipv6-capable clients is to use a dual-stack service point and offer both Ipv4 and Ipv6 capability. Counting the number of systems that prefer Ipv6 over IPv4 provides a good indication, if the sample is large enough. Another measurement technique includes carrying out IPv6 connectivity tests with a sample of clients to determine their preferences. Both measurements are regularly carried out by some content providers and regional Internet registries, and can be accessed by policy makers.

As noted in other OECD reports, multiple players (i.e. ISPs, backbone providers, device manufacturers, content providers and so forth) must co-ordinate to transition to IPv6. According to OECD (2014_[61]), IPv6 transition can be thought of as a “technology adoption model” characterised by the presence of direct and indirect network effects. These effects can make it harder for a new platform standard to achieve critical mass because different stakeholders may find it difficult to co-ordinate (OECD, 2014_[61]). SEA governments can help to achieve a critical mass by acting as what the OECD has called “focal” players – i.e. the main buyers of IPv6-enabled devices and services).

Previous OECD work also has highlighted the importance of IPv6 for the development of the IoT ecosystem (OECD, 2016_[41]). As billions of connected devices are expected to come on line in the next few years, promoting the IPv6 transition is the most effective way to support

the IoT. Against the backdrop of the current IPv4 address depletion, deployment of IPv6 is crucial if the Internet is to continue to effectively operate. It also is the way to ensure that SMEs will be able to take full advantage of the IoT (OECD, 2016^[41]). This will become increasingly relevant in the next few years for SEA countries, as new IoT solutions are designed to foster development outcomes. Moreover, if new SMEs are to grow in SEA, they will not have legacy IPv4 addresses and will therefore need an ecosystem sympathetic to IPv6 use.

Figure 2.22. IPv6 country adoption in APAC vs. OECD (July 2019)



Note: Lao PDR = Lao People's Democratic Republic.

Sources: Google (2018^[57]), *Statistics – IPv6 adoption* (database), www.google.com/intl/en/ipv6 (accessed in July 2018); APNIC (2018^[58]), *IPv6 Capable Rate by country (%)* (database), <http://stats.labs.apnic.net/ipv6> (accessed in July 2018); Akamai (2019^[60]), *State of the Internet – IPv6 Adoption Visualization, Countries* (database), <https://www.akamai.com/uk/en/our-thinking/state-of-the-internet-report/state-of-the-internet-ipv6-adoption-visualization.jsp> (accessed in July 2019).

Notes

¹ Despite a lack of a clear definition, the term Asia Pacific is generally used to describe countries or economies throughout East and South Asia, Southeast Asia and Oceania. In the study from M-Lab, 40 economies are included in the category of Asia Pacific. These are Afghanistan, Australia, Azerbaijan, Bangladesh, Brunei Darussalam, Cambodia, the People's Republic of China, Fiji, French Polynesia, Guam, Hong Kong (China), India, Indonesia, the Islamic Republic of Iran, Japan, Kazakhstan, Korea, Kyrgyzstan, Lao People's Democratic Republic, Macau (China), Malaysia, Maldives, Mongolia, Myanmar, Nepal, New Caledonia, New Zealand, Pakistan, Papua New Guinea, the Philippines, Réunion, Singapore, Sri Lanka, Chinese Taipei, Tajikistan, Timor-Leste, Thailand, Turkmenistan, Uzbekistan and Viet Nam.

² For more information, see the De Guzman (15 February 2016)_[62].

³ In the Seoul Declaration for the Future of the Internet Economy, OECD countries agreed to “[e]ncourage the adoption of the new version of the Internet protocol (IPv6), in particular through its timely adoption by governments as well as large private sector users of IPv4 addresses, in view of the ongoing IPv4 depletion”. See <http://dx.doi.org/10.1787/230445718605>.

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3. Promoting adoption of digital services and applications in Southeast Asia

This chapter examines the adoption of digital tools. It discusses demand side issues related to the use of digital tools and services by small and medium-sized enterprises (SMEs) in Southeast Asia that include digital skills, local content and applications, privacy, and security. It also addresses issues related to vulnerable populations, rural SMEs, the gender gap and equal access to e-commerce platforms.

The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

The digital transformation of small and medium-sized enterprises (SMEs) means not only enhancing their access to information and communication technologies (ICTs), but also enhancing the uptake and use of digital applications and services. Together, these improvements can foster the digital transformation within economies and societies that are needed to turn the use of digital services and applications into concrete opportunities in Southeast Asia (SEA).

It is important for SMEs in SEA to be aware of the value of digital services and applications, have the skills to integrate these in their own production processes and services, mitigate the security risks involved with digital services, and be part of an ecosystem where both public and private customers are digitally ready and able. Recent studies suggest that this part of the transformation is more complex and costly than the diffusion of the actual technologies, and is moving more slowly, implying that the effects of the new technologies are often slow to emerge (Bloom et al., 2017^[1]). However, adoption can occur at a fast pace, under the right conditions, as demonstrated by the rapid expansion of tools such as money transfer over mobile telephones in many of the world's emerging economies.

Connectivity and the use of digital services and applications in their daily operations offer many benefits, particularly in terms of opening new markets, for businesses of all sizes. Broadband access and related ICTs can be used to connect businesses to digitally managed global value chains, and offer an important platform for selling goods and services locally or worldwide. Firms thus are able to launch and scale more quickly than in the past and to compete with other firms locally or globally.

Around SEA, offering WiFi has become a complimentary service, much like cafes and restaurants, that many small and medium businesses provide to customers. Indeed, especially in cities, it has become common for businesses to offer courtesy WiFi services for their clients. The benefits can be substantial. A 2016 survey of 400 small businesses in the United States, for example, found that offering complimentary WiFi to clients increased foot traffic as well as the amount of time and money customers spend (Campbell, 20 January 2016^[2]). Some businesses that offer complimentary WiFi also use WiFi marketing for push advertising and are customising the experiences of users while they are connected to the business's WiFi.

In areas where access to knowledge faces obstacles – as is often the case in rural areas in SEA – the Internet also is an important source of information supporting business innovation and knowledge accumulation. Broadband access is fundamental for ICT applications to play this enabling role. From basic accounting and inventory applications for smaller companies to more elaborate services, such as customer relationship management (CRM) software and enterprise resource planning (ERP) systems, broadband access and ICT applications can empower new ways of commerce. Their impact and importance will only increase, for example through new tools for machine learning, artificial intelligence (AI), blockchain and big data analytics (BDA).

In recent years, some parts of SEA have become digital growth and innovation hubs for digital growth and innovation, largely due to improved broadband connectivity and smartphone adoption. Some countries – Malaysia, Myanmar, Thailand and Singapore – now have over 60% smartphone penetration (Telenor, 2018^[3]). Mobile smartphones are driving innovation in services, products and business models; for example, mobile payment systems are emerging as crucial tools for SMEs to leapfrog over analogue to digital systems. Likewise, digital services and applications transform how customers interact with businesses and search for products, how brands are built and how financial transactions are carried out.

The extent to which this dynamism translates to actual productive use of digital tools by companies and particularly by SMEs is still largely unknown. The available data show

SMEs lag behind in some areas, with factors such as connectivity, regulatory frameworks and lack of awareness, skills and trust all hindering adoption of digital services and applications. Nevertheless, a growing number of small firms are treating such challenges as opportunities, and are pioneering solutions for SMEs that can make the promises of digital transformation a reality.

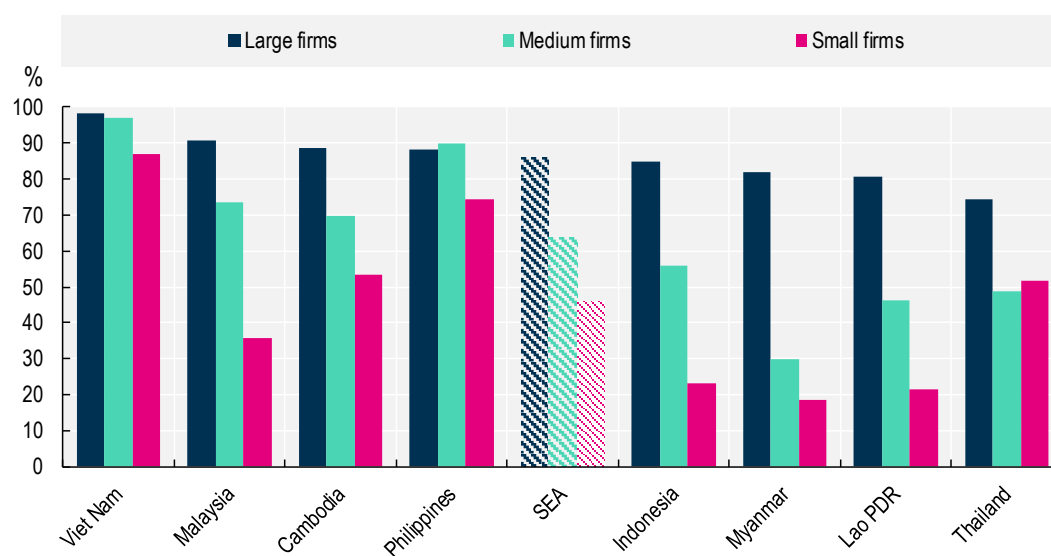
The state of digital enterprises in SEA

SMEs using digital services and applications

Use of basic and intermediate digital tools

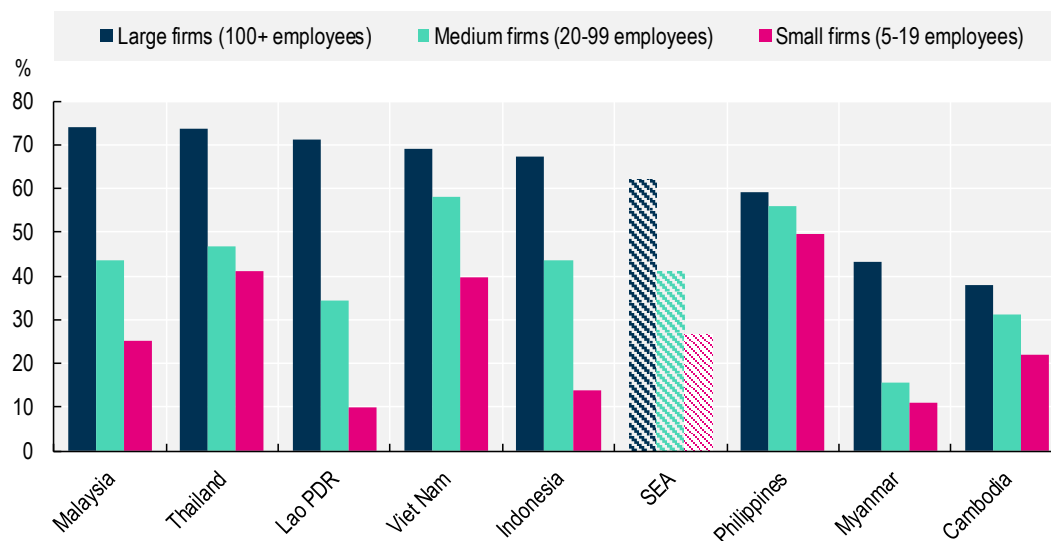
While somewhat dated and incomplete, available firm-level data across SEA countries point to considerable differences in the take-up of digital services. The World Bank Group's Enterprise Surveys are one of the few sources of comparable data regarding firms' use of some of these tools. It finds, for example, that the SEA average use of email by small firms in 2016 was approximately 45% versus 86% by large firms. The usage gap, meaning the difference between small and large firms in their use of the Internet, is greatest in Indonesia (62%), Lao People's Democratic Republic (hereafter "Lao PDR") (59%) and Myanmar (63.5%) (Figure 3.1).

Figure 3.1. Percentage of firms using email to interact with clients/suppliers in SEA (2015 and 2016)



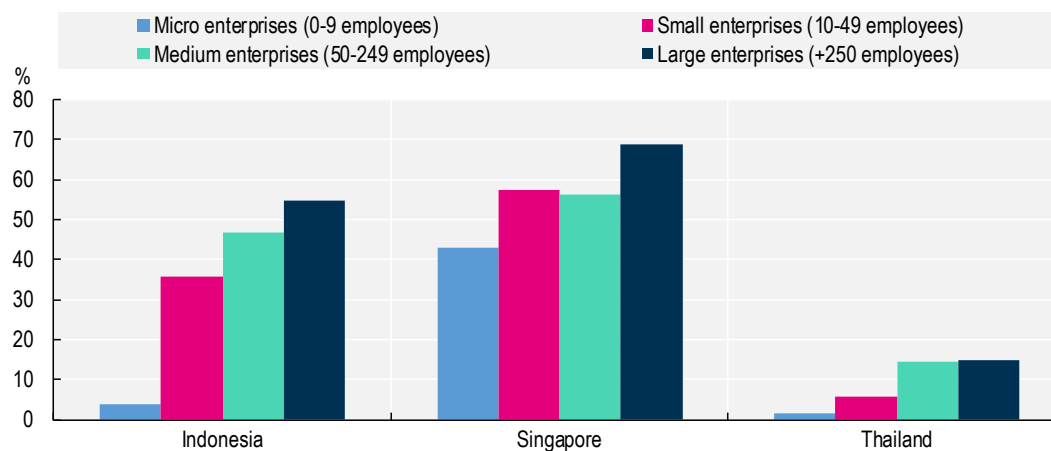
Notes: Lao PDR = Lao People's Democratic Republic. The definition of small and medium firms in terms of numbers of employees is drawn from the World Bank criteria, to make SME definitions comparable. Singapore is not part of the World Bank Group's *Enterprise Surveys*. Indonesia, Malaysia, the Philippines and Viet Nam data are from 2015; Cambodia, Lao People's Democratic Republic, Myanmar and Thailand data are from 2016. *Source:* World Bank (2019^[4]), *Enterprise Surveys* (database), www.enterprisesurveys.org/.

According to World Bank data for such firms, some from 2015 and some from 2016, in terms of online presence, the SEA share of firms having their own website was 62% for large firms, in contrast to 26% by small firms. Among the SEA countries surveyed, Malaysia has the largest proportion of large firms with their own website and the Philippines has the largest proportion of small firms with their own website. The biggest percentage-point differences in this regard between small and large firms in the same country are in Lao PDR (61), Indonesia (54) and Malaysia (49) (Figure 3.2).

Figure 3.2. Percentage of firms with their own website in SEA (2015 and 2016)

Notes: Lao PDR = Lao People's Democratic Republic. First, the definition of small, medium and large firms in terms of numbers of employee is drawn from the World Bank to make SME definitions comparable. Second, Singapore is not part of the World Bank Group's Enterprise Surveys. Third, Indonesia, Malaysia, the Philippines and Viet Nam data are from 2015; Cambodia, Lao PDR, Myanmar and Thailand data are from 2016.

Source: World Bank Group (2019^[4]), *Enterprise Surveys* (database), www.enterprisesurveys.org.

Figure 3.3. Percentage of businesses receiving orders over the Internet, by size, in selected SEA countries (2014)

Note: Thailand data are from 2013, the most recent year available.

Source: UNCTAD (2017^[5]), *UNCTADStat* (database), <http://unctadstat.unctad.org>.

The proportion of firms using the Internet to receive orders from buyers varies across SEA countries (Figure 3.3). In Singapore, 47.6% of firms overall, 42.9% of micro enterprises and 54.6% of large enterprises reported they received orders over the Internet in 2014. The proportion overall in Indonesia in 2014 was 24.6% of firms, with wide differences depending on firm size: 3.7% of micro enterprises reported Internet orders compared 54.6% of large enterprises. In Thailand, in 2013, 1.7% of businesses received Internet orders; the proportion ranged from 1.4% of micro enterprises to 14.7% of large enterprises.

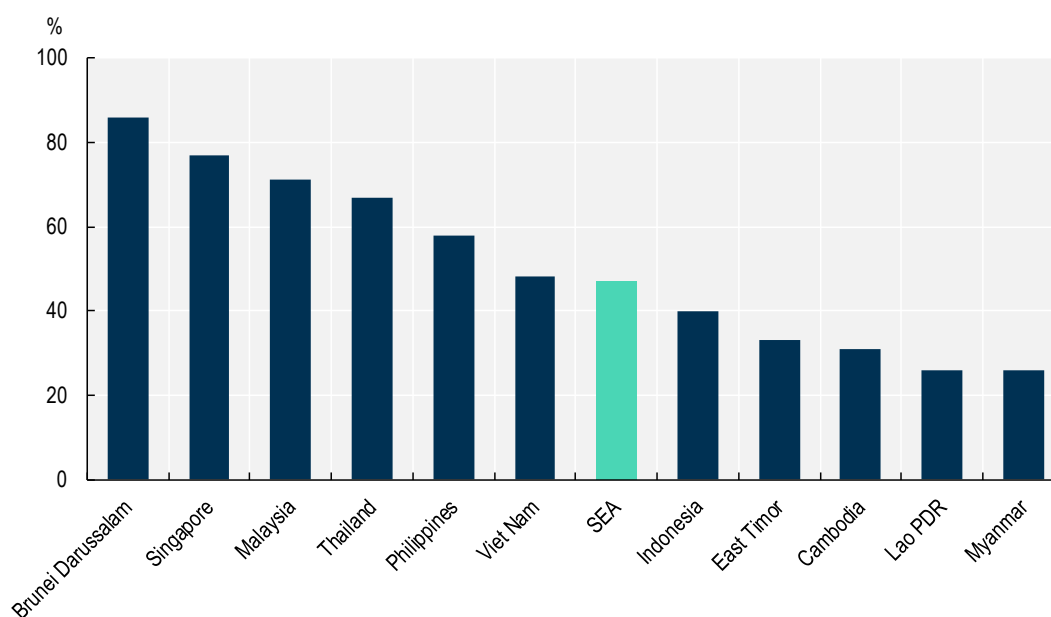
While more generalised and detailed data are not available for all SEA countries, OECD data from the model survey *ICT Usage by Businesses* (OECD, 2015^[6]) suggest that in general many firms engage in using rather basic digital tools, i.e. they subscribe to a broadband connection, use email and/or establish a website or home page.

Recent studies in the region reveal a similar trend. In a study for Bain & Company, Hoppe, May and Lin (2018^[7]) showed that only 16% of SMEs in SEA were truly digitised. Another study by ERIA (2018^[8]), based on interviews with 40 SMEs across SEA, concluded that while all interviewed used of personal computers and mobile phone, but that the use of customised digital services was rare or non-existent. According to the survey by ERIA, 56% of SMEs in SEA were at a basic level of adoption of digital tools (i.e. Microsoft Office, email, WhatsApp, personal computers, mobile phones), 34% at an intermediate level (i.e. website, social media, e-commerce, tablets, printers) and only 10% at an advanced level (i.e. CRM, analytics, big data, automation, pure online business, scanners, bank card readers, central servers, imaging devices) (ERIA, 2018^[8]).

Use of social media

Social media, which has become much more than a simple communication channel, is also an ICT tool, and is used as such by about 45% of businesses in the OECD. It continues to spread very rapidly. In SEA, overall social media penetration was estimated to be 46% in 2018, a 31% increase over 2017; 72 million people used social platforms for the first time in the 12 months up to January 2017 (We Are Social, 2017^[9]). Social media use in 2017 in Association of Southeast Asian Nations (ASEAN) countries was highest in Brunei Darussalam, followed by Singapore; barely one-quarter of the populations of Lao PDR and Myanmar¹ were using social media in 2017 (Figure 3.4).

Figure 3.4. Percentage of social media usage by individuals in SEA (2018)



Note: Lao PDR = Lao People's Democratic Republic.

Source: We Are Social (2017^[9]), *Digital in Southeast Asia in 2017*, <https://wearesocial.com/special-reports/digital-southeast-asia-2017>.

SMEs in SEA are familiar with social media as they become useful ways to communicate with audiences and a useful tool for providing customer services (ERIA, 2018^[8]). A regional study conducted by We are Social at a platform level found that Facebook had the greatest number of monthly active users in the SEA region (We Are Social, 2017^[9]). Separately, Facebook data show that three of the top ten countries in the world in total volume of traffic generated by use of this platform are in SEA: Viet Nam ranks fourth globally, Thailand fifth and Malaysia eighth (Table 3.1). The amount of data traffic is surprising when compared to the percentage of the population that is on line in these three SEA countries.

Table 3.1. Facebook country ranking based on traffic volume

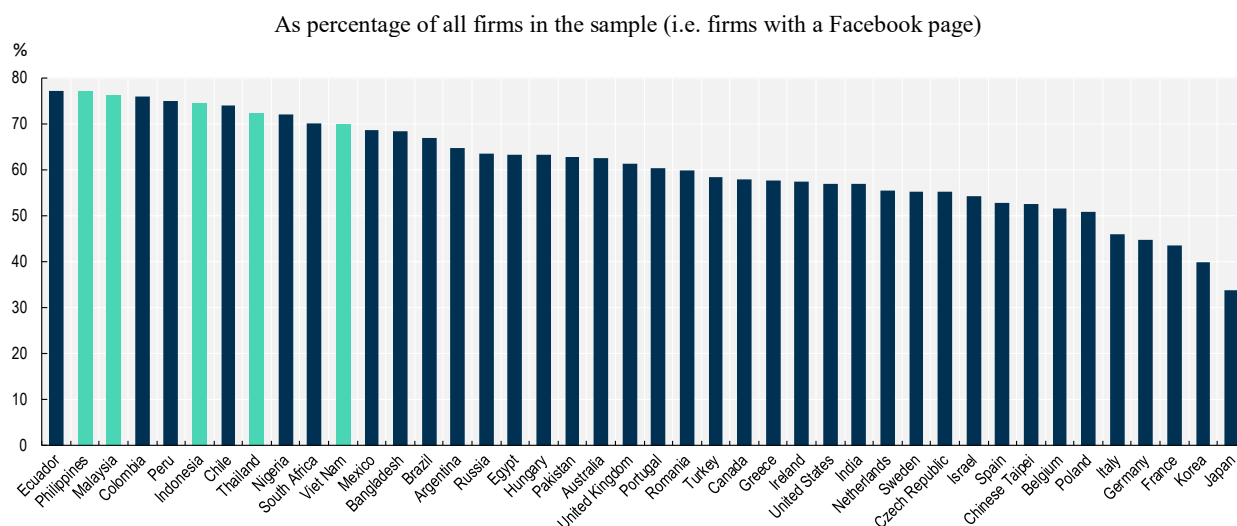
Rank	Country	% of world population	Percentage of individuals using the Internet (%)
1	United States	4.3	76.2
2	India	17.8	34.5
3	Brazil	2.7	67.5
4	Viet Nam	1.3	49.6
5	Thailand	0.9	52.9
6	Germany	1.1	84.4
7	United Kingdom	0.9	94.8
8	Malaysia	0.4	80.1
9	Mexico	1.6	63.9
10	Japan	1.7	90.9
Total top ten		33	

Note: Data on percentage of individuals using the Internet is based on ITU data of 2017, while the Facebook country ranking is based on 2018 data.

Sources: Facebook (2018^[10]), *IPv6 – Adoption by country* (database), https://www.facebook.com/ipv6/?tab=ipv6_country (accessed on 6 September 2018); ITU (2018^[11]), *ITU World Telecommunication/ICT Indicators* (database), www.itu.int/en/ITU-D/Statistics/Pages/publications/wtid.aspx.

Improved broadband access and the use of online platforms such as Facebook have enabled SMEs to lower costs in establishing an online presence and conducting e-commerce. An online survey tool designed by Facebook in co-operation with the OECD and the World Bank sheds light on the use of social media by firms in SEA. It asked firms about their “use of online tools or platforms (e.g. websites/apps, social networks like Facebook or Google+, etc.) to sell products and services to customers” (Facebook/OECD/World Bank, 2019^[12]). The survey, conducted in 42 countries, found that five SEA countries rank among the top 11 in terms of the proportion of firms that are online sellers, with approximately 70% to 77% of firms with a Facebook page being identified as “online sellers” in the Philippines, Malaysia, Indonesia, Thailand and Viet Nam (Figure 3.5).

The overall results of the survey show that online tools are most frequently used for sales of products or services in the retail and wholesale sector (72%), followed by use for real estate (69%), accommodation (65%) and manufacturing (64%) (Facebook/OECD/World Bank, 2019^[12]). The results also show that among the sample of firms with an online presence, small firms more frequently participate in online sales than do large firms on average (61% versus 54%). The selective nature of the Facebook sample might be partly responsible for this result, that is, while larger firms tend to be faster in adopting digital technologies overall, SMEs that have passed a certain threshold might be faster in adopting online tools and platforms for the sale of products (OECD, 2019^[13]).

Figure 3.5. Online sellers (2017-18)

Note: This figure is based on a sample of 205 619 firms that have a Facebook page and were surveyed over the period from March 2017 to April 2018.

Source: OECD (2019^[13]), *Unpacking E-commerce: Business Models, Trends and Policies*, <https://dx.doi.org/10.1787/23561431-en>, based on Facebook/OECD/World Bank (2019^[12]), *Future of Business Survey* (database), www.oecd.org/sdd/business-stats/the-future-of-business-survey.htm (accessed in March 2019).

Other indicators point to the positive economic influence on employment that access to social media platforms can provide for employment. Surveys show that in Viet Nam, for example, businesses started on Facebook in the first quarter of 2017 employed 2.3% of the working age population (i.e. 1.1 million people) (Van Dat, 2017^[14]). According to Facebook, over 51 million people in Thailand access the platform every month. Every day, 34 million people access Facebook in Thailand, of whom about 33 million access it via their mobile device. In Thailand, estimates point to around 2.5 million SME Facebook pages, with as many as 40 million people connected to these pages, while about 100 million people outside of Thailand connected to Thai SME Facebook pages (Pornwasin, 2018^[15]; Pornwasin, 2018^[16]). Facebook use is also high in Malaysia, where approximately 21.9 million people used one or more social media platforms in 2016 and 97.3% of these saying they had a Facebook account (MCMC, 2017^[17]).

Use of messaging applications

Messaging apps, like social media, have become ubiquitous in the day-to-day lives of people in SEA and have transformed business communications. In OECD countries, apps like Slack, Microsoft Teams and Facebook Workplace are used as substitutes for email and have contributed to making business communication more responsive, dynamic, and contextual. However, these tools tend to be used by larger enterprises and for intra-company communication, and more traditional communication channels such as email remain the predominant form of business communication. SMEs in SEA are using Facebook Messenger, WeChat, LINE and WhatsApp, although the preference for each service vary from country to country (Table 3.2). These messaging apps have become the new and major platforms for business communication in a way that fixed telephony and emails never were, due to the earlier lack of fixed telecommunication infrastructure (including both fixed telephony and fixed broadband access) in the region.

Table 3.2. Messaging apps in SEA

Apps	Business use	Popularity in SEA countries
Facebook Messenger	Facebook Business Messenger has a set of functionalities enabling deeper and richer customer engagement, integration into existing enterprise platforms (customer relationship management, etc.) and partnerships (Facebook M, a virtual assistant, started as a partnership with Uber for booking).	Indonesia, Viet Nam, Philippines
WhatsApp	WhatsApp Business makes interacting with customers easy by providing tools to automate, sort and quickly respond to messages, and with SMEs in mind. It also provides businesses with statistics so they can see how many messages were successfully sent, delivered and read.	Singapore, Malaysia, Indonesia
LINE	LINE provides key value-added services via unbundled apps (50+ apps in the "LINE Family" that include shopping deals and LINE TV). For businesses, LINE offers Official Accounts with a fee and that include business chats and application space for rolling out in-app features like loyalty cards, coupons and mobile. For SMEs, LINE created the LINE@ app, with a lower fee for businesses to communicate with users, especially through personalised, rich and animated stickers that are collectable and popular among LINE users.	Thailand, Cambodia
Viber	Viber for Businesses provides businesses with tools to engage with customers in a personalised manner. Viber launched the Viber Communities feature whereby businesses can build communities with an unlimited number of members and enjoy more administrative controls and conversation features (such as editing messages).	Myanmar, Philippines, Viet Nam
WeChat	WeChat provides a gateway to all consumer services such as movie tickets, transportation (air, rail, taxi), money transfer and doctor's appointments). For businesses, WeChat has developed an entire ecosystem of business-oriented tools that allow workers to complete tasks, including taking inventory to filing employee reimbursements, entirely in-app. WeChat allows brands to create accounts on the platform and engage users directly via Official Accounts, which enable brands to offer users a mobile app and/or browser-like experience.	Philippines
BBM	In Indonesia, the BBM Blackberry app company partnered with Bukalapak, a homegrown online marketplace, to power digital transactions. The BBM app allows features like bill payment, in-app coupons and brand communication.	Indonesia
Zalo	In Viet Nam, Zalo's comparative advantage is due to its response to deep cultural and linguistic context, which is reflected in the app's stickers. For businesses and consumers, Zalo Pay, which is integrated in Zalo, lets users link a payment card to make peer-to-peer payments, pay via Near Field Communication and QR codes, purchase products and services on line, make mobile top-ups, and pay their utility bills.	Viet Nam

At the consumer level, messaging apps are widely used in SEA, for example to contact customer support services and online booking of services; co-ordinate the purchase and pick up of merchandise; and follow up on food delivery. On the business side, these apps are completely transforming interactions between businesses and consumers (i.e. business-to-consumer transactions) and between businesses (i.e. business-to-business transactions).

Many companies in SEA are building so-called chat apps into their systems, which integrates these messaging apps into established consumer platforms. These apps enable SMEs to interact, form groups and exchange files with external parties and thus allows collaboration beyond any physical and geographic constraints. As a result, a great deal of business – between independent professionals and clients, brands and agencies – can be carried out on messaging apps.

Use of advanced applications and services

Despite increased use by individuals and SMEs of digital tools such as social media in SEA, few firms engage in more complex digital services and applications. Buying and selling on line, using digital tools to outsource business processes to the cloud (i.e. cloud computing), or using digital applications for CRM or ERP are not a reality for most SMEs in SEA. ERP allows firms to benefit from a higher integration of information and processing across their various business functions. CRM mirrors an intensive use of information technologies by firms to collect, integrate, process and analyse information related to their customers. Digitalisation allows higher business integration, in particular for information flows within companies. The tendency of smaller firms to lag behind in the adoption of these tools means that they likely will be less efficient and competitive than they otherwise could be.

Even fewer firms engage in the most advanced technologies such as the use of big data or AI. The term "big data" relates to the huge amount of data generated from activities that are

carried out electronically and from machine-to-machine communications (e.g. data produced from social media activities or from production processes).

Big data have characteristics widely summarised as 3V, or volume, variety and velocity. Volume, which refers to vast amounts of data generated over time. Second, “variety” refers to the different formats of complex data, either structured or unstructured (e.g. text, video, images, voice, documents, sensor data, activity logs, click streams, co-ordinates and so forth). Velocity refers to the high speed at which data are generated, become available and change over time (OECD, 2017^[18]).

Overall, BDA refers to the use of techniques, technologies and software tools for analysing big data (Laney, 6 February 2001^[19]) (Eurostat, 2016^[20]). In the OECD, the proportion of businesses having performed BDA in 2016 varies from 4% in Korea to 19% in the Netherlands, with BDA mainly performed by large businesses (OECD, 2017^[18]). While similar evidence is not available for SEA countries, the available data suggest that the more advanced use of digital services and applications in the SEA region is still at an early stage.

SMEs are at a considerable disadvantage in relation to larger firms with respect to adopting digital tools. First, SMEs have weaker bargaining power to negotiate more advantageous technology solutions with service providers. Specialised solutions can be costly, and SMEs lack the resources and/or skills to either screen suppliers or implement a particular solution on their own. SMEs also are at a disadvantage in terms of retaining specialised human capital. At the same time, SMEs and start-ups are better placed to be more flexible and adapt to new circumstances. Given that SMEs usually have fewer legacy technological solutions, they can potentially leapfrog to cheaper, more efficient and tailored digital services including often cloud-based services.

The manufacturing and retail sectors, characterised by low adoption of technology and a high reliance on labour, could largely benefit from digitalisation. One way to achieve this could be through increasing standardisation of supply chain management and logistics processes that make use of Internet of Things (IoT) solutions and identity and tracking systems; another way could be through increased digital payments that are powered by mobile access and enabled by digital identity and transaction solutions. Das et al. (2016^[21]) estimated the potential impact of digital services and applications in Indonesia to be an increase in the country’s gross domestic product (GDP) of USD 150 billion and 3.7 million additional jobs by 2025. Although a growing body of ad hoc studies and anecdotal evidence is available, improved data collection and analysis of the diffusion of specific technologies in the SEA region would be helpful to support evidence-based policy recommendations in this area.

One of the digitalisation innovators in Indonesia is OnlinePajak, a rapidly growing start-up that reportedly handled tax transactions worth USD 3 billion in 2017, a figure the company projects will more than double in 2018; put in context, this means the firm handles around 10% of Indonesia’s total tax revenues (Liu and Yuniar, 2018^[22]). OnlinePajak enables SMEs to record their tax deposits and transactions using an application instead of by way of the laborious paperwork. As the platform is built using blockchain technology, it addresses issues such as security that have challenged previous online efforts in this area. A 2018 article in the *South China Morning Post* stated that OnlinePajak was being used by 800 000 users, from individuals to large firms, to simplify their taxation transactions, and that its use of blockchain could enable public authorities to track the issuing of receipts in the future (Liu and Yuniar, 2018^[22]). Such applications can truly be said to be contributing to a digital transformation by addressing issues such as increasing productivity and trust and by offering the potential to transform government activities in the area of receipts and expenses.

The use of blockchain also could potentially play an important role as a tool to improve the availability of information to all stakeholders and to increase transparency in transactions. For public authorities, a better understanding of the adoption of such technologies – drawn from data generated by new tools such as taxation via online applications or from traditional surveys, for instance – is essential to better foster digital transformations (Box 3.1).

Box 3.1. Collecting better data on ICT usage by business

Policies that aim to increase firms' adoption of ICT require the development of a measurement agenda that ideally, and as a first step, is harmonised across countries. This approach would enable policy makers to understand the status quo and identify the key obstacles for firms. A major challenge in the SEA region is measuring the actual use of ICTs in companies and not only whether firms have a website or use emails. OECD has developed an extensive list of indicators on ICT usage by businesses that allows policy makers to conduct standardised surveys and expand the scope of the analysis on ICT adoption by enterprises (OECD, 2015^[6]). These indicators pertain to the use of cloud solutions, paperless procurement systems, tax filing systems, RFID barcode-based management and tracking services, points of service, mobile payments, and social media and apps, among others. SEA countries could use this extensive list of indicators and OECD experience to jointly identify other key indicators for measuring ICT adoption by firms in the region. Using indicators developed for the OECD survey would also allow direct comparisons between SEA countries and ICT adoption in OECD countries, enabling a harmonised approach across countries.

In addition to developing this measurement framework in the regional context, countries should also ensure that the business surveys they conduct are truly representative. This is not always an easy task. As reliable business registers are not always available, it is important to first develop such registers. Countries should also make sure that the informal sector is duly represented. Otherwise, results will not reflect the business uptake in the region. In general, for all surveys, countries should carefully report sample statistics and the concrete methodology used.

Enterprises digital by default

SEA is home to several Internet unicorns, defined as privately held start-up companies valued at more than USD 1 billion, among them Grab, Go-Jek, Lazada and Traveloka, among others (Table 3.3). These firms are important because they address demand from consumers and businesses as well as challenges that are not always unique to the region and provide opportunities for innovative solutions. Often, such unicorns establish a platform for the creation of micro firms. Go-Jek is a case in point. It started as a ride-sharing platform with a handful of motorcycle drivers and grew to more than one million car drivers. Go-Jek thus addresses the challenge of improving transport in some of the most congested urban areas in the world – Indonesia and Viet Nam – by providing an affordable solution to the lack of quality public transportation. The firm has expanded into other business areas including logistics and digital payments.

As might be expected, most of the capital invested in digitally based companies in SEA has so far gone to a few large firms. For instance, OnlinePajak attracted funding from Silicon Valley's largest venture firm, Sequoia Capital, in 2018, four years after its creation (Liu and Yuniar, 2018^[22]). It is estimated that USD 9 billion of the USD 12 billion invested since 2016 went to SEA unicorns (Business of Fashion, 2017^[23]). This corresponds to a

global trend of investment favouring more established Internet companies, but it also highlights the fundraising challenge that smaller and new start-ups are confronting more and more. However, it is important to note that successful unicorns in the region often create digital services and applications that enable the digital transformation of SMEs through the tools and services they devise.

Table 3.3. SEA-based unicorns

Company	Value (USD)	Headquarters	Sector	Description	Geographical presence
Go-Jek	10 billion (Salna, 2019 ^[24])	Indonesia	Transport, delivery and mobile payment	Founded in 2010, Go-Jek offers app-based, on-demand services that include transportation (GO-RIDE, GO-CAR, GO-BLUEBIRD), logistics (GO-SEND and GO-BOX), food delivery (GO-FOOD); grocery delivery (GO-MART), shopping delivery (GO-SHOP), entertainment ticket selling (GO-TIX), medicine delivery (GO-MED); massage (GO-MASSAGE); beauty (GO-GLAM), professional cleaning (GO-CLEAN), automotive solutions (GO-AUTO), digital payment and e-wallet (GO-PAY), bill payment (GO-BILLS), phone credits top-up (GO-PULSA), and loyalty points (GO-POINTS)	Indonesia and Viet Nam, with planned expansion to the Philippines, Singapore Thailand,
Grab	10 billion (Russell, 2018 ^[25])	Singapore (originally Malaysia)	Transport, delivery and mobile payment	Founded in 2012, Grab app-based services include transportation (GrabTaxi, GrabCar, GrabBike, GrabHitch), delivery (GrabExpress and GrabFood), and digital payment and e-wallet (GrabPay)	Cambodia, Indonesia, Malaysia, Myanmar, Philippines, Singapore, Thailand, Viet Nam
Traveloka	2 billion (Lee, 2017 ^[26])	Indonesia	Travel	Established in 2012, Traveloka is a web and app-based travel agent offering affordable deals and booking for flights, trains, car rentals and hotels; top-up and data packages; ticket bookings for attractions and activities; and utility bill payment	Indonesia, Malaysia, Philippines, Singapore, Thailand, Viet Nam
Lazada	3.15 billion (Check, 2018 ^[27])	Singapore	Market place	Founded in 2011 and launched in 2012, Lazada is a web and app-based, online retail platform that integrates all steps from online shopping, from purchase, tracking to delivery in an intuitive interface	Indonesia, Malaysia, Philippines, Singapore, Thailand, Viet Nam
Bukalapak	1 billion (The Jakarta Post, 2018 ^[28])	Indonesia	Market place, digital financial services	Established in 2011, Bukalapak is a web and app-based platform that allows consumer to consumer buying and selling, with payments being made either by cash on delivery or a secure e-wallet service (BukaDompot) and allows users to make small investments in conventional and Shariah mutual funds	Indonesia
Tokopedia	7 billion (Lee, 2018 ^[29])	Indonesia	Market place and digital payment	Founded in 2009, Tokopedia is an online market place for sellers to open e-stores; offers prepaid mobile phone credits and, train tickets, among others; and operates an e-payment system and e-wallet	Indonesia
Razer	4.6 billion (Wilhelm, 2017 ^[30])	Singapore, United States	Gaming hardware and digital payment	Founded in 1998 and recreated in its current version in 2005, Razer develops gaming laptops and personal computer peripherals for gaming such as mice, keyboards, wearables and virtual reality consoles, smartphones, and an e-wallet service	Malaysia, Singapore, United States
Sea	4 billion (Tech Collective, 2018 ^[31])	Singapore	Market place, digital payment and gaming	Founded in 2009 as Garena, the Sea group has three brands: Garena, which introduced the multiplayer, online battle arena game League of Legends; Shopee, an e-commerce platform; and AirPay, an e-wallet and digital payments platform	Indonesia, Malaysia, Philippines, Singapore, Thailand, Chinese Taipei, Viet Nam

Company	Value (USD)	Headquarters	Sector	Description	Geographical presence
Revolution Precrafted	1 billion (Reuters, 2018 ^[32])	Philippines	Housing development	Established in 2015, Revolution Precrafted develops a collection of limited-edition, pre-crafted properties such as homes and pavilions. Revolution aims to democratise high design and architecture by introducing designed spaces in collaboration with industry-leading creatives	Bahamas, Brazil, Cyprus, ¹ Ecuador, El Salvador, Guyana, Indonesia, Jamaica, Japan, Myanmar, Philippines, Puerto Rico, Spain, Trinidad and Tobago, United Arab Emirates

1. Note by Turkey

The information in this document with reference to “Cyprus” relates to the southern part of the Island. There is no single authority representing both Turkish and Greek Cypriot people on the Island. Turkey recognises the Turkish Republic of Northern Cyprus (TRNC). Until a lasting and equitable solution is found within the context of the United Nations, Turkey shall preserve its position concerning the “Cyprus issue”.

Note by all the European Union Member States of the OECD and the European Union

The Republic of Cyprus is recognised by all members of the United Nations with the exception of Turkey. The information in this document relates to the area under the effective control of the Government of the Republic of Cyprus.

Digital economies increasingly rely on AI and machine learning to deliver value by analysing huge amounts of data from online transactions. The use of advanced technologies in retail in SEA is mainly present through narrow applications of AI. Retailers across the region are enabling smartphone users to snap a photo of an item, for example, and perform a visual search of their catalogues by using AI. AI applications also are being used to help consumers have their questions answered by virtual assistants (Box 3.2). The expectation is that personalised one-to-one journeys through AI in the future will reshape customer service by anticipating consumers’ needs.

Box 3.2. Using AI in retail

In August 2018, the Chinese e-commerce platform JD announced the opening of an automated store in Indonesia – the first of its kind in SEA. In the AI-powered store, customers can simply pick up whatever they want and walk out of the store without going through lines to pay. The store leverages cutting-edge technologies such as radio frequency identification, facial recognition and image recognition to track retail activity.

Cameras placed throughout the space track and recognise the movements of customers and generate activity heat maps to monitor traffic flow, product selection and customer preferences. These data will be used to optimise inventory, product displays and all facets of store management. JD has made a significant push in developing offline store technology as part of its boundary-less retail vision: the idea that consumers should be able to buy whatever they want, wherever and whenever they want it, on line or off line. JD launched its first unmanned convenience store in Beijing in October 2017, and has subsequently added more than 20 additional unmanned stores across the People’s Republic of China (hereafter “China”).

Source: Fan (2018^[33]), “JD opens unmanned Indonesia store”, www.chinadaily.com.cn/a/201808/04/WS5b65043da3100d951b8c8969.html.

It should be noted that AI applications in different sectors such as retail should be encouraged to follow a human-centric approach. The OECD Principles on Artificial Intelligence (OECD, 2019^[34]) are a useful guide for countries seeking to promote AI solutions that benefit people and the planet by driving not only innovation, but also inclusive growth, sustainable development and well-being (OECD, 2019^[35]).

Skills for the digital transformation of SMEs in SEA

Firms in emerging markets, particularly SMEs, generally have certain managerial skills gaps. Some of these skills gaps affect the quality of goods produced, the use of imported inputs from advanced economies and export performance (Bloom et al., 2018^[36]). In the context of digital transformation, firms of all sizes face the urgent need for appropriate skills.

A digital transformation creates demand for new skills along three lines:

- ICT generic skills to use technologies and digital services and applications for professional purposes
- ICT specialist skills to program, develop applications and manage networks
- ICT complementary skills to perform new tasks associated with the use of ICTs at work, including communicating on social networks, managing the brand of products on e-commerce platforms and analysing big data.

Several of these skills are directly associated with higher adoption rates of digital tools in firms. For example, the quality of management, ICT skills, and the participation in lifelong learning and on-the-job training are associated with higher adoption of CRM and cloud computing by firms (Andrews, Nicoletti and Timiliotis, 2018^[37]). Moreover, while recruiting talent seems to be a vital but difficult task for all firms, smaller and laggard firms tend to have more challenges doing so, as leading and larger firms often lure with more competitive offers. In SEA countries with limited supplies of skilled employees, this is especially the case and results in SMEs being even more vulnerable to lagging further behind. Keeping SMEs up to date in terms of skills is one of the key steps towards encouraging the digital transformation of SMEs.

Generic skills

Despite progress in recent years, both access to education and quality education remain concerns in SEA. For example, the middle-income countries of Indonesia, Malaysia and Thailand fall below the baseline level of performance on the OECD's Programme for International Student Assessment (PISA) (OECD/RECOTVET, 2015^[38]). Phan and Coxhead (2015^[39]) noted that many countries in SEA display lower levels of human capital than some Northeast Asian neighbours at the same income level, such as Korea. A noteworthy exception is Viet Nam. Its human capital performance mirrors the level Korea attained at a similar stage of development. Meanwhile, after decades of extremely low public spending on education, Myanmar recently increased its expenditure on education – from 5% relative to total public spending in 2011 to approximately 13% in 2015 (UNESCO, 2016^[40]). In addition to problems related to education quality and accessibility, outward migration of skilled labour has contributed to skills shortages in many parts of SEA.

The ability to perform basic operations with the aid of ICTs is fundamental to ensuring adoption by SMEs. Some basic skills are prerequisites for navigating a digital transformation. These include working with an email account; managing passwords; understanding applications, the web, the role of telecommunication operators, and communication service bundles; and knowing how to leverage each digital device for professional activities to create value and to think beyond the passive use of digital tools. As discussed in Box 3.3, a one-year research project in Kenya led by the Mozilla Foundation, could have relevance for SEA (Reynal and Richter, 2016^[41]). The study identified the skills necessary to use Android mobile devices. Some of these skills were adapted to local conditions (e.g. Android as opposed to another operating system, local language as opposed to English), but the list nevertheless is a useful reference point for the type of skills needed by SMEs in SEA. Few SMEs, however, may have these basic skills.

Box 3.3. Skills that new mobile Internet users should master

The Digital Skills Observatory project developed and led by the Mozilla Foundation found an array of skills that all new mobile Internet users should master to use their phones and apps with confidence and productively. These skills identified in the study fall into the following categories:

- **Android.** Creating a Google account, customising phone settings, taking a screenshot, copying and pasting text, managing storage space, troubleshooting and recovering from crashes, understanding memory limitations and problems, and recognising icons.
- **Apps.** Understanding what apps are and how they differ from websites and Unstructured Supplementary Service Data (USSD) applications, finding and installing apps from the Play Store, updating apps from the Play Store, evaluating the quality and credibility of apps on the Play Store, sending and receiving apps without a network connection, understanding pre-installed apps, and understanding business models behind apps and the Play Store.
- **Accounts.** Understanding what digital accounts are and how to use them with different services, opening an email account, opening a social media account, and resetting an account password.
- **Privacy and security.** Understanding who can access a personal account and how they can do so, making strong passwords, keeping pins and passwords secret, understanding and managing the visibility of information on line, and understanding how personal data is collected, shared and used.
- **Managing data usage and costs.** Understanding and connecting to WiFi, sharing hotspots, understanding how phones connect to cell networks, and managing data usage.
- **Ethics.** Recognising spam and frauds, publishing credible information on line, validating information on line, and understanding web etiquette (harassment, all caps, forums, security, etc.).
- **Problem solving.** Understanding smartphones as tools to learn, communicate and create, and mapping personal and professional problems to smartphone capabilities.
- **Searching.** Using in-app or web search, building effective search phrases based on needs or desires, and being able to assess discovered content.
- **Literacy.** Navigating resources written in common English terminology, and understanding common language and conventions within Android.
- **Frauds.** Being sceptical of information on the Internet, and verifying the claims of apps and services.
- **Ecosystem.** Understanding the relationship between network operators, service providers, app developers and content creators, understanding the role of consumers, making conscious decisions with awareness of the different actors of the ecosystem, and understanding the open nature of the Internet where anyone can make content.
- **Social.** Managing contact lists, using social media and messaging, blocking contacts, and joining, silencing and leaving groups on social platforms.

- **Creative and functional.** Opening documents and creating memes.
- **Browsing.** Managing browser settings and limiting browser data usage.

Source: Reynal and Richter (2016^[41]), *Digital Skills Observatory Report: Stepping Into Digital Life*, <https://d20x8vtl2bnfa2.cloudfront.net/reports/Stepping+Into+Digital+Life+-+Digital+Skills+Observatory+Research+Report.pdf>.

For online commerce, generic ICT skills that are required to set up online operations may include editing images, providing accurate product description and navigating e-commerce platform memberships. Moreover, to take full advantage of the potential of digital services and applications for increasing efficiency and productivity, SMEs also must be capable of using these to find the information they need, recognise potential frauds and falsehoods, and overall to be safer on line. For SMEs to use these tools, SMEs further need to have a good understanding of the dynamics behind the apps and services they use. Mastering skills like these will help SMEs to make informed decisions about technologies they may invest in and whom to trust with their data.

Advanced skills

Advanced skills include those needed for fundamental digital services such as the development of ICT architecture (e.g. telecommunication services and Internet exchange points) and maintenance of ICT infrastructure (servers, computers, printers, networks and so forth). Other advanced skills encompass those needed for the application layer, such as service and support for software installed on employees' computers; development of e-business systems (e.g. ERP and CRM databases); maintenance of e-business systems; development of web solutions (e.g. websites and e-commerce); maintenance of web solutions; and protection of security and data (e.g. in testing, software development and computer emergency response teams).

SMEs engaging in e-commerce require specific technical skills. The first step for companies to engage in e-commerce, for example, is to establish an online presence. This could be through a virtual shop or an e-commerce platform or by adding an e-commerce module on the company's website. A survey by the International Trade Centre (ITC) (2017^[42]) found that in addition to generic ICT skills that encompass managing online accounts and creating online content, the biggest challenge for SMEs in this first stage is ensuring online visibility for potential customers from other countries – accounting for 27% of overall reported challenges. Another key challenge cited (21%) was a lack of what respondents identified as technical skills (International Trade Centre, 2017^[29]).

Lack of skills is also a pressing issue for businesses that provide digital services or applications, although of a different nature. One of the biggest recruitment challenges in SEA is the projected shortfall of qualified candidates to fill positions that are required by existing or expanding companies, especially SMEs and technology start-ups. The lack of candidates with more advanced skills such as coding and development is a known bottleneck in some countries in the region. While Singapore has invested in cultivating an ecosystem that attracts talent from all over the region, other countries face a serious shortfall of qualified candidates. To complicate matters, the skills requirements are constantly evolving, with new programming languages having increasingly shorter lifespans. Another issue is retention of qualified candidates after they are found. Given the scarcity of talent, there is increasing competition and poaching by one company from another – usually to the detriment of smaller firms and in favour of larger and more established Internet firms.

Some start-ups have sought creative solutions to these issues, such as distributing teams across different countries in the region despite the increased transaction and communication costs of doing so. An example is the start-up Advance.ai. Its headquarters are in Singapore because of the relatively large pool of data science experts there. But the software and product team is located in China due to the substantial pool of engineers in China; the operations support team is in Indonesia due to the size of that market.

Complementary skills

The skills needed to set up a digital business in SEA are important in their own right. A lack of business skills in a context of digital transformation hampers the adoption and effective use of digital services and applications by companies and entrepreneurs. It takes capable, well-rounded managers and entrepreneurs to establish, and scale up, digital and other businesses. This means that successful entrepreneurial education will contain elements of traditional resource management skills as well as soft skills such as good interpersonal relations and instilling good work ethics and creativity.

In general, SMEs in emerging economies score much lower on the capacity to enter on e-commerce activities. In surveys, more than one-third of SMEs from developing countries cite a lack of technical skills, alongside a lack of business knowledge, as impediments to establishing their online presence (International Trade Centre, 2017^[42]).

Moreover, SMEs wishing to engage in cross-border e-commerce are facing a new set of challenges in terms of skills. Exporters engaging in cross-border e-commerce are subject to local regulations that can be quite complex. Skills are necessary to identify the issue and seek the appropriate information and solutions (International Trade Centre, 2017^[42]).

Many governments in SEA are working towards ensuring that SMEs acquire necessary complementary skills so they can thrive in the digital economy. The private sector, too, is doing its part. An example of this is discussed in Box 3.4.

Box 3.4. An Indonesian unicorn is training SMEs

Bukalapak Community is a programme of the e-commerce platform, Bukalapak, in co-operation with the state lender BNI and courier service JNE in Indonesia to provide training SMEs in Indonesia for e-commerce. As part of its mission to develop small and medium-sized entrepreneurs in Indonesia, Bukalapak holds events called “Learning to Sell with Community”. These entrepreneurs learn how to take attractive pictures of their merchandise and products, write enticing introductions for their businesses, and promote their goods and services. In August 2018, Bukalapak Community was present in 100 cities in Indonesia.

Source: Sangadji (2018^[43]), “Bukalapak trains small entrepreneurs one city at a time”, <https://www.thejakartapost.com/news/2018/08/15/bukalapak-trains-small-entrepreneurs-one-city-at-a-time.html>.

Trust in the digital age

Adoption of ICTs by both enterprises and consumers can be hindered by a lack of trust in these technologies. Trust is often cited as a key barrier to adoption of e-commerce. For consumers, trust relates to a number of aspects of being on line, particularly concern for the security of personal identity and fear of identity theft. Businesses still miss a significant number of opportunities out of concern about digital security risk. Current OECD surveys

on the diffusion of ICT tools and activities in enterprises indicate that companies, and in particular SMEs, are not making the most of the business opportunities the online environment has to offer. Among the reasons cited for not using digital services and applications to their full potential are technical issues, such as re-organising business processes and systems; skills, including a lack of specialist knowledge or capability, and increasingly issues around trust.

SMEs account by far for the largest share of all businesses in OECD countries, and these firms especially do not yet have full confidence in the digital tools offered (OECD, 2017^[18]). The potential loss of consumer trust, damage to reputation, negative impacts on revenue and so forth – all of which can stem from a digital security incident – are the main reasons for the mistrust. To address these concerns, it would be beneficial to establish and harmonise good practices in digital security, data protection, e-signature and privacy laws across SEA.

Privacy

A major objective for SEA should be to develop and implement a policy framework that protects privacy. This framework should encourage the use of the digital environment for economic and social prosperity while enabling transborder flows of personal data through appropriate international policy and legal interoperability. Properly designed privacy safeguards help to gain the trust of consumers and SMEs and ensure the free flow of data at the national level and across borders.

Malaysia, the Philippines and Singapore have detailed data privacy laws, and Indonesia already has in place privacy regulation. Thailand has passed a data protection bill and a series of ad hoc privacy-related rulings are in effect in Viet Nam.

The OECD Guidelines Governing the Protection of Privacy and Transborder Flows of Personal Data, referred to in this report as the OECD Privacy Guidelines, aim to assist policy makers in the development of privacy frameworks (OECD, 2013^[44]). They were initially adopted in 1980 and revised in 2013. They define key concepts used in this area such as personal data, data controller and so on, and include principles that can be used as a basis for privacy protection frameworks worldwide. The OECD Privacy Guidelines are high-level policy recommendations that can be used as a basis for developing a privacy protection framework that has the flexibility to accommodate regional and local variations. These recommendations also can facilitate international interoperability for transborder flows of personal data.

Having privacy frameworks in place is a good first step. But considerable, additional work is needed to raise awareness among the private sector and users and establishing mechanisms to deal with data breaches. A 2017 survey by PayPal of 4 000 consumers across seven Asia Pacific markets, including Singapore and Thailand, found that more than half of local consumers and merchants do not use online payment systems due to privacy concerns (Heng, 2017^[45]). Among their privacy concerns were worries that financial information such as credit card details are directly shared with merchants during a purchase. Surprisingly, in Singapore, an overwhelming majority of respondents (90%) preferred cash as their primary mode of payment. Although nearly everyone surveyed said they owned a smartphone, only 3% used mobile wallets, such as PayPal, and only 2% used contactless payments via smartphones as their most common mode of payment (Heng, 2017^[45]). The lack of uptake of digital payment services highlights the need of efforts around privacy in the region.

Security

The economic and social benefits of digital transformation in SEA can only be realised if stakeholders manage digital security risks – that is, the security risks associated with the use of the digital environment. The need to manage these risks is especially true for businesses.

Notably in the case of cloud computing, security issues have become a barrier to adoption. In the OECD area, only 20% of businesses had used cloud computing by 2014. SMEs were more reluctant than large firms (40% of firms with 250 or more employees had used cloud computing compared to 20% of firms with 10 to 49 employees). The gap between large and small firms is also substantial in a number of countries including the United Kingdom, where 21% of all smaller enterprises (10 to 49 employees) are using cloud computing services compared to 54% of all larger enterprises (OECD, 2017^[18]).

Risk of security breach is perceived as a major barrier to cloud computing adoption by businesses. Almost 30% of all businesses in the European Union do not use cloud services due to security concerns. It would not be surprising, therefore, if a similar or even larger gap exists in SEA as well. A report by Kerney (2018^[46]) estimated that digital risks could cost the top 1 000 companies in the region about USD 750 billion in market capitalisation and derail digital innovation.

A number of countries in SEA address some aspects of digital security. Malaysia, the Philippines, Singapore and Thailand have national cybersecurity agencies and plans. Myanmar is in the process of establishing a plan. Indonesia, on the other hand, does not have one and Viet Nam has ad hoc rulings under different administrative acts.

Along similar lines, a few countries in the region have begun developing plans for digital identities to improve authentication issues and security concerns. While initiatives to establish digital identities are welcome, it is important to note that these should be seen as part of a longer process of building trust in the digital ecosystem. First, as noted above, it is necessary to have a privacy framework, since the risk of having one digital identity for everything would leave a very robust trail of people's activities. Second, robust security frameworks are a fundamental requirement to ensure that any database of digital identities for an entire country is protected from attackers. For businesses, improving authentication systems of business within public processes is an area that would be particularly less problematic than a more ambitious plan on digital identification for citizens and one area where many governments have started their digital identity projects. Digital identities have the potential to cut costs for smaller firms that wish to do business with the government and those that wish to engage in exporting, for example.

Some of the authentication issues are being addressed by start-ups in SEA using the application of new technologies such as distributed ledger technology (DLT), commonly known as blockchain. If structured with privacy by design and by default, DLT should address security concerns in complex, multiparty transactions via decentralised structures that better enable users to control what – if any – personal information they share with particular parties (Box 3.5).

The Malaysian Communications and Multimedia Commission has announced plans to develop a secure digital identity platform for both the public and private sectors. Singapore is further along in its digital identity scheme: it has overhauled its SingPass and CorpPass programmes to provide improved security and better integration with a range of existing and forthcoming services, including real-time payment authentication tied to a mobile number, and the use of shared services, such as bicycles, cars, lodging and drones (GSMA, 2018^[47]).

In most cases, digital security frameworks in place do not address this issue from a strategic perspective and with a clear vision for the future. Most importantly, they generally do not approach digital security policy as a means of increasing economic and social prosperity, and focus instead on the technical and criminal aspects of the issue or on national security. As more people in SEA connect to the Internet, digital security risks will also rise.

Box 3.5. Blockchain start-ups in SEA

Singapore: TenX

Founded in 2015, TenX is one of the most successful blockchain start-ups in the SEA region, having recently raised USD 80 million in a token sale only. TenX offers a debit card and accompanying app that provides users access to multiple cryptocurrencies anywhere in the world and at any time, and with the ability to withdraw them from any automated teller machine (ATM) or receive it via the app. Its payment platform utilises an off-chain, multi-asset instant transaction network that connects to real-time and instant cross-blockchain assets transactions.

Thailand: Omise

Established in 2013, Omise offers an online payment gateway through blockchain to facilitate seamless digital transactions. Omise has recorded an exponential transaction growth, making it a leading blockchain business. Its clients include major retailers in Thailand such as McDonalds the communication operator, True; and King Power. Omise also focuses on a range of processing solutions tailored to business needs such as automated checkout, social assistance, automated workflow and flexible payment options.

Philippines: Coins.ph

Profiting from the size of the remittance industry in the region – the third largest in the world and which amounts to USD 33 billion in the Philippines alone – Coins.ph set up a financial services platform in 2014 operating on Bitcoins and Ethereum. It provides peer-to-peer, low-cost wallet transfers as well as mobile top-ups, bill payments, game credits, online transactions and remittance services that free users from the need to have bank accounts. Coins.ph has more than five million users and connects to a vast network of banks, payment outlets, pawnshops and door-to-door delivery across the region.

Indonesia: Pundi X

Founded in 2017, Pundi X aims to build the world's largest decentralised, offline cryptocurrency network, most notably in retail through its all-in-one exchange at point of sale or point-of-sale devices installed in physical outlets. Besides facilitating multiple cryptocurrency transactions, Pundi X also accepts payments through mobile wallets and payment cards.

Source: Radin (2018^[48]), “Reimagining the ASEAN digital landscape: 4 ASEAN startups with blockchain technology”, <https://www.prospectsasean.com/asean-startups-using-blockchain-technology/>.

Those risks will become more complex in nature, requiring greater efforts from various stakeholders to tackle them. In contrast, the policies in place often lack the appropriate level of co-ordination between governments and other stakeholders. This undermines public policy efforts to encourage the use of ICTs due to the limited understanding of the economic and social dimensions of digital security. The OECD Recommendation on Digital Security Risk Management for Economic and Social Prosperity (OECD, 2015^[49]) provides guidance for all stakeholders to manage these risks and promote prosperity and inclusiveness.

Relevance

In SEA, policy makers face two important challenges. First, the majority of content available on line is in English across many content aggregation platforms. A study by ERIA (2018^[8]) showed that out of the 40 SMEs interviewed across all SEA countries, 87% tended not to search for information on line, which typically requires English competencies, rather relying on information from their business partners and local community. According to this study, the lack of knowledge and awareness of SMEs about digital services and applications is the first challenge on their journey to the digital transformation.

Content in local languages on the Internet (Wikipedia or YouTube, for example) is still disproportionate to the size of the population in many SEA countries. The content and applications currently available do not always serve the needs of people and businesses in emerging economies, especially those segments of the population with the lowest incomes. Most of the self-learning materials for digital tools are also only available in English. There is limited supply of local content, primarily due to a weak local digital ecosystem. It is therefore necessary to foster the development of content and applications tailored to the region, while enhancing the digital ecosystem as a whole. Automated translation, using AI, could also support the creation of local content, especially in less widely spoken languages such as Khmer, Lao and Burmese (ERIA, 2018^[8]).

The demand for, and the absence of, tailored content may depend on how relevant these services and applications are considered in relation to daily economic and social activities of SMEs and consumers. As users, SMEs constitute a very broad universe of actors and may be in different places along the spectrum in terms of adoption of digital services and applications. In different countries in SEA, and in different geographical areas within these countries, SMEs may have many reasons for not using digital tools (Box 3.6). They also differ in their willingness to pay for different applications. A starting point to understand the challenge of relevance of digital tools for SMEs is assessing the existing digital content.

Digital content overall and especially local content are crucial to increase adoption of digital services and applications. Both serve not only as an important source of information but also make businesses and administrative processes more efficient. A robust content market is also beneficial for the development of network infrastructure. A report prepared by the OECD, the Internet Society and the United Nations Educational, Scientific and Cultural Organization (UNESCO) found that more developed local markets tend to lead to lower international prices for bandwidth and that conversely, markets with more intense international traffic tend to report lower local prices for Internet access, particularly in emerging economies (OECD/ISOC/UNESCO, 2013^[50]).

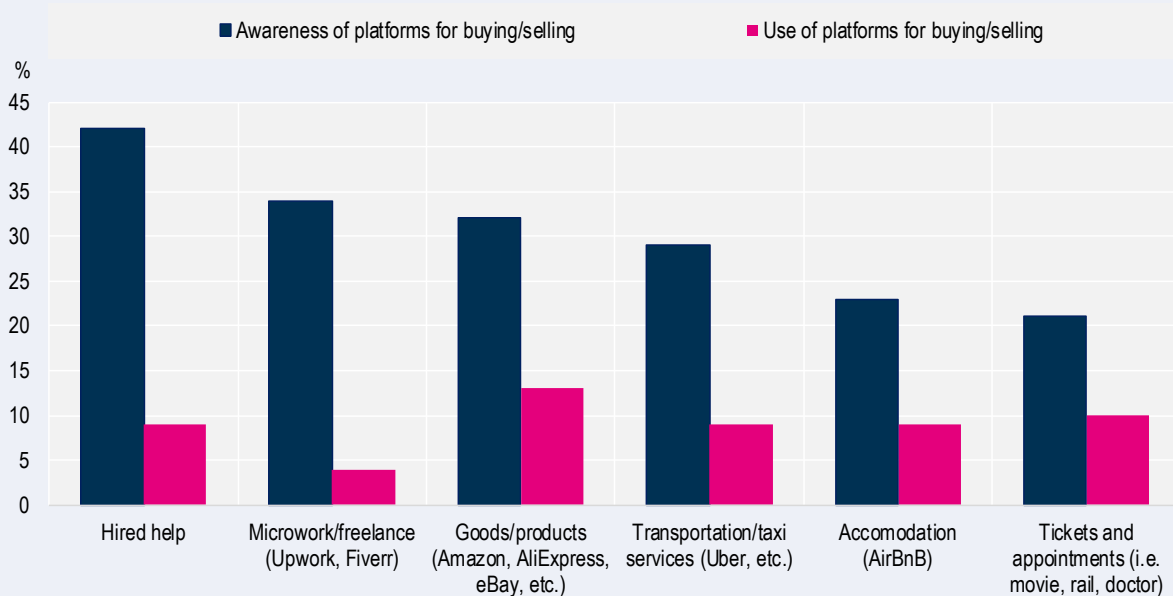
The SEA region is home of a rich cultural heritage, valuable not only for the region, but also for the entire world. Digital platforms, applications and services can make digital content widely available and can empower users to create local content. The Internet, as a major content distribution platform facilitates dissemination of content and can be a repository to store content. Preserving and promoting local content is important to raise awareness not only on the rich historic heritage, but also on the new knowledge and content being produced in the SEA region.

Overall lack of awareness on the existence of government support and policies to support further complicates effective adoption of digital tools by SMEs. According to a study by ERIA (2018^[8]), only 34% of the SMEs interviewed were aware of local government initiatives to encourage SMEs digital adoption, despite the fact that all countries in SEA have initiatives of this type, with training and education usually as priorities.

Box 3.6. Awareness and use of platforms in Cambodia

A 2018 survey undertaken by LIRNEasia found that user awareness of certain Internet platforms tends to translate into proportionate use of these platforms. In the case of Cambodia, however, awareness of the existence of certain platforms often has not resulted in correspondingly greater use, as illustrated in Figure 3.6.

Figure 3.6. Percentage of users aware and using platforms in Cambodia



Source: Adapted from LIRNEasia data in LIRNEasia (2018^[51]), *AfterAccess: ICT Access and Use in Asia and the Global South*, <https://lirneasia.net/wp-content/uploads/2018/10/LIRNEasia-AfterAccess-Asia-Report.pdf>.

Among those who do not buy on line, the LIRNEasia survey found that lack of skills and relevance of the applications are key barriers. In Cambodia, asked why they do not buy on line, 29% of respondents said the reason was they “do not know how to”, 23% said they “do not need to (they can buy all necessary goods/services from physical stores)”, 15% said “not being certain of the quality of the product” was the reason, and 6% cited “not being certain that I will receive the goods/services”. Similarly, lack of skills and relevance were the most cited reason for users not selling on line: 42% of respondents in Cambodia said they “do not need to” do so and 40% said they “do not know how to” (Figure 3.6).

Source: LIRNEasia (2018^[51]), *AfterAccess: ICT Access and Use in Asia and the Global South*, <https://lirneasia.net/wp-content/uploads/2018/10/LIRNEasia-AfterAccess-Asia-Report.pdf>.

For policy makers in SEA, encouraging local digital content and applications that serve the needs of businesses and society, that in turn can increase overall ICT adoption and advance inclusive development. Local digital content and services in rural areas, for example, could take the shape of mobile applications for agriculture, livestock and fishery. Moreover, the public sector can play a central role in promoting relevant and local content by developing digital government services and strategies that improve access to public sector information and increase public engagement with public services through digital services and applications (Box 3.7).

Box 3.7. Digital government

Digital services and applications offer opportunities to increase access to public services, boost the reach and quality of such services, and improve policy making and service design. Digital tools should not only be used to digitise analogue processes and services. They also represent an opportunity to fundamentally rethink and reorganise government processes, procedures and services to be digital by design and incorporate people's preferences and needs as drivers of change. In line with this approach, countries are increasingly adopting a mobile-first approach to digital government.

In many OECD countries, tenders and contract awards are announced via a central national e-procurement system. In an increasing number of countries, all tax filings for personal and corporate income tax returns are submitted on line. Digital services and applications also create new opportunities for co-operation between the public and private sectors, such as through more effective value-added tax collection on online sales.

Source: OECD (2019^[52]), *Going Digital: Shaping Policies, Improving Lives*, <https://dx.doi.org/10.1787/9789264312012-en>.

An inclusive digital transformation

Different communities, groups and stakeholders have diverse requirements regarding their access and usage patterns. Businesses, especially SMEs, may require targeted initiatives. Anchor institutions such as schools, hospitals and government buildings have different constraints and needs. It is crucial to understand where usage and access gaps exist to design the appropriate policy action.

Beyond the expected difficulties in providing access, rural populations, women and certain minority groups may face specific barriers in terms of usage to full adoption of digital options as a means for social, community or economic participation. Therefore, these groups require qualified analysis and targeted policies to bridge existing adoption gaps.

Vulnerable and rural populations

Many rural, remote and minority communities in SEA are actively seeking new opportunities to drive economic growth, but face constraints in the absence of adequate broadband access and the necessary skills. In terms of infrastructure, for example, businesses need fast, reliable connection speeds to process purchase orders and payments, participate in online commerce, and stay competitive in an increasingly digital economy. At the same time, anchor institutions in rural areas such as schools and hospitals need broadband connectivity to efficiently treat information and provide public services efficiently.

Due to the lack of basic communication infrastructure, SMEs in rural areas are more constrained than SMEs in urban areas. In addition to a lack of stable and quality infrastructure, they face the challenge of limited or non-existent sources for the acquisition of generic, advanced and complementary digital skills. Without proper broadband connections, mobile coverage or anchor institutions that are connected, SMEs are left cut off from the Internet information pool. In this non-connectivity trap, they have no means to digitalise their businesses to the full extent possible.

Moreover, the population of SEA, meanwhile, is ageing, although this is less pronounced than in the OECD countries, where approximately 17% of the population was aged 65 and

above in 2018. In several countries in SEA in 2018, the proportion of the population over age 65 exceeded the 7% threshold, among them Singapore (13%), Thailand (11.8%) and Viet Nam (7.4%) (World Bank, 2019^[53]). This is a challenge especially for rural areas where the declining younger population is moving from traditional activities such as agriculture to live in urban centres. Targeting rural SMEs in efforts to enhance adoption of digital services and applications could increase productivity in these traditional sectors, including agriculture. This also could help to attract more individuals to live in a small town or region and encourage the establishment of new firms in these areas, thus fostering an ecosystem that will be more appealing for youth (Box 3.8). Telework and home learning outside urban areas also can improve the conditions for the growth of digital businesses, and can potentially help rural communities to slow or even reverse migration to urban areas.

Box 3.8. Applying AI to agriculture and fashion

Few sectors have more potential than agriculture to apply new digital tools such as the IoT and AI. Not only can these applications improve yields in more sustainable ways, they also can also higher quality and higher skill jobs for young people. An example is Sero, a crop intelligence company based in Viet Nam that optimises rice production with full-cycle data analytics. Using images taken by farmers with smartphones, sensors and its mobile app, Sero assists rice growers to collect in-field data throughout the entire growth cycle to provide preventative recommendations via their Computer Vision technology. The company also provides production insights to farmers, agribusinesses, government extension workers and importers.

Another example is Sorabel (previously Sale Stock), an Indonesian online clothing site that competes against the industry giants by using AI to predict fashion demand. The company says it has more data scientists than fashion designers and that AI enables it to mine and analyse market data and customer behaviour to forecast demand. With production tailored to demand the company says it can charge substantially lower prices.

Sources: Freischlad (2016^[54]), “An unknown startup is tackling Indonesia’s ecommerce giants with a ‘no discounts’ policy”, <https://www.techinasia.com/salestock-what-we-know>; Crunchbase (2019^[55]), *Sero overview* (web page), <https://www.crunchbase.com/organization/sero#section-overview>; Liu (2017^[56]), “Artificial intelligence is on the rise in Southeast Asia, helping everyone from fashion designers to rice growers”, <https://www.scmp.com/week-asia/business/article/2118345/artificial-intelligence-rise-southeast-asia-helping-everyone>; Sorabel (2018^[57]), *Sorabel* (web page), <https://www.sorabel.com/?sorabelPopup=true>.

Changing jobs

As new digital services and business models emerge in SEA, labour markets and jobs themselves are transforming, with some job being lost, others being created and many existing jobs changing. Adapting to technology progress, new forms of organisation and jobs will require policy makers in the region to ensure that no workers are left behind regardless of firm size, industry, region or occupation.

Usually, low-skilled workers have the most urgent need to upskill or reskill. Yet, they are least likely to receive training. Low-skilled workers tend to be in smaller and laggard firms, and to face higher barriers to participation in adult learning including lack of basic skills to meet entry requirements, time constraints and low motivation (OECD, 2019^[52]).

For SMEs, policies should aim to help them to navigate uncertain and evolving environments. This could be done by providing SMEs with comprehensive information about the skills

and learning opportunities required to effectively use digital services and applications; making sure these tools are flexible and affordable; and fostering SME engagement with digital services and applications, with a particular focus on SMEs whose skills or business models are most at risk of becoming obsolete (OECD, 2019^[58]).

Another policy consideration concerns the changing nature of jobs arising from platform-mediated work. These platform job markets include crowd work (i.e. the outsourcing of tasks to a large pool of online workers), gig work (i.e. short-term contracts or freelance work), and other forms of on-demand labour such as those exemplified by Go-Jek and Grab in SEA. Workers in platform markets and even sellers using e-commerce platforms often benefit from low entry barriers and flexibility, factors that can facilitate the inclusion of typically under-represented groups including women with small children, workers with disabilities, workers in small firms and the least skilled workers. However, attention should be given to ensuring that on-demand jobs should have suitable working conditions and mitigating adverse effects (e.g. greater job strain, less exposure to training, and lower wages and social protection) (OECD, 2018^[59]). While it is important to provide people and businesses the mix of skills necessary to succeed in the digital transformation, promoting successful transitions from declining to expanding jobs is also crucial. Such transitions can be eased through social dialogue that seeks to strike a balance between flexibility and mobility, on one hand, and job stability, on the other (OECD, 2019^[52]).

Gender digital divide

The emerging digital economy offers women increased flexibility in terms of the hours and where they work, thus potentially increasing their participation in the labour force and improving their quality of life. Evidence also shows that digital services and applications can connect women-led businesses to a larger customer base far more effectively than attempts to do so off line. Both digital banking and payment systems, for example, can level the playing field for women in terms of access to financial services. Using digital banking and payment can significantly reduce the amount of time spent travelling to and waiting in line for a physical point of payment, bank or ATM. Moreover, the use of digital tool for professional purposes can reduce the hours women spend on unpaid work; adoption by many businesses of telecommuting practices can also make it easier for women to remain in the workforce if they so choose. However, the fundamental issue of the digital divides that affect women, particularly in SEA, must be addressed for these benefits to be fully enjoyed.

According to International Telecommunication Union (ITU) estimates, women globally have less access to – and make less use of – ICTs than men. The gender digital divide grew to 12% in 2016, up from 11% in 2013, and it shows no sign of narrowing. But in Asia and Pacific regions, the average gap between male and female Internet users for Internet access was 17% (ITU, 2017^[60]).

This gender digital divide reinforces other gaps in digital entrepreneurship. The fact is that women's entrepreneurship is largely skewed towards smaller and informal firms. According to the International Finance Corporation, women-owned businesses make up nearly 32% to 39% of very small firms, 30% to 36% of small SMEs and 17% to 21% of medium-sized companies; women entrepreneurs are also more likely than their male counterparts to be in the informal sector, running smaller firms mainly in service sectors and thus operating in lower value added sectors (IFC, 2011^[61]). However, very few official statistics or data exist on how many women-owned businesses actually access the Internet or how they use it. With the exception of a few case studies (such as those discussed in Box 3.9), little is known in SEA countries about the extent to which extent women-owned SMEs engage in e-commerce.

Box 3.9. Women-led digital businesses in ASEAN

Brunei Darussalam: Tyne Solutions

Tyne Solutions is based in Brunei Darussalam, with clients in 12 different countries. The company provides software and creative solutions, all located in the cloud, to enable businesses of all sizes and non-governmental organisations to give flexibility to their workers. Digital tools such as G-Suite, Atlassian products and Amazon Web Services allow Tyne Solutions to operate day to day and grow its international clientele (Tyne Solutions, 2018_[62]).

Cambodia: Lotus Silk

Lotus Silk launched its first boutique in Phnom Penh in 2011, and now employs seven women full time in eight different communities across Cambodia. It exports 90% of its fashion products to customers around the world. Lotus Silk tapped into Codingate, another local SME, to design its website and use tools such as Facebook Messenger, Instagram and Verve to update retail customers on their orders, facilitate group chats with the company and increase the company's visibility on line. Lotus Silk's marketing, planning and export plan was supported by the ITC and Cambodia's Ministry of Commerce (Lotus Silk, 2018_[63]).

Malaysia: Nashata

The goal of the Nashata company is to empower modest women to have an active lifestyle and be more confident about working outside their homes by providing suitable hijabs and clothing for playing sports. Nashata is an Internet-based company with an online store, email services and a cloud-based accounting system. About 60% of its sales are in foreign markets (mainly Singapore, the United States, Europe, Australia and the Middle East). It accepts payments through global gateways including PayPal, maintains an active profile on social media and attributes much of its website traffic to simple Google searches. The company also uses WhatsApp and online chat powered by Smartsupp, based in the Czech Republic, to attract more customers (Nashata, 2018_[64]).

Source: Global Innovation Forum (2018_[65]), *ASEAN Women in E-commerce*, <https://globalinnovationforum.com/reports/asean2018/>.

In terms of skills, women often do not have much-needed opportunities for acquiring expert skills. In OECD countries, men enrol in tertiary level computer science and engineering programmes at a rate four times that of women (OECD, 2017_[66]). Similarly, female participation in ICT professions worldwide is low. Moreover, because women-owned businesses generally are in the informal sector and small business segment, women have less access to finance and public grants. In terms of access to venture capital, for instance, women-owned start-ups receive 23% less funding than businesses owned by men, and are 30% less likely than these to have a positive exit – i.e. to be acquired or to issue an initial public offering (Breschi, Lassébie and Menon, 2018_[67]).

These divides can be overcome by tapping the potential that digital services and applications offers for women entrepreneurs. A number of recent studies have explored the benefits of doing. An ITC survey of 111 countries found that 75% of online-only, e-commerce businesses are owned by women. Businesses owned by women ultimately generate higher revenue and are often more innovative than businesses owned by men (International Trade Centre, 2017_[42]).

Women can be empowered by increased participation in e-commerce, including in the higher value added sectors of the ICT industry and ICT-enabled services, and inserting themselves in global value chains (OECD, 2018_[68]). International efforts have aimed to spur the participation of women-owned enterprises in the digital economy. One example is the SheTrades app, an ITC initiative that connects buyers and women-owned enterprises worldwide as part of a wider initiative to connect one million women entrepreneurs to markets by 2020. Another is the EQUALS coalition formed by the ITU and UN Women, which seeks to promote gender equality through international collaboration on connectivity, digital leadership and improved evidence. More disaggregated data on women's participation in the digital economy and e-commerce also would play a part by helping to shape and assess policies to improve situation of women-owned businesses.

Note

¹ This may change as Myanmar only recently lifted restrictions on Facebook.

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4. Leveraging market openness and regional integration in Southeast Asia

This chapter explores aspects related to regional strategies and co-ordination, particularly within ASEAN frameworks, and looks at regional connectivity through mobile roaming and international cables and e-commerce.

Regional co-operation and integration can contribute to economic growth by increasing productivity, generating opportunities for employment and strengthening institutions. Recognising these benefits, countries in Southeast Asia (SEA) have increased regional co-operation in their communication sectors in recent years. Such collaboration among policy and regulatory authorities can especially help to connect small and medium-sized enterprises (SMEs) through initiatives to improve international broadband connectivity. A regional focus on going digital opens opportunities not only in regional and global markets, but also fosters SME and e-commerce growth at home.

Regional approaches to improving international broadband connectivity can take the form of developing cross-border backbones, international submarine cables and services such as international mobile roaming. Through their collaboration in policy and regulatory networks, national authorities also can foster market openness. Access to regional and global markets and knowledge networks helps to diffuse ideas and technologies across borders; connect businesses and consumers globally; better integrate new players and new business models into global value chains; and spur innovation (OECD, 2019^[1]).

SMEs benefit from regional and international approaches to connectivity. Digital services and applications, for example, enable firms to sell their products on line and to new consumers and markets across national boundaries. Cross-border e-commerce, a subset of digital trade, is increasingly important for SMEs. More broadly, online technologies and platforms, including through their applications to e-commerce, are important drivers of business for SMEs: online platforms have lowered barriers to entry for firms to trade, including by enabling smaller firms to use a platform's logistics and customer service infrastructure outside of their domestic markets (OECD, 2019^[2]).

E-commerce is an increasingly important form of economic activity that affects businesses in a number of ways. For example, it can reduce operational costs at different stages of business activity and enlarge market scope. But it also intensifies competition by lowering barriers to entry and, existing companies, introduces the need for additional skills. The growth of e-commerce also has impacts on consumers, giving them better access to product and price information about a broader set of goods and allowing them a wider choice of goods at a lower price. E-commerce further benefits consumers in welfare gains, such as time saving (OECD, 2013^[3]).

This chapter addresses some of the issues associated with both e-commerce and regional integration in the context of fostering connectivity for SME growth in SEA. The enabling environment for promoting SMEs in the region and beyond should feature these two critical attributes.

Regional co-ordination

Regional co-ordination can be defined as the process of increasing social and economic relations among the countries in a given geographical area (OECD/IDB, 2016^[4]).¹ Broadband networks can foster regional co-ordination and integration by lowering barriers to the exchange of information among businesses and people in different countries.

As broadband connectivity and services evolve, data flows and commerce between SEA countries are creating tremendous opportunities for SME growth. Cloud computing is a prime example, whereby broadband networks facilitate the access of SMEs to computing infrastructure in the cloud and thus significantly lower their capital requirements. Other new and emerging tools such as artificial intelligence, big data and blockchain can potentially promote SME growth, but also require responsive communication services.

For SMEs in SEA to flourish, data must flow seamlessly across national borders. Many applications and much content likely are located in data centres that are outside a particular country or outside the region. Inadequate or inefficient international connectivity can result in slower and less reliable data transmission, lower service quality and raise the cost of final delivery of services. The availability of international connectivity infrastructure and services (e.g. regional terrestrial backbones, international submarine cables and international gateways) and how to encourage competition in these markets.

Regional integration implies that people, goods and data flow efficiently across borders. In a data-dependent world, uncompetitive international roaming prices are a significant challenge that require a policy response. To foster regional integration, policies governing international roaming should focus on good practices to promote transparency for customers and ensure that they are aware of substitutes for international roaming. Policies also should concentrate on protecting customers from what is sometimes called bill shock, or inadvertently high bills, and inadvertent roaming; developing transnational roaming offers; ensuring a competitive wholesale market; and promoting competition at the retail level.

Finally, regional integration policy should take a long-term perspective that is prepared for future demand and emerging cross-border services. Online services tend to disregard national boundaries. Given the growing number of connected devices, including for vehicles, policy makers should anticipate both future challenges and opportunities in regional agreements and national frameworks. Preparing for the Internet of Things (IoT) is an example. Policy frameworks should be adapted or devised in such a way that they enable the adoption and deployment of IoT applications and services. Adequate resources (such as spectrum and number identifiers) and solutions that are flexible and that avoid lock-in also are essential. The overarching goal should be to address IoT development in both national and regional public policy.

Regional IP traffic

The growth in Internet exchange points (IXPs) in SEA in recent years is encouraging. However, some analysis suggests that less-than-optimal routing is a factor contributing to higher latency in the region. Lee (2016^[5]), in a study for the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) and Korea's National Information Society Agency (NIA), found significant variation in the speeds and latency experienced by Internet users in SEA.

This study indicated that regional traffic often traversed longer distances than would seem optimal if all else was equal. Often traffic was exchanged within the region but in some cases, it travelled via Hong Kong (China) or the United States before returning to the region. The NIA cited a number of reasons for this: incorrect information in routing tables, insufficient capacity on some more direct routes, and transit costs that are higher over more direct routes than over some routes with more competition. As noted in the study, exchanging traffic locally is generally less expensive and more efficient than relying on international capacity, highlighting the essential role played by IXPs.

SEA networks rely on exchanging traffic in countries outside the region, as Lee (2016^[5]) illustrated using Malaysia as an example. The report found that some traffic between Malaysia and neighbouring countries went via Germany and Hong Kong (China), as well as via the United States. The exchange of some traffic from Malaysia to Indonesia traversed a route from Malaysia to Germany to the United States and finally to Singapore before getting to Indonesia. In another example, some exchanges between Malaysia and Thailand resulted in a Malaysia-United States-Spain-Hong Kong (China)-Thailand route. For certain Internet

service providers (ISPs), some exchanges were direct between Malaysia and other countries, for instance between Malaysia and Singapore. But even for these ISPs, some traffic went outside the region (Table 4.1).

Table 4.1. Routing trace, by ISP, from Malaysia to selected countries' capital cities

To	ISP	Hop	Trace
Brunei Darussalam	DST Communications Sd	9	Malaysia > Brunei Darussalam
Cambodia	Mekong Net	10	Malaysia > Cambodia
Indonesia	Telekomunikasi Indo	15	Malaysia > Germany > United States > Singapore > Indonesia
	Biznet Networks	13	Malaysia > Singapore > Indonesia
	CBN	12	Malaysia > Singapore > Indonesia
	Qiandra Information	13	Malaysia > Singapore > Indonesia
Lao PDR	Lao Telecom	12	Malaysia > United States > Thailand > Lao People's Democratic Republic
Myanmar	RedLink	9	Malaysia > Myanmar
Philippines	SKY Broadband	10	Malaysia > United States > Philippines
	Dunham Bush International	12	Malaysia > United States > Philippines
Singapore	Viewqwest Pte. Ltd	8	Malaysia > Hong Kong (China) > United States > Singapore
	New Media Express	11	Malaysia > Singapore
	SGIX	12	Malaysia > Singapore
	SingTel	11	Malaysia > Singapore
Thailand	PEA	18	Malaysia > United States > Spain > Hong Kong (China) > Thailand
	CS LOXINFO	11	Malaysia > United States > Thailand
	Shama Thunder	16	Malaysia > Singapore > Thailand
	Internet Thailand PCL	11	Malaysia > Thailand
Viet Nam	Viettel	9	Malaysia > United States > Viet Nam

Note: IXP = Internet exchange point; Lao PDR = Lao People's Democratic Republic.

Source: Lee (2016^[5]), *A Pre-Feasibility Study on the Asia-Pacific Information Superhighway in the ASEAN Sub-region: Conceptualization, International Traffic & Quality Analysis, Network Topology Design and Implementation Model*, <https://www.unescap.org/sites/default/files/ASEAN%20report%20final.pdf>.

Other studies have found that land-based interconnectivity in SEA is weak and that costs are high. The regional Internet transit prices in Cambodia, the Lao People's Democratic Republic (hereafter "Lao PDR"), Myanmar and the Philippines were ten times more expensive than those in Singapore (see, for example, UNESCAP (2019^[6])).

International connectivity

Undersea cables play a critical role in SEA for international connectivity and for domestic connectivity in the case of countries made up of archipelagos, such as Indonesia. Despite the amount of undersea cables in the region (Table 4.2), international connectivity in most SEA countries is relatively weak. Exceptions are Malaysia, the Philippines and Singapore, which have long been regional hubs or are on well-established routes for undersea cables. These cables connected some SEA countries to each other and also were on major telecommunication routes between Asia and Europe; they also were on routes connecting countries including Australia, Hong Kong (China), and Japan or part of routes to North America (TeleGeography, 2019^[7]).

Among SEA countries, Indonesia, with weak and limited interregional connectivity, strongly depends on Singapore for its transit capacity. Cambodia also continues to rely on backhaul agreements with neighbouring countries for international connectivity. Lao PDR, the only landlocked country in the region, has no direct connectivity to submarine cable networks (UNESCAP, 2019^[6]).

Two of the cables traversing the SEA region – the Asia-Pacific Gateway (APG) and the South-East Asia Japan Cable System (SJC) cables – have terabit capacity. In addition to providing connectivity to some SEA countries, these cables connect to large countries in the broader Asia Pacific region (APAC) such as Hong Kong (China), Japan and Korea and through these countries to cables that cross the Pacific Ocean.

Table 4.2. Selected submarine cables connecting SEA countries

Cable name	Countries connected	Capacity
Asia Pacific Cable Network (APCN)	Hong Kong (China), Indonesia, Japan, Korea, Malaysia, Philippines, Singapore, Chinese Taipei, Thailand	5 Gbps
Asia Pacific Cable Network 2 (APCN-2)	China, Korea, Japan, Hong Kong (China), Malaysia, Philippines, Singapore, Chinese Taipei	2.56 Tbps
East Asia Crossing-City-to-City Network	China, Hong Kong (China), Japan, Korea, Philippines, Singapore, Chinese Taipei	30.72 Tbps
Indigo	Australia, Indonesia, Singapore	18 Tbps
TGN-Intra Asia Cable System (TGN-IA)	Guam, Hong Kong (China), Japan, Philippines, Singapore, Viet Nam	3.84 Tbps
Malaysia-Cambodia-Thailand (MCT)	Cambodia, Malaysia, Thailand	1.5 Tbps
Matrix Cable System (MCS)	Indonesia, Singapore	2.56 Tbps
Moratelindo International Cable-System One	Indonesia, Singapore	10 Gbps
South-East Asia Japan Cable System (SJC)	Brunei Darussalam, China, Hong Kong (China), Japan, Philippines, Singapore, Thailand	28 Tbps
Asia-Pacific Gateway (APG)	China, Hong Kong (China), Japan, Korea, Malaysia, Singapore, Chinese Taipei, Viet Nam	54 Tbps
Asia Submarine-Cable Express	Japan, Malaysia, Philippines, Singapore with extension to Cambodia underway	15 Tbps
TIS Cable Network	Indonesia, Singapore, Thailand	320 Gbps
Dumai Malaka Cable System (DMCS)	Indonesia, Malaysia	320 Gbps
Batam-Dumai-Melaka (BDM)	Indonesia, Malaysia	80 Gbps

Note: Gbps = gigabits per second; Tbps = terabits per second; China = People's Republic of China.

Source: Submarine Cable Networks (n/d_[8]), *Global Submarine Cable Systems* (web page), <https://www.submarinenetworks.com/en/systems>.

When the APG cable opened in October 2016, it substantially increased capacity to meet growing demand from digital economies in the region (Qiu, 2016_[9]). SEA countries connected by the cable are Malaysia, Singapore, Thailand and Viet Nam. In 2012, four years before its launch, Facebook had joined with large telecommunication operators as an investor in the proposed system. At the time, it was a pioneer. Today, it is common in SEA for traditional telecommunication operators as well as companies such as Amazon, Alphabet (Google) and Facebook to invest in undersea cables. Google, for instance, has invested in Indego, a consortium cable running from Singapore to Australia via Indonesia (Quigley and Francois, 5 April 2017_[10]).

To meet anticipated increased demand from digital transformations in the region, a number of new cable projects are planned or underway. The South-East Asia Japan 2 Cable (SJC2) will land in Singapore, Thailand, Cambodia and Viet Nam before continuing to other Asian countries (Smart Cities World, 2018_[11]). When it is completed in 2020, the cable will have a capacity of 144 terabits per second (Tbps). Overall, this means that the countries connected to the APG and, in the future, SJC2 will have the capabilities to support their digital economies in terms of international connectivity, and may well exceed other cables in the region. Another example is the Jupiter cable. Announced by several new and traditional players in 2017, this cable is to have 60 Tbps of capacity and connect the United States to the Philippines,

where it can connect to other regional cables. The proposed Bay-to-Bay Express Cable System is expected to provide service by 2020 over the longest undersea cable without repeaters, landing in the United States, Japan and Singapore. Each of its multiple pairs of fibre will be able to carry at least 18 Tbps of capacity, using Singapore to connect to other regional cables. Other proposed undersea cables would increase capacity between SEA and countries surrounding the Indian Ocean, among them the Indian Ocean Xchange (IOX) cable system (Phase 3) (IOX, 2018_[12]).

The groups running undersea cables are springboards for international co-operation. One example is the Asia-Pacific Information Superhighway (AP-IS) working group, discussed in Box 4.1. Such groups can share good practices in areas such as regulation and make available information that assists in forecasting expected demand for capacity. Indeed, good practice in domestic markets acts as a magnet for undersea cable investment. Growth in domestic markets attracts investment in international connectivity because it stimulates demand and eliminates restrictions in ways that increase the seamless nature of connectivity between domestic and international infrastructure.

Box 4.1. The Asia-Pacific Information Superhighway

The AP-IS, officially launched in 2017, is a member-driven initiative of UNESCAP. to improve regional broadband connectivity through a dense web of open access, cross-border infrastructure. Its core objective is to create a seamless regional network of fibre optic cables to provide both intra-regional and intercontinental connectivity. This enhanced regional fibre network is expected to drive down international bandwidth prices and improve affordability; increase resilience by offering redundancy; decrease latency across the region; and enhance digital inclusion.

The four pillars of the AP-IS are:

- **Connectivity.** Aims to nurture effective physical network design, development and management across the region through intergovernmental negotiation and by improving regulations based on open access.
- **Traffic and network management.** Aims to nurture improvement of Internet traffic and network management at regional, sub-regional and national levels.
- **E-resilience.** Aims to promote resilient information and communication technology (ICT) networks to support disaster management systems and ensure last-mile disaster communication.
- **Broadband for all.** Aims to bridge digital divides by promoting affordable access to underserved areas and providing policy and technical support to governments.

The Master Plan for the AP-IS contains a long-term vision, targeted goals, specific activities and milestones with regard to these four pillars. The Master Plan is intended to add value to sub-regional initiatives such as the ASEAN ICT Master Plan as well as to other initiatives including member states' national ICT plans and initiatives.

Source: UNESCAP (2019_[6]), *Master Plan for the Asia-Pacific Information Superhighway 2019-2022*, https://www.unescap.org/sites/default/files/ESCAP_CICTSTI_2018_INF1.pdf.

For the most part, undersea cables are financed by the private sector and undertaken by consortiums. Where there is public investment, it is good practice to ensure open access for

new players. Generally, though, the best safeguard is to ensure competition, particularly for domestic infrastructure, as this attracts international connectivity. In SEA, only Lao PDR is landlocked. But in some regions of the world, this has proven to be a barrier if neighbouring countries have uncompetitive communication markets. Encouragingly, the consortiums proposing undersea cables in SEA, such as the Malaysia-Cambodia-Thailand cable that opened in 2017, view connecting countries such as Lao PDR over terrestrial cables as an opportunity to add more users to their regional network (China Daily, 2015^[13]).

Experience elsewhere suggests that increased broadband penetration and the demand for services associated with greater competition are strong drivers for the private sector to increase international cable capacity. Increased capacity lowers the cost of international connectivity for firms, including SMEs, and improves their access to markets and hubs where they can take advantage of cloud-based services. Greater connectivity via multiple routes also ensures redundancy in the event of an interruption to a particular cable.

International mobile roaming

As digital economies grow in SEA, uncompetitive international roaming prices can become a serious challenge – not just because connected travellers cross borders but also because connected machines operate across borders. Good practices to foster regional integration should focus on promoting transparency for customers and helping to ensure that customers are aware of substitutes for international roaming; protecting them from excessively high bills, or what is sometimes called bill shock. Policies should also concentrate on protecting customers from what is called bill shock, including inadvertent roaming; developing transnational roaming offers; ensuring a competitive wholesale market, and promoting competition at the retail level.

Policy making and regulatory action in the area of international roaming should also be based on evidence drawn, for instance, from monitoring the evolution of prices, volumes and revenues for each roaming service from data, when available, on real costs for international roaming services. To collect such data from operators, communication regulatory authorities must have appropriate powers, specified in the regulatory framework. Benchmarking with other countries can also identify trends and specific characteristics of national markets. Care should be taken when publishing costs and price comparisons that confidential commercial information is not disclosed. To avoid this, aggregation of data can be considered. The Body of European Regulators for Electronic Communications is a useful reference on the type of measurements and indicators that can be used to monitor prices and volumes for international roaming services.

SMEs rely on communication services. When staff and customers switch off or curtail using their devices when roaming, as many of them do in uncompetitive markets, this impacts these firms. Therefore, it is welcomed that policy makers in SEA have made improving the market for roaming in the region a priority in recent years. Initiatives through Association of Southeast Asian Nations (ASEAN) and bilateral agreements are equally appreciated.

An example of this commitment is the Joint Ministerial Statement adopted in 2011 by ASEAN countries and its Addendum on Intra-ASEAN Mobile Roaming Rates. The statement aimed to highlight the issue and encouraged members to implement bilateral arrangements on mobile roaming. The ministers noted that bilateral arrangements on international mobile roaming charges had been implemented or were in the process of being implemented between Malaysia and Singapore, Brunei Darussalam and Malaysia, and Brunei Darussalam and Singapore. The statement encouraged other member states to follow suit.

ASEAN countries reaffirmed the importance of making international roaming accessible and transparent for people living in the region at an ASEAN Telecommunications and Information Technology Ministers meeting in December 2017. ASEAN ministers adopted an international mobile roaming framework to achieve these goals. In addition, SEA countries that are parties² to the Trans-Pacific Partnership Agreement (TPP), as it was then called, pledged in Article 13.6 to enhance transparency and competition in mobile roaming. The TPP has been renamed the Comprehensive and Progressive Agreement for Trans-Pacific Partnership, and the articles relating to international mobile roaming remain intact.

The current bilateral agreements on international mobile roaming now in effect in SEA are the ones between Malaysia and Singapore (2011), Brunei Darussalam and Singapore (2014) and Cambodia and Thailand (2015). Apart from the bilateral action, Thailand and Singapore have adopted regulations aimed at protecting consumers by preventing bill shock, including by requiring operators to stop service once a predetermined spending limit is reached. The APEC Telecommunications and Information Working Group had issued guidelines for the region on this issue for the region in 2010. Both sharing good practices and bilateral agreements are important to address issues around roaming charges.

Malaysia and Singapore were the first ASEAN countries to reach and implement an agreement on international mobile roaming. The telecommunication regulators in both countries, the Infocomm Development Authority of Singapore (IDA) (Singapore's former communication regulator; Infocomm Media Development Authority [IMDA] since 2016) and the Malaysian Communications and Multimedia Commission (MCMC), worked closely to study the rates charged by mobile operators to better understand the prevailing industry practice and charging model (Box 4.2).

Box 4.2. Regional co-operation between Malaysia and Singapore

In March 2011, the IDA required operators to provide consumers with the option of a premium rate service barring function, which is free the first time it is activated. Operators were also required to give consumers the option of limiting their data roaming usage in a monthly billing cycle and comply with a number of other transparency measures. However, as mobile roaming charges involve different price components charged by operators from both Singapore and Malaysia, it was recognised that regulators from both countries needed to co-ordinate and co-operate in a study of roaming charges and in any regulation to reduce these charges. Such collaboration would ensure that users from both countries benefit from any decision to intervene in the market.

A subsequent study of charging practices found that prices were well above costs and that a series of wholesale and retail price controls would be appropriate. Singapore and Malaysia concluded discussions to progressively reduce bilateral roaming rates.

The IDA worked closely with its counterparts in the MCMC and with mobile operators in Singapore to reduce roaming rates. Beginning on 1 May 2011, prices dropped by as much as 30% for voice calls and 50% for SMS services for mobile phone subscribers in Malaysia and Singapore using the mobile roaming service provided by all mobile operators. Mobile operators implemented the price reductions in two phases for both prepaid and post-paid subscribers. Both the wholesale inter-operator charges and the retail subscriber charges were reduced to affect the lowered prices.

Source: OECD (2013^[14]), "International mobile roaming agreements", <http://dx.doi.org/10.1787/5k4559fzbn5l-en>.

A further positive development in SEA in recent years is the increased level of competition with respect to offers targeted to users who use roaming in the region. Notably, operators are increasingly offering so-called roam like at home plans, whereby users have more seamless access to services without additional charges. A few offers already are in place in the most developed and competitive markets (Table 4.3).

Table 4.3. Roam like at home in SEA (June 2018)

Country	Operator	Destination in SEA	Details
Cambodia	Metfone	Lao PDR, Myanmar, Viet Nam	Applies only when connected to the network of Viettel or its subsidiary in each country
Lao PDR	Unitel	Cambodia, Myanmar, Viet Nam	Applies only when connected to the network of Viettel or its subsidiary in each country
Malaysia	Digi	Brunei Darussalam, Indonesia, Myanmar, Philippines, Singapore, Thailand	Free with Digi "Postpaid 110", 60 minutes calling, 5 GB/month Applies only when connected to preferred carrier in destination
	U-mobile	Cambodia, Indonesia, Lao PDR, Philippines, Singapore, Thailand	Free with certain post-paid plans; up to local data quota; Applies only when connected to preferred carrier in destination
Myanmar	Mytel	Cambodia, Lao PDR, Viet Nam	Applies only when connected to the network of Viettel or its subsidiary in each country
Singapore	Starhub	Malaysia	Prepaid customer only
Viet Nam	Viettel	Cambodia, Lao PDR, Myanmar	Applies only when connected to the network of a subsidiary of Viettel in each country

Note: GB = gigabyte; Lao PDR = Lao People's Democratic Republic.

Sources: Operators' websites.

Communication services and infrastructures

Several different bodies in SEA co-ordinate activities related to communication services as part of their mandates. A number of bodies have this responsibility for the broader APAC. Table 4.4 describes their roles, resources and websites.

Aside from regional bodies, a number of international intergovernmental organisations have programmes and initiatives in the SEA region. Both the International Telecommunication Union (ITU) and the OECD have programmes aimed at SEA that address issues related to connectivity and the digital transformation. ITU has offices in the region: its office for Asia and the Pacific, serving 38 countries, is located in Bangkok, and its SEA office is in Jakarta. The SEA programme of the ITU covers Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, the Philippines, Singapore and Viet Nam. Among other activities, the ITU fosters co-operation among these countries to arrive at common positions on the use of the radio spectrum.

Regional integration among ASEAN countries has been accelerating since the early 1990s (Tanaka, 2009^[15]), including in the area of ICTs. Since 2001, for instance, telecommunications and information technology ministers hold regular meetings, known as the TELMIN; the Telecommunications and Information Technology Senior Officials Meeting (TELSOM) and its Working Groups carry out the policies and objectives of TELMIN. Among the initiatives emerging from the TELMIN are successive and ambitious ASEAN ICT master plans (Box 4.3).

Table 4.4. Regional and SEA bodies mandated to deal with communication issues

Organisation	Description	Website
Asian Development Bank (ADB)	Established in the early 1960s, the ADB is a financial institution to foster economic growth and co-operation in Asia	www.adb.org/
Asian Infrastructure Investment Bank (AIIB)	AIIB, a modern knowledge-based institution, focuses on the development of infrastructure and other productive sectors in Asia, including energy and power, transportation and telecommunications, rural infrastructure and agriculture development, water supply and sanitation, environmental protection, urban development and logistics, etc.	www.aiib.org/
Asia-Pacific Economic Cooperation (APEC)	APEC is a regional forum created in 1989 to promote sustainable economic growth and prosperity in APAC; its Telecommunications and Information Working Group (TELWG) was established in 1990	www.apec.org/APEC-TELWG
Asia-Pacific Network Information Centre (APNIC)	APNIC is a non-government organisation responsible for assigning and administering Internet numbering resources in APAC	www.apnic.net/
Asia-Pacific Telecommunity (APT)	APT is an intergovernmental organisation that operates in conjunction with telecom service providers, manufacturers of communication equipment, and research and development organisations active in the field of communication, information and innovation technologies	www.aptsec.org/
Association of Southeast Asian Nations (ASEAN)	ASEAN is a regional organisation comprising ten SEA countries that promotes intergovernmental co-operation and facilitates economic integration among its members	www.asean.org/
United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP)	UNESCAP is as the United Nations' regional hub promoting co-operation among countries to achieve inclusive and sustainable development. Established in 1947, it is the largest regional intergovernmental platform with 53 member states and 9 associate members	www.unescap.org/

A crucial role of these regional co-operation forums is to allow for the sharing of information and best practices, particularly in the areas of measurement. Collecting information and data is a critical part of ensuring that any policy is meeting goals. In the context of regional co-operation in SEA, such data can also be used to share experience and demonstrate the effectiveness of approaches. Sharing good practices in a region where countries often have similar economic, geographical and other challenges is a key benefit of greater regional co-operation.

In the context of the development of international communication infrastructure and services in the region, assessment tools for progress in SEA co-operation could include:

- qualitative and quantitative assessment of the participation in international/regional forums and organisations, the main issues discussed, and the policy decisions taken
- periodic assessment of resources (in terms of budget and human resources) and benefits obtained (even if they cannot be quantified) to guide international activity and set priorities in the allocation of resources for different lines of work.

Relevant topics for a measurement roadmap in this area could include:

- maintaining a database of infrastructure that is providing connectivity to SEA countries (such as submarine cables, international trunks and international gateways)³ and publishing aggregated data to protect the confidentiality of operators' commercial information
- monitoring traffic and prices through regular information requests to operators, complemented by normalised benchmarking with similar countries in other regions and/or leading countries, and maintaining regular contacts with operators to identify existing bottlenecks or future needs.

Box 4.3. ASEAN initiatives for ICT

The first TELMIN was held in July 2001 in Malaysia. TELMIN took over the technological aspects of the e-ASEAN work programme, which falls under the ASEAN Economic Ministers. TELSOM and its Working Groups carry out the four objectives of the e-ASEAN Framework Agreement, namely to develop, strengthen and enhance the competitiveness of the ICT sector; reduce the digital divide within and among ASEAN member countries; promote co-operation between the public and private sectors; and develop ASEAN information infrastructure.

To further strengthen collaboration among ASEAN member states, ministers at the 10th TELMIN in January 2011 adopted and launched the ASEAN ICT Masterplan 2015 (AIM 2015), *Towards an Empowering and Transformational ICT: Creating an Inclusive, Vibrant and Integrated ASEAN*. The five-year comprehensive plan outlined specific actions and projects with clear targets and timelines in six strategic pillars. The aim was to deliver four key outcomes: ICT as an engine of growth for ASEAN countries, recognition of ASEAN as a global ICT hub, enhanced quality of life for the peoples of ASEAN and contribution to ASEAN integration.

Ministers at the 15th TELMIN in November 2015 adopted and launched AIM 2020 and its vision, “to propel ASEAN towards a digitally enabled economy that is secure, sustainable, and transformative [and] to enable an innovative, inclusive and integrated ASEAN community”. AIM 2020 structures ASEAN ICT co-operation activities into eight “strategic thrusts”: economic development and transformation, people integration and empowerment through ICT, innovation, ICT infrastructure development, human resource development, ICT in the ASEAN Single Market, new media and content, and information security and assurance.

In September 2016, ASEAN leaders adopted the Master Plan on ASEAN Connectivity 2025 (MPAC 2025). This plan, which succeeds the Master Plan on ASEAN Connectivity 2010, focuses on five strategic areas: sustainable infrastructure, digital innovation, seamless logistics, regulatory excellence and people mobility.

Source: ASEAN (2015^[16]), *ASEAN Telecommunications and IT Ministers Meeting (TELMIN)* (web page), <https://asean.org/asean-economic-community/asean-telecommunications-and-it-ministers-meeting-telmin/>.

In addition to ASEAN, other regional and international co-ordination bodies have agreed initiatives aimed at promoting ICT development (Table 4.5). Information and data for all stakeholders are key to the success of all these efforts. Ensuring the availability of data and information allows the effectiveness of policies and approaches to be demonstrated and contributes to developing a body of good practices for the region.

While regional and cross-border infrastructure projects are progressing in SEA, it would be useful to continue to improve the alignment of these initiatives and domestic infrastructure strategies and implementation capacities. The Master Plan on ASEAN Connectivity 2025, adopted at the 28th ASEAN Summit in September 2016, directs ASEAN co-operation on infrastructure. The plan identifies five strategic areas to improve physical, institutional and people-to-people connectivity: sustainable infrastructure, digital innovation, seamless logistics, regulatory excellence and people mobility.

Table 4.5. Regional initiatives for ICT development

Regional initiatives	Description	Member economies
ASEAN ICT Masterplan (AIM) 2020	<p>Its vision is to propel ASEAN towards a digitally enabled economy that is secure, sustainable, and transformative; and to enable an innovative, inclusive and integrated ASEAN Community. The objectives are:</p> <ul style="list-style-type: none"> • an accessible, inclusive and affordable digital economy • deployment of next-generation ICTs as enablers of growth • sustainable development through smart city technologies • multiple ICT opportunities across a single regional market • secure digital marketplaces and safe online communities. 	Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Thailand, Singapore, Viet Nam
Masterplan on ASEAN Connectivity 2025	<p>Its vision is to achieve a seamlessly and comprehensively connected and integrated ASEAN that will promote competitiveness, inclusiveness and a greater sense of community. The strategic objectives are:</p> <ul style="list-style-type: none"> • Sustainable infrastructure. To co-ordinate existing resources to deliver support across the full life cycle of infrastructure projects in ASEAN, including project preparation, improving infrastructure productivity and capability building, including on smart urbanisation models • Digital innovation. To establish establishing regulatory frameworks for the delivery of new digital services including data management and digital financial services; support the sharing of best practices on open data; and equip micro enterprises and SMEs with the capabilities to access these new technologies • Regulatory excellence. To establish good regulatory practice to support implementation of key policies critical for the ASEAN Connectivity agenda, with a particular focus on standards harmonisation, mutual recognition, technical regulations and addressing trade-distorting non-tariff measures. <p>Other objectives are achieving seamless logistics and people mobility.</p>	Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Thailand, Singapore, Viet Nam
APEC TEL Strategic Action Plan 2016-2020	<p>Its vision is to enable APEC to attain regional economic integration; economic transformation and growth; and physical, institutional and people-to-people connectivity. The objectives, to be reached by 2020, are to establish an ICT ecosystem characterised by integrated, seamless, secure, trusted and innovative ICT infrastructure, services and applications foster widespread use of ICT in all sectors; and improve ICT skills and digital literacy. Priority areas are:</p> <ul style="list-style-type: none"> • Develop and support ICT innovation to promote infrastructure investment, connectivity and support the productive and innovative use of ICTs; champion strategic opportunities for new ICTs and sponsor leadership; explore ways ICTs can address emerging challenges such as disaster risk reduction and management, social responsibility. • Promote a secure, resilient and trusted ICT environment to enhance trust and confidence in the use of ICTs, supporting the capacity of all relevant stakeholders to manage risks; create resilient networks; and facilitate a trusted environment for transactions and communications. • Promote regional economic integration to promote connectivity, regulatory coherence and technical harmonisation (including physical, institutional and people-to-people), and advance measures that promote interoperability and transborder co-operation. • Enhance the digital economy and the Internet economy to develop of a vibrant digital economy with a focus on the Internet economy; raise the overall level of ICT industry development; and expand the extensive integration of ICTs with other industries. • Strengthen co-operation to engage with groups within APEC and other forums to consider how to apply digital tools and issues arising from their application and to maximise synergies, harness resources and minimise duplication. 	SEA countries: Brunei Darussalam, Indonesia, Malaysia, Philippines, Singapore, Thailand, Viet Nam Other countries: Australia, Canada, Chile, China, Hong Kong (China), Japan, Korea, Mexico, New Zealand, Papua New Guinea, Peru, Russia, Chinese Taipei, United States
Asia-Pacific Information Superhighway (UNESCAP)	<p>As a pillar of regional connectivity, the AP-IS Initiative has a vision to be a catalyst to develop seamless regional broadband networks that improve affordability, reliance, resilience and coverage. The initiative aims to address the causes of digital divides, develop the Internet ecosystem to support the implementation of the Sustainable Development Goals, and stimulate the digital economy in Asia and the Pacific. Its main pillars are:</p> <ul style="list-style-type: none"> • upgrading physical infrastructure and interconnection • Internet traffic management • building regional network resilience • promoting broadband access in underserved areas. 	SEA countries: Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand, Viet Nam Other countries: Afghanistan, Armenia, Australia, Azerbaijan, Bangladesh, Bhutan, China, France, Georgia, India, Iran, Japan, Kazakhstan, Korea, Kyrgyzstan, Mongolia, Nepal, Netherlands, New Zealand, Pakistan, Russia, Sri Lanka, Tajikistan, Timor-Leste, Turkey, Turkmenistan, United Kingdom, United States, Uzbekistan

Note: Lao PDR = Lao People's Democratic Republic; China = People's Republic of China.

Currently, some of the large projects being implemented and considered in the region include the ASEAN Highway Network, the ASEAN Power Grid and the ASEAN Broadband Corridor. The ASEAN Infrastructure Fund promotes the financing of regional infrastructure. Countries in the region also are participating in the Belt and Road Initiative. In light of the delays that are sometimes inherent to international co-operation on infrastructure projects and strategies, such efforts can be made more effective through institutionalised means of communication such as ministry-level focal points or periodic consultation meetings on recent developments (OECD, 2016^[17]).

E-commerce

E-commerce developed primarily as a means to facilitate repeated transactions between large firms, typically business-to-business (B2B) transactions, and it relied on custom networks for the electronic exchange of data. Since the 1990s, B2B cross-border e-commerce has been growing steadily (OECD, 2018^[18]). With the expansion of open networks like the Internet, e-commerce is now spreading to smaller firms and it is increasingly used for business-to-consumer (B2C) transactions (OECD, 2019^[21]).

Measuring how e-commerce has evolved is a complex task. This is due to the difficulty of recording how firms do business and of measuring intangibles, as well as the blurring of the distinction between goods and services (OECD, 2019^[21]). Another concern is that results often are not comparable across countries because different methodologies are used in the data collection process, including with respect to the definition of e-commerce (Box 4.4).

Box 4.4. Defining and measuring e-commerce

The OECD defines e-commerce as any transaction for the sale or purchase of goods and services that is conducted over computer networks and by methods specifically designed to receive or place orders. Accordingly, whether a commercial transaction qualifies as e-commerce is determined by the ordering method rather than the characteristics of the product purchased, the parties involved, the mode of payment or the delivery channel (OECD, 2011^[19]). It should be highlighted that the OECD understanding of e-commerce is one among many different definitions, and that even the usage of the term varies in different contexts.

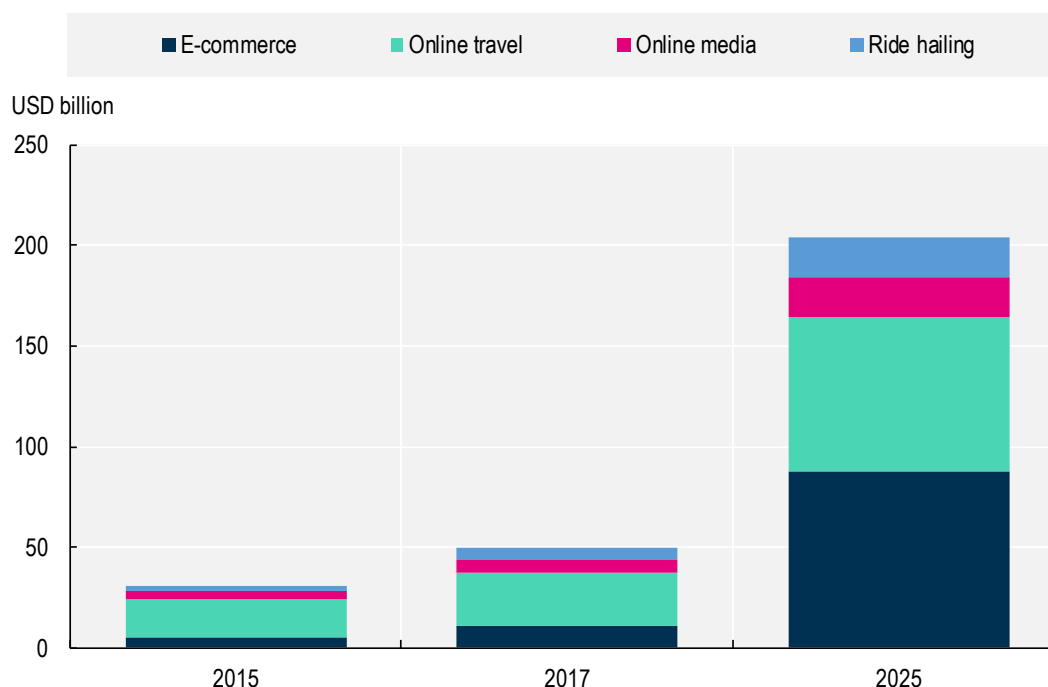
Many data sources from governments and international organisations such as the United Nations Conference on Trade and Development (UNCTAD) are in line with the OECD definition. However, in some private sector surveys, the term e-commerce is often not defined at all or only relates to a subset of the transactions that would be covered by the OECD definition. In a trade policy context and in World Trade Organization discussion, the term e-commerce is understood more expansively, as “production, distribution, marketing, sale or delivery of goods and services by electronic means” – a definition that captures many activities that would not fall under e-commerce as the OECD defines it. The broader international debate on trade policy refers to “digital trade”, which comprises “digitally enabled transactions in goods and services which can be digitally or physically delivered”, with e-commerce only one of the components of such cross-border transactions.

Sources: OECD (2019^[21]), *Unpacking E-commerce: Business Models, Trends and Policies*, <https://dx.doi.org/10.1787/23561431-en>; López González (2017^[20]), “Mapping the participation of ASEAN small- and medium- sized enterprises in global value chains”, <http://dx.doi.org/10.1787/2dc1751e-en>; López González and Jouanjean (2017^[21]), “Digital trade: Developing a framework for analysis”, <https://dx.doi.org/10.1787/524c8c83-en>; UNCTAD (2017^[22]), *UNCTAD B2C E-Commerce Index 2017*, https://unctad.org/en/PublicationsLibrary/tn_unctad_ict4d09_en.pdf.

Public or private surveys are one way to measure the extent to which firms and consumers engage in e-commerce. In addition to survey data, several other data sources have been used to approximate e-commerce shipments, including across borders. These include the aggregation of data from company reports, payment data, parcel shipments and Internet traffic (OECD, 2019^[2]).

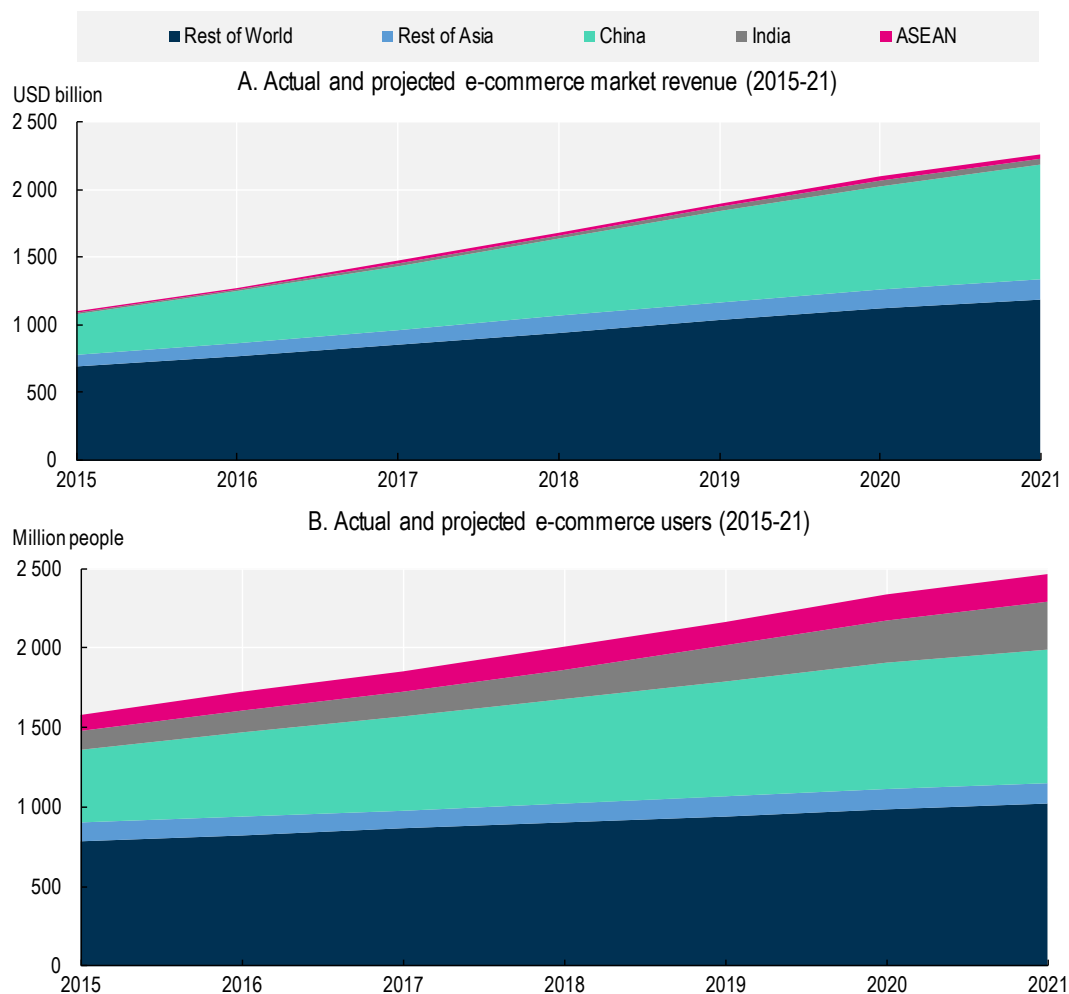
Irrespective of the diversity of definitions, it is generally agreed that the e-commerce market is still smaller than traditional markets but will continue to grow in the future, including the SEA region. Using 2017 estimates by Google of the e-commerce market in SEA – comprising B2C sales and marketplaces where first-hand goods sold by SMEs to consumers represented the majority of transactions. Anandan et al. (2016^[23]) found that this market experienced a compound annual growth of 41% from 2015 to 2017, from USD 5.5 billion to USD 10.9 billion. The study projected the e-commerce market will reach USD 88 billion in gross merchandise value in 2025. Based on this study's definition of e-commerce, then, it is estimated that the value of the e-commerce goods marketplace in 2025 would exceed that of online travel (estimated USD 76.6 billion), ride hailing (USD 20.1 billion) and online media (USD 19.5 billion). These projections are illustrated in Figure 4.1.

Figure 4.1. SEA e-commerce market size, actual and projected



Source: Anandan et al. (2017^[24]), *e-Conomy SEA Spotlight 2017: Unprecedented Growth for Southeast Asia's \$50B Internet Economy*, <https://www.thinkwithgoogle.com/intl/en-apac/tools-research/research-studies/e-conomy-sea-spotlight-2017-unprecedented-growth-southeast-asia-50-billion-internet-economy/>.

Using other estimates of B2C e-commerce, anticipated growth of the market in SEA can be compared with other regions of the world (Figure 4.2). Statista estimates for 2018 to 2021, for instance, project that SEA e-commerce revenue will grow from USD 21 billion to USD 34 billion. E-commerce users are expected to increase from 140 million people in 2018 to 170 million in 2019. These estimates do not include digitally distributed services, digitally distributed goods in B2B markets, and digital purchase or resale of used goods.

Figure 4.2. Actual and projected e-commerce in SEA

Note: China = People's Republic of China.

Source: OECD (2018^[18]), *Economic Outlook for Southeast Asia, China and India 2018 – Update*, <http://dx.doi.org/10.1787/9789264302990-en>; and based on Statista (n/d^[25]), *Ecommerce* (database), www.statista.com/outlook/243/126/e-commerce/.

The growth in SEA e-commerce has been driven in part by the emergence of new business models that allow SMEs to sell directly to consumers, typically on mobile-first platforms. Unicorn companies such as Lazada, Shopee and Tokopedia, for example, are e-commerce businesses that provide a readily accessible platform where smaller retailers and SMEs can conduct transactions on line and reach new consumers within and beyond SEA (Chapter 3 discusses unicorns in SEA in more detail).

The scale of e-commerce in the region and the potential for its further development are the result of multiple factors. Among these are levels of ICT use; the development of ICT infrastructure, transportation and logistics capabilities; use of e-payment systems; and the regulatory environment. The readiness of countries for e-commerce is measured in the *UNCTAD B2C E-commerce Index*, which looks at four indicators: Internet use, secure servers, credit card penetration and postal delivery services (Box 4.5).

Box 4.5. Measuring e-commerce readiness

The *UNCTAD B2C E-commerce Index*, first published in 2015, aims to assess the readiness of countries for e-commerce. It covers data for 130 countries and four indicators related to Internet use, secure servers, credit card penetration and postal delivery services. The Index has been found to have a strong and positive correlation with variations in the percentage of individuals shopping on line. Luxembourg and Switzerland rank highest in e-commerce readiness; among SEA countries, the leader is Singapore, followed by Malaysia. The B2C rankings show the need to improve e-commerce readiness in the region, especially as it relates to the share of individuals using Internet (Table 4.6)

Table 4.6. UNCTAD B2C E-Commerce Index, SEA and other countries

Country	% of individuals using Internet (2016)	% of individuals aged 15 and older with an account (2014 or latest)	Secure Internet servers per 1 million people (normalised 2016)	UPU postal reliability score (2016)	Index value (2016 data)	Rank
Luxembourg	97	96	98	94	96.5	1
Switzerland	89	98	100	99	96.43	2
Norway	97	100	96	93	96.39	3
Netherland	90	99	99	95	95.9	4
Singapore	81	96	87	97	90	18
Malaysia	79	81	66	82	77	38
Thailand	48	78	54	72	66	49
Viet Nam	47	31	48	76	50	74
Lao PDR	22	27	31	84	41	92
Philippines	56	31	46	28	40	96
Indonesia	25	36	42	39	36	101
Cambodia	26	22	38	30	29	115
Myanmar	25	23	24	20	23	123

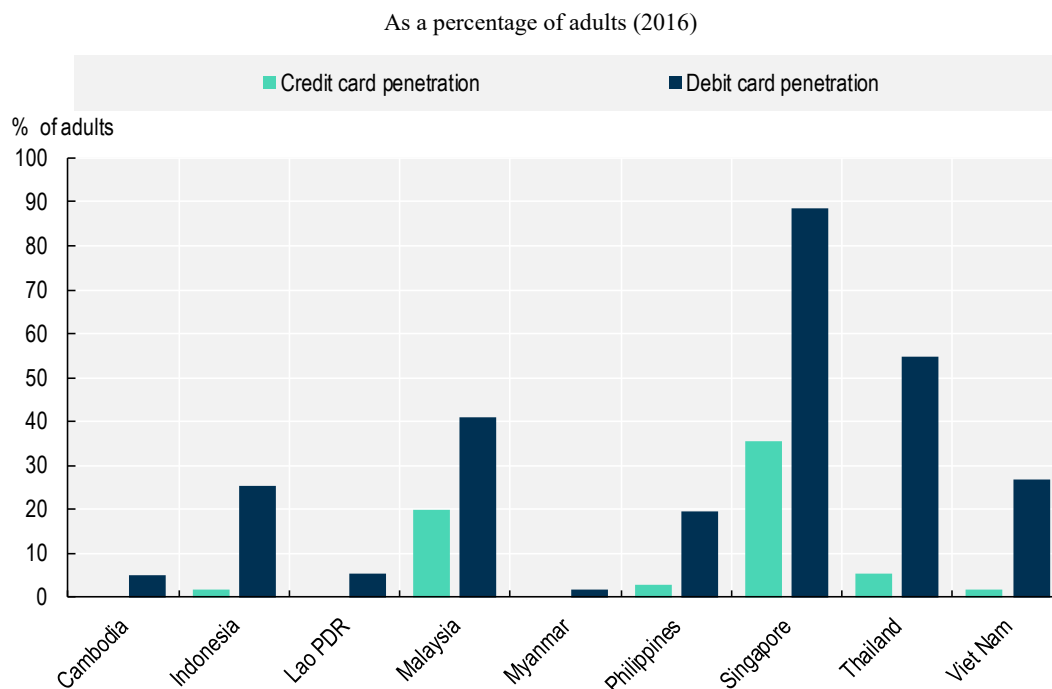
Note: UPU = Universal Postal Union; Lao PDR = Lao People's Democratic Republic.

Source: UNCTAD (2017^[22]), UNCTAD B2C E-commerce Index 2017, https://unctad.org/en/PublicationsLibrary/tn_unctad_ict4d09_en.pdf.

A lack of communication and related infrastructure constrains further e-commerce growth in SEA, as discussed in Chapter 2. The growth of e-commerce depends upon the development of extensive and high-quality Internet connections, and significant improvements are needed to ICT infrastructure in much of the region.

Payment methods are an additional impediment to e-commerce expansion in SEA. Payment methods vary across SEA countries, and are a function of national financial regulations, credit card riskiness, vendor strategies and consumer preferences. Cash on delivery is the predominant e-commerce payment method in the region; for more than 74% of payments, physical cash is handed over at the time of delivery (Hasnain and Pasti, 2017^[26]).

Even in Singapore, where credit cards are popular, cash on delivery is overwhelmingly the preferred payment method. As of 2016, only 30% of adults in SEA countries held a debit card and only 9% had a credit card (ADB/UNESCAP, 2018^[27]). Except in Singapore, the credit card penetration rate in SEA countries was below 30% and the penetration rate for debit cards was below 6% (ADB/UNESCAP, 2018^[27]) (Figure 4.3). The low levels of credit card holders suggest there is room for newer payment models such as mobile payments and mobile wallets, which have increased access to e-commerce for the unbanked elsewhere in the world.

Figure 4.3. Credit and debit card penetration in selected SEA countries

Note: Lao PDR = Lao People's Democratic Republic.

Source: ADB/UNESCAP (2018^[27]), *Embracing the E-commerce Revolution in Asia and the Pacific*, <https://www.adb.org/sites/default/files/publication/430401/embracing-e-commerce-revolution.pdf>.

The main roles of a payment system are to provide a way to transfer value between different parties in the economy and facilitate transactions at minimal cost. The optimal payment system is one designed to allow quick and effective value transfers while imposing a minimum costs and risks. High costs for the payment process can make transactions excessively expensive, and thus may seriously affect economic activity. The lower costs of efficient payment systems can have a positive effect on economic growth (OECD, 2006^[28]). Policy makers can help to promote economic activity through a framework for electronic settlements and payments. The OECD (2014^[29]) paper “Policy guidance on mobile and online payments” provides a wealth of information on policy actions to build a framework for e-commerce that can be tailored to the SEA region.

Businesses, like consumers, benefit from choices, and this is certainly the case when it comes to their use of e-commerce marketplaces, platforms and direct service offerings. Changing consumption behaviour and trends have already realigned competition. Governments should support competition and ensure that firms, including SMEs, have available the widest possible array of choices to help them determine how best to participate in markets.

Regional initiatives are playing an important role in driving further e-commerce growth in SEA (Box 4.6). ASEAN has embraced the goal of becoming a digital economy, as demonstrated by the establishment of the ASEAN Coordinating Committee on Electronic Commerce. This committee addresses a number of aspects of e-commerce development, including infrastructure, payment systems and consumer protection.

Box 4.6. Regional initiatives for e-commerce in SEA

In November 2018, ASEAN took a new step to advance the e-commerce area by agreeing the first regional agreement on e-commerce. This agreement urges member states to use paperless trading schemes and promote the use of services (other than financial services) via electronic means including digital signatures. It further encourages ASEAN members to be transparent about consumer protection measures and promotes online personal information protection. It also covers commitments to co-operate on issues related to ICT infrastructure as well as legal and regulatory frameworks, electronic payments and settlement, trade facilitation, intellectual property rights in the digital era, competition policy, and cybersecurity (Elms, 27 March 2019^[30]).

Legislative and regulatory reforms in support of e-commerce should consider both the domestic and international contexts. The *OECD Recommendation of the Council on Consumer Protection in E-Commerce*, for example, calls for global co-operation through such means as information sharing, international assistance, and mutual recognition and enforcement of judgments related to disputes arising from e-commerce activities (OECD, 2016^[31]). ASEAN and other regional frameworks also increasingly focus on the need to work together to achieve efficient cross-border e-commerce in Emerging Asia.

The 2000 e-ASEAN Framework Agreement outlined regional plans to develop the ICT sector, reduce the digital divide within and among member states, promote co-operation between the public and private sectors, and promote liberalisation of trade in relevant goods and services and investment. Article 5 of the Agreement concerns “facilitation of the growth of electronic commerce” through supportive laws and policies, mutual recognition of digital signatures, secure regional electronic transactions, protection of intellectual property rights arising from e-commerce, protection of data and consumer privacy, and alternative dispute mechanisms for online transactions.

The ASEAN Economic Community Blueprint 2015, adopted in November 2007 and covering the period up to 2015, includes e-commerce as one of six elements needed to build a competitive economic region. Targeted actions on e-commerce in the 2015 Blueprint included co-operation on telecommunication, harmonisation of relevant legal infrastructures, development of guidelines and best practices, mutual recognition of digital signatures, and establishment of a networking forum for businesses in ASEAN and dialogue partner countries.

A section dedicated to e-commerce in the current regional economic plan, the ASEAN Economic Community Blueprint 2025, notes its global growth and importance in determining trade and investment as well as the opportunities it offers by lowering costs to businesses.

Targets for promoting e-commerce in the 2025 Blueprint include harmonising consumer rights, protection laws and legal frameworks for online dispute resolution; co-operating on creating e-identification and authorisation initiatives; and building a framework for personal data protection. The 2025 plan also includes targets related to e-commerce in the context of consumer protection and to strengthening the role of micro enterprises and SMEs by promoting their use of e-commerce.

The eight strategic thrusts presented in the ASEAN ICT Masterplan 2020 have at least some relevance for the further development of e-commerce in the region. E-commerce is directly mentioned in this plan only in the context of promoting digital trade, under “economic development and transformation”. However, the plan calls for the study of policies and best practices to accelerate the development of e-commerce and digital service delivery in ASEAN.

Co-operation on e-commerce and the ICT sector is a key focus of the Greater Mekong Subregion (GMS) programme, which covers Cambodia, Yunnan Province and Guangxi Zhuang Autonomous Region in the People's Republic of China, Lao PDR, Myanmar, Thailand, and Viet Nam. The GMS programme focuses on increasing connectivity, improving competitiveness and building a greater sense of community through investments in sub-regional projects in a number of sectors. The GMS Economic Co-operation Program Strategic Framework 2012-22, the programme's current ten-year plan, calls for efforts to strengthen institutional structures, identify future infrastructure needs, advance co-operation on new ICT, promote ICT applications such as e-commerce and e-learning, direct human resources for the sector's development, and develop pilot ICT projects in rural areas.

Sources: OECD (2018^[32]), *Economic Outlook for Southeast Asia, China and India 2018: Fostering Growth through Digitalisation*, <http://dx.doi.org/10.1787/9789264286184-en>; Elms (27 March 2019^[30]), "ASEAN's E-Commerce Agreement", www.asiantradecentre.org/talkingtrade/aseans-e-commerce-agreement.

Regional co-operation in the area of e-commerce can be crucial for SMEs. Smaller firms tend to struggle more with regulatory uncertainty because they often lack the financial means to obtain the required legal expertise; this means they can be at a disadvantage when dealing with the larger service providers, such as online platforms (OECD, 2019^[2]). To help SMEs negotiate the digital ecosystem, regional initiatives could focus on rules that encourage transparency and fairness to foster a predictable and trusted business environment for both SMEs and online platforms.

In terms of cross-border commerce, innovative multi-stakeholder initiatives such as the Electronic World Trade Platform (eWTP) can provide the mechanism for improving access to online trading opportunities, in particular for SMEs. The eWTP is a public-private dialogue to foster a more effective policy environment for e-commerce (including both B2B and B2C). As such, eWTP seeks to share best practices, develop efficient infrastructures around e-commerce and test experiment digital trade zones to solve outstanding issues facing SMEs in developing countries (eWTP, 2019^[33]).

In 2017, Malaysia became the first country to operationalise the eWTP pilot project on a digital free trade zone (DFTZ), working in partnership with Alibaba. By 2025, the DFTZ in Malaysia aims to double the growth rate of goods exports of SMEs to reach a value of USD 38 billion, facilitate USD 65 billion worth of traded goods and create 60 000 Malaysian jobs. The DFTZ provides an e-fulfilment hub to help SMEs to easily export their goods; a satellite services hub to connect SMEs with relevant services; and an e-services platform for digital management of cargo clearance and other cross-border trade processes (OECD/ERIA, 2018^[34]).

Improved access to information around cross-border e-commerce and greater access to trained and certified advisors can increase opportunities for SMEs to thrive in the regional – and global – e-commerce marketplace.

Notes

- ¹ See in particular Chapter 8 of OECD/IDB (2016_[4]).
- ² These are Brunei Darussalam, Malaysia, Singapore and Viet Nam.
- ³ These data could inform the joint UNESCAP and ITU Interactive map, for example: <http://drrgateway.net/information-communications-technology/map-asia-pacific-information-superhighway>.

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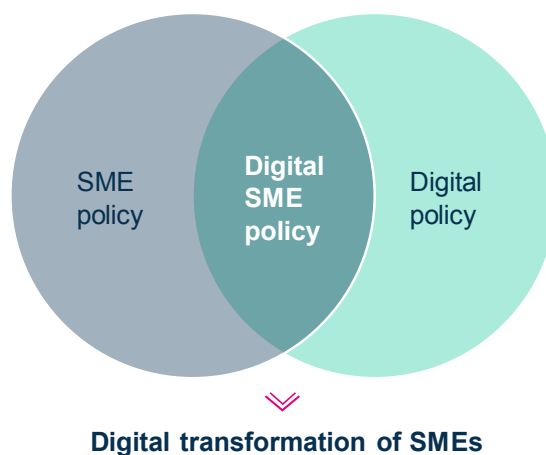
5. Fostering strategies to enable SMEs to go digital in Southeast Asia

This chapter analyses the essential developments needed to enhance the connectivity of small and medium-sized enterprises (SMEs) in Southeast Asia (SEA). It examines the institutional and regulatory frameworks for communication markets in SEA, as well as the enabling environment needed to foster digital entrepreneurship such as policies to promote digital start-ups and foster the use of digital services and applications by SMEs.

A further challenge is developing the multi-sided policy framework that is needed to enable that small and medium-sized enterprises (SMEs) to make the most of the digital transformation. In order for SMEs to thrive as innovators and fast adopters of digital tools, the design of policy and regulation must focus on areas where SME policy and digital economy policy overlap (Figure 5.1).

This means tailoring SME policy for the digital transformation and tailoring digital policies for SMEs. Government agencies responsible for elaborating and implementing policies for SMEs therefore should be made aware of the opportunities and challenges that digital services and applications can bring to SMEs. These agencies also should be provided tools to identify the specific barriers faced by SMEs in a context of digital transformation and given the means to propose cross-cutting solutions. In addition, policy makers and regulators responsible for digital economy policy (i.e. enabling access, promoting adoption and/or fostering trust) should incorporate the perspective of SMEs in their analyses to better understand the specific challenges. The objective should be to adapt goals and work with other stakeholders on strategies to relevant to SMEs, which are the backbone of the economy in many countries in Southeast Asia (SEA).

Figure 5.1. A policy framework integrating SME and digital policies



The following steps are essential to develop an integrated digital SME policy:¹

- **Establish a governance approach** that supports effective co-ordination between both SME and digital economy policies, with a clear assignment of responsibilities on implementation.
- **Articulate a strategic framework to ensure policy coherence** by identifying the main priorities and objectives for the digital transformation of SMEs, while taking into account domestic, regional, and international strategies and agendas.
- **Assess key digital trends that affect SMEs** to identify opportunities and challenges for these firms, including by evaluating current policies, regulations and strategies so as to identify gaps and lack of coherence among different policy initiatives in the face of technological developments.
- **Develop a comprehensive and coherent strategy for digital SMEs** by leveraging the governance approach, strategic vision and evaluation of trends and policy gaps, and by engaging all relevant stakeholders, particularly SMEs, to foster the digital transformation of SMEs.

- **Implement the digital SME strategy successfully** by issuing an action plan with specific measures, key responsibilities, time frames and measurable targets, and by anticipating challenges related to existing institutions, social preferences, and administrative capacity or lack thereof.

SEA countries have the potential to enable SMEs to become actors in the modernisation of global value chains and the digital transformation of economies and societies. In this regard, using an integrated approach to target digital SME policy can promote digital enterprises and connectivity of SMEs in general. This approach means developing and implementing comprehensive policy frameworks for SMEs and for communication infrastructure and services, as well as creating the enabling environment for digital entrepreneurship and e-commerce to flourish.

Policy frameworks for SMEs

Countries in SEA are active in the area of SME policy and apply a mix of horizontal and targeted approaches. On the horizontal side, countries tend to prioritise measures to cut red tape and streamline business registration. On the targeted side, they tend to focus on measures to enhance productivity and increase access to finance. The intensity and extent of policy intervention vary greatly among countries, and this correlates with the overall level of institutional development. Indonesia, Malaysia, the Philippines, Singapore and Thailand have invested significantly in business development services – an area that Brunei Darussalam and Viet Nam are increasingly exploring – while Cambodia, Lao People’s Democratic Republic (hereafter “Lao PDR”) and Myanmar have focused more on improving the legal and regulatory environment for SMEs and building institutions for SME policy (OECD/ERIA, 2018^[1]). In most SEA countries, SME policy has traditionally had a social orientation although in some countries (notably in Brunei Darussalam, Malaysia, Singapore, Thailand and Viet Nam) this has evolved to focus increasingly on stimulating innovation and technological upgrading.

According to the OECD/ERIA (2018^[1]) analysis of SME frameworks across the region, the main areas for improvement are:

- **Ensuring an integrated approach** to SME policy in which a stocktaking exercise looks at the mission of SME agencies and SME feedback is solicited with the aim of enhancing the coherence and impact of interventions and programmes.
- **Strengthening data collection and analysis** to ensure that SME policies are evidence-based and well targeted.
- **Enhancing the policy process** of design, adoption, and implementation and monitoring to ensure that policies remain responsive to firms’ real needs and that evaluation is conducted systematically to inform that design of future policies.
- **Fostering regional co-operation** on SME development to promote knowledge sharing, development of joint projects and establishment of harmonised norms.
- **Encouraging the social contribution** of SMEs while taking care not to place unnecessary burdens on SMEs through policies intended to achieve greener and more inclusive economic development.

At the regional level, SEA countries have been very active in the area of market access and internationalisation. The most notable regional initiative is that of the ASEAN SME Working Group. Since 2014, this group has been developing the ASEAN Strategic Action Plan for SME Development 2016-2025 with the support of the Japan-ASEAN Integration

Fund to implement its main goals (Box 5.1). The Asia-Pacific Economic Cooperation forum (APEC) also has an SME working group, which convenes twice a year to share ideas and strategies on enhancing SME development. The APEC policy support unit publishes reports on finance and regulatory updates on SMEs.

Box 5.1. ASEAN SME Working Group

The following actions aim to achieve the main goals of the ASEAN SME Working Group:

- **Develop an online interactive platform** for ASEAN Business Incubator Network (ABINet) for the exchange of ideas and information.
- **Promote collaboration between creative industry agencies and SMEs** and entrepreneurs to advance the skills of knowledge-based creative industries by supporting the use of information technology (IT)-based capacity.
- **Create an interactive online platform presenting the range of financial support** available to SMEs to minimise information gaps, that is, the ASEAN SME Service Centre.
- **Establish and promote a Digital Service Hub** that will enhance trade supply chains and improve the competitiveness of Association of Southeast Asian Nations (ASEAN) SMEs in a low-cost manner.
- **Promote the development and utilisation of e-commerce** platforms to encourage expansion of SMEs.
- **Develop ASEAN accelerator toolkits** and online application and registration for business start-ups.
- **Build capacity of policy makers** for designing and improving business registration and licensing, including the simplification of business registration procedure through utilisation of IT.

Source: ASEAN (n/d_[2]), *ASEAN SME Service Center* (web page), www.aseansme.org/aboutus.

Policy frameworks of communication infrastructure and services

Institutional framework

All countries in SEA have a dedicated ministry in charge of telecommunication or, as reflected in the name of the recently created Thai ministry, a ministry in charge of digital economy and society. Nevertheless, some countries in the region have not yet established either a separate regulator for the communications sector or a competition authority. In those countries where one of these exists, the division of responsibilities and authority between the government, the communications authority and/or the competition authority is not always clear, with overlapping powers and/or intersecting management (Table 5.1).

In SEA, neither Lao PDR nor Viet Nam has yet established a communications regulator. In Myanmar, the regulatory function is carried out under the Ministry of Transport and Communications, although there are plans to establish a separate regulator. This will be welcome, as having such independent authorities is widely recognised as international good practice and crucial for correcting market failures and ensuring a dynamic communications sector (Box 5.2).

Table 5.1. Policy and regulatory bodies in SEA

Country	Sector ministry	Communications authority	Broadcasting authority	Competition authority	Consumer protection
Brunei Darussalam	Ministry of Communications (MinCom)	Authority for Info-communications Technology Industry (AITI)		..	Prime minister's office (DEPD)
Cambodia	Ministry of Posts and Telecommunications (MPTC)	Telecommunication Regulator of Cambodia (TRC)	Ministry of Information (MI)	..	Import Export Inspection and Fraud Repression Directorate-General (CamControl)
Indonesia	Ministry of Communication and Information Technology (Kominfo)	Indonesian Telecommunications Regulatory Authority (BRTI)	Indonesia Broadcasting Commission (KPI)	Commission for the Supervision of Business Competition (KPPU)	National Consumer Protection Agency (BPKN)
Lao PDR	Ministry of Posts and Telecommunications (MPT)	..	Ministry of Information, Culture and Tourism (MICT)	Ministry of Industry and Commerce (MOIC)	..
Malaysia	Ministry of Communication and Multimedia Malaysia (KKMM)	Malaysian Communications and Multimedia Commission (MCMC)		Malaysia Competition Commission (MYCC)	Ministry of Domestic Trade, Co-operatives and Consumerism (KPDNKK)
Myanmar	Ministry of Transport and Communications (MCIT)	..	Ministry of Information (MOI)	..	..
Philippines	Department of Information and Communication Technology (DICT)	National Telecommunications Commission (NTC)		Philippine Competition Commission (PHCC)	Department of Trade and Industry (DTI)
Singapore	Ministry of Communications and Information (MCI)	Infocomm Media Development Authority of Singapore (IMDA)		Competition Commission of Singapore (CCS)	Ministry of Trade and Industry (MTI)
Thailand	Ministry of Digital Economy and Society (MICT)	National Broadcasting and Telecommunications Commission (NBTC)		Office of Trade Competition Commission (OTCC)	Consumer Protection Board (OCPB)
Viet Nam	Ministry of Information and Communications (MIC)	..	MIC	Vietnam Competition Authority (VCA)	Ministry of Trade and Industry (MOIT)

Notes: .. = not available; Lao PDR = Lao People's Democratic Republic.

In addition to regulating telecommunication services, some countries in SEA – Brunei Darussalam, Malaysia, the Philippines, Singapore and Thailand – have chosen to expand the mandates of their communications regulators to include issues related to the broadcasting sector. A goal of these changes is to encourage what is widely termed converged regulation by facilitating the oversight of two sectors – telecommunication and audiovisual services – which have increasingly merged.

The convergence of regulators is evident in OECD countries from recent reforms in Hungary, Mexico, the Netherlands and Spain. These join the list of OECD countries that had already adopted some features of a converged structure (e.g. Australia, Canada, the United Kingdom and the United States). Regulators with a converged structure have the advantage of being able to examine the entire value chain of services in the value chain and/or in neighbouring markets, be a one-stop-shop for the industry, and to make and implement more coherent regulatory decisions.

Some OECD countries also have incorporated a mandate to carry out competition control and analysis within their communication authorities. All OECD countries maintain general competition authorities to be responsible for strengthening competition in all other markets in the economy. The majority of countries in the SEA region have established independent competition authorities, although Brunei Darussalam, Cambodia and Myanmar are still in the process of doing this. In Lao PDR, the Ministry of Industry and Commerce acts as a competition authority.

Box 5.2. Fostering independent regulators

- Good practices applied in many OECD countries to ensure the independence of regulatory bodies include the following: The regulator should be provided with a distinct legal mandate, free of ministerial control. Decisions taken by the regulator should not be subject to ministerial approval. In general, the ability to overrule the regulator's decisions by other actors should be kept to a minimum.
- Regulatory powers must include all aspects of regulatory oversight and be clearly defined to allow competition issues to be addressed for telecommunication players and for over-the-top providers when they offer similar services. These include powers to independently enforce decisions.
- Regulators should have their own source of funding that is not controlled by the government. If the budget of the regulatory body depends on an appropriation from the government's budget, a government may use this discretionary power to control a regulator. A good practice applied in many countries is to impose a levy on the regulated industry based on a small percentage of its turnover that is used to finance the regulatory agency. This practice provides a stable source of funding independent of the government and more predictable than sources such as spectrum fees or fines.
- The legislative body should be responsible for appointing the head and members of the board of regulators or, at a minimum, should be able to confirm or reject appointees proposed by the government; appointments also should be conducted through open and transparent procedures. Mandates should not be too short to avoid instability and increase independence. A usual practice is to mandate staggered terms of five or six years to ensure continuity of the board.
- Issues such as rules for dismissal, conflicts of interest and provisions regarding joining the regulated sector after termination of a mandate should be addressed in the law to ensure independence and increase the credibility of the regulatory body.

Source: OECD/IDB (2016^[3]), *Broadband Policies for Latin America and the Caribbean: A Digital Economy Toolkit*, <http://dx.doi.org/10.1787/9789264251823-en>.

In terms of consumer protection, the ministry of trade and industry in most SEA countries tends to have a leading role; this is the case in Malaysia, the Philippines, Singapore and Viet Nam. The National Consumer Protection Agency in Indonesia and the Consumer Protection Board in Thailand are dedicated agencies responsible for with consumer protection, however.

Clear institutional roles for policy and regulation are fundamental to ensure consistency, legal certainty and effectiveness of public and regulatory policies. Sound regulatory frameworks and public policies provide investors and operators both stability and predictability, and are crucial to facilitating healthy, sustainable competition in the communication market, which enhances further deployment of networks and innovation in services.

Connectivity goals

National objectives for connectivity are usually defined in national broadband plans (NBPs), digital agendas, innovation plans or national budgets that contain sub-targets and disaggregated goals in terms of schools, public institutions, hospitals, main urban hubs, rural/urban or gender gaps). These plans are used to co-ordinate different policy and regulatory initiatives.

In SEA, Brunei Darussalam, Cambodia, Indonesia, the Philippines, Thailand and Viet Nam have approved NBPs or digital strategies for periods to 2019 or 2020. Singapore established its objectives for 2025. However, not all countries in SEA have a standalone NBP or comprehensive digital strategy (Table 5.2).

While Brunei Darussalam has a comprehensive Digital Government Strategy, neither an updated plan focusing on broadband connectivity nor a strategy that tackles broader policies for the digital transformation of the entire economy and society is currently in place.

Malaysia established a National Broadband Initiative in 2012, included some connectivity goals within the 11th Malaysia Development Plan, and is currently developing a National Fibreisation and Connectivity Plan. Myanmar drafted a Telecommunication Masterplan in 2015 and a Universal Service Strategy in January 2018, but neither has been formally adopted.

Lao PDR, meanwhile, has a draft NBP and a Ministry of Posts and Telecommunications Vision 2030 document. Its 2016-20 8th Five-Year National Socio-economic Development Plan contains some of its general objectives related to connectivity, data centres, e-government and cybercrime (Government of Lao PDR, 2018^[4]) (UNCTAD, 2018^[5]).

Thailand's National Digital Economy Policy and Plan is one of the most comprehensive digital strategies in the region. Cambodia's ICT Master Plan also is comprehensive. Brunei Darussalam's Digital Government Strategy touches on several elements necessary for improving the enabling environment, but focuses on the perspective of the government. Singapore's Smart Nation – described by the prime minister at its launch as a “whole-of-nation” effort – aims to harness digital services and applications to transform the country. It is based on three national plans for the economy, government and society: the Digital Economy Framework for Action, the Digital Government Blueprint and the Digital Readiness Blueprint (Government of Singapore, 2018^[6]).

Most NBPs in the region do not have a specific component on SMEs and none contain a specific target for SMEs. Nor do some NBPs even mention that at least part of their overall purpose is to support business development. The NBPs that do mention business are those of Brunei Darussalam (2014-17 plan), Cambodia and the Philippines do mention business. Meanwhile, only Singapore's Next Generation Nationwide Broadband Network (Next Gen NBN) mentions a specific target for connecting businesses: provision of broadband access of 1 gigabit per second (Gbps) or more for all businesses in the country. The Next Gen NGN also aims to increase operational efficiency for businesses through cost-effective, ultra-high-speed broadband by enabling Software-as-a-Service, cloud services, bandwidth-intensive remote back-up and online collaboration. The plan also mentions enabling high-definition video conferencing and real-time collaboration platforms so that firms can interact with employees at home or at remote site, and with partners and potential customers around the world. Singapore also seeks to ensure that retail service providers supply competitive and innovative services for both businesses and consumers over their Next Gen NBN.

All SEA countries except Lao PDR have specific national goals for broadband availability. In the majority of countries, however, goals for broadband deployment are set in terms of speed of service offered, percentage of coverage, penetration and specific groups contemplated.

These national objectives are usually defined in NBPs, digital agendas, innovation plans or national budgets. These contain a number of sub-targets and disaggregated goals in terms of schools, public institutions, hospitals, information and communication technology (ICT) community centres, main urban hubs, and rural/urban or gender gaps.

Table 5.2. National broadband plans and digital agendas

Country	National broadband plan	Development/ICT/digital strategy
Brunei Darussalam	National Broadband Policy (2014-17) Managed by AITI	Digital Government Strategy (2016-20) Managed by AITI
Cambodia	..	Telecommunication and ICT Development Policy (2016-20) Managed by MPTC
Indonesia	Indonesia Broadband Plan ¹ (2014-19) Managed by Ministry of National Development Planning and National ICT Council (<i>Detiknas</i>)	..
Lao PDR	Draft of National Broadband Plan ² (2015-25) Managed by MPT	..
Malaysia	National Fiberisation and Connectivity Plan (2019-2023) Managed by MCMC	11th Malaysia Development Plan (2016-2020) Managed by MCMC
Myanmar	Telecommunications Masterplan ² (2017-20) Managed by MCIT	..
Philippines	National Broadband Plan (2017-20) Managed by DICT	..
Singapore	Next Gen NBN (2015-25) Managed by IMDA	Smart Nation (2014-20) Managed by GovTech
Thailand	National Broadband Policy (2014-2020) Managed by MDES	National Digital Economy Policy and Plan (2016-20) Managed by MDES
Viet Nam	Viet Nam National Broadband Plan ¹ (2016-20) Managed by MIC	..

1. Only available in original language.

2. Not yet finalised or approved.

Notes: .. = not available; ICT = information and communication technology; Lao PDR = Lao People's Democratic Republic.

Singapore, with 26 subscriptions per 100 inhabitants for fixed broadband and an average of 20 megabits per second (Mbps) in speeds (Akamai, 2017^[7]), is the most advanced country in SEA. It also has the most elevated connectivity goals. It aims to connect all users with a 100 Mbps download speed and all physical addresses including homes, schools, government buildings, businesses, hospitals to 1 Gbps and more. Thailand has set a target of 100 Mbps by 2020, and aims to connect 100% of cities and major centres; Malaysia aims to connect 100% of households in state capitals and high-impact growth areas. At a target of 25 Mbps, Viet Nam plans to connect 60% of its Internet subscribers; at 20 Mbps, Brunei Darussalam aims to cover 75% of its population and Indonesia, 71% of its urban households (Table 5.3).

While broadband plans understandably focus on household and community centres or aim at extending mobile broadband coverage in areas with little or no coverage, Singapore takes the connectivity goals to another level. The Singapore plan mentions “smartening essential amenities”, “speeding up use of emerging technologies such as big data and analytics”, the Internet of Things (IoT), heterogeneous networks, self-healing systems, cognitive computing and immersive media – all pointing to the direction towards which NBPs may evolve in the world and the region.

Table 5.3. Past and present national broadband targets in SEA

Country	Year	Coverage
Brunei Darussalam	2017	75% of population with 20 Mbps and 80% of households with 10 Mbps of shared connectivity to all villages
Cambodia	2020	Broadband to 100% of urban areas and 70% of rural areas, mobile penetration for 95% of the population, Internet penetration to 70% of population, Internet access to 20% of households
Indonesia	2019	71% of urban households with 20 Mbps, 49% of rural households with 10 Mbps, 100% of urban population and 52% of rural with 1 Mbps of mobile broadband
Lao PDR	2025	100% Internet coverage across all villages
Malaysia	2020	100% of households in state capitals and high-impact growth areas with 100 Mbps, 50% of households in suburban and rural areas with 20 Mbps
Myanmar	2020	90% of population with Internet access and 50% of population with 7.2 Mbps
Philippines	2020	15% of population with 2 Mbps, 55% of population with mobile broadband, 50% of households with Internet access, average broadband speed of 10Mbps
Singapore	2025	All homes, schools, government buildings, businesses and hospitals with 1 Gbps and 100 Mbps (download) and 50 Mbps (upload) per end-user connection
Thailand	2020	95% of population with broadband network access; 100% of cities and major centres with 100 Mbps; 95% of schools, hospitals, local governments and ICT community centres with 30 Mbps
Viet Nam	2020	40% of households with fixed broadband, 95% of residential areas with 3G/4G (average 4 Mbps in urban areas and 2 Mbps in rural areas), 60% of Internet subscribers with 25 Mbps, 50% of public Internet access points with 50 Mbps

Note: Mbps = megabits per second; Lao PDR = Lao People's Democratic Republic.

Source: OECD, based on countries' broadband plans.

Preparing SMEs for inclusion in global value chains means identifying targets for higher upload as well as download speeds so these firms can share and create content on line and benefit from developments such as cloud computing and big data. Policy makers should examine the differing capacity requirements within each community, which are typically moderate for residents, mixed for business and higher for community anchor institutions. Businesses, homeworkers and SMEs, for example, may need upstream projections to be planned, given that they use more data-intensive services such as collaborative, residential video-based applications covering value added activities as well as current usage such as online gaming. Anchor institutions, such as schools and hospitals, often require even more intense capacity in terms of bandwidth and reliability, given the critical nature of the activities performed (i.e. telemedicine) and the number of users serviced. Therefore, tailored broadband availability targets should be developed for each group – residential, business and anchor institutions.

Policies for expanding connectivity

Fostering sound policies to expand the availability of quality and affordable broadband services is crucial to enabling the digital transformation of economies and societies.

Encouraging market-driven solutions is a first step that can help to increase competition and lower entry barriers for new providers, whether they are existing players from other areas, commercial start-ups or community networks. With this approach, policy makers reduce the proportion of the market that needs public intervention, which invariably involves using scarce public funds. Once it is established that the market is unlikely to serve a given location, a range of measures are available. One is to use competitive tenders to provide services because the private sector often has the best information available on the actual costs of providing services. Other approaches may involve establishing coverage obligations associated with competitive bidding for the radio spectrum. In some cases, such obligations may lower the price that operators are prepared to pay and also satisfy policy objectives of extending services at a lower cost and in a more inclusive manner.

Public-private partnerships and universal service funds that use competitive tenders are other potential ways to fund expansion. Some countries also have financed and deployed high-speed networks through the models of municipal or community networks. When private broadband supply is not sufficient, promoting local government policies and community-led initiatives can potentially facilitate last-mile broadband provision and reduce its costs.

There are always technologies on the horizon with the further potential to provide better services at lower prices than those already on offer. In the area of fixed wireless and satellite delivery, the technology is advancing quickly and can sometimes be used in combination to provide service. In addition, there are many other approaches of a more experimental nature such as balloons, drones and wireless services tethered to power line cables (OECD, 2017^[8]). Furthermore, the next generation of wireless technologies (5G) is expected to be mostly used in areas with higher population density and in combination with 4G to provide wider coverage (OECD, 2019^[9]). Thus, operators may explore the possibility of using 5G where there is adequate backhaul connectivity (e.g. if there are backhaul links to rural villages, 5G may enable fixed wireless access). Commercial services now also are using mesh wireless networks that could provide solutions in some areas by making each connection a tool to further expand coverage.²

A number of good practices can be considered by SEA countries to improve rural and remote access. A good step is to collect and make available standardised and comparable data on actual broadband gaps, not only in terms of advertised speeds but also the actual quality of service of download and upload streams. In some countries, information on services such as coverage (e.g. online maps), prices and so forth is made available to better enable communities and users to make decisions. All other stakeholders in the public and private sectors can also use this information to compete and co-operate. Also needed is co-ordination between the central government, regional government, and communication service providers in urban planning and other related issues. For example, adopting policies for encouraging efficient deployment of broadband by leveraging non-broadband infrastructure projects (e.g. road construction) can reduce the costs of broadband expansion considerably.

Removing existing barriers to access to passive infrastructure – for instance, restrictive rights of way and limitations on access to poles and ducts – is of tremendous importance to encourage investment by new entrants and facilitate network deployment in rural and remote areas in SEA. Access to backhaul fibre infrastructures is crucial to cut the deployment costs for both mobile and fixed services (OECD, 2018^[10]).

By creating an environment for effective, non-discriminatory access to network elements by multiple retail providers, especially where public funding is involved, open access network policies also can potentially promote an environment of affordable prices and increased usage. There is often a need for the public and private sectors to carry out projects in partnership in rural areas. Improving the dialogue among these parties can also yield strengthened public-private partnerships and more effective use of public infrastructure for areas with low population density, without creating anti-competitive conditions (OECD, 2018^[10]).

To inform these initiatives, broadband definitions should be updated to keep pace with the evolving technologies and data based on speed tiers should be collected to assist in measuring progress. In addition, sharing experience from the broader Asia-Pacific region can provide useful information about how different countries have gone about improving rural coverage.

Ultimately, a digital transformation will affect all parts of the economy, society and public sector activities. To realise the full benefits of this transformation, governments need to reach across traditional policy silos and different levels of government, and develop a whole-of-government approach to policy making. To do so effectively, governments need

to better co-ordinate across different ministries and levels of government when making decisions and implementing policy measures. They should further actively involve all key stakeholders – including the business community from large firms to small businesses, trade unions, civil society and the Internet technical community – in the policy-making process, implementation and monitoring. Making the most of a digital transformation also requires co-ordination of all relevant ministries and government bodies that need to be connected to ensure that all policies are mutually reinforcing and aligned to one coherent and strategic national digital agenda. Going Digital, the OECD’s cross-cutting framework, aims to support governments in this endeavour (OECD, 2019^[11]).

Policy frameworks to promote digital entrepreneurship

Policies to promote use of digital services and applications by SMEs

Promoting a digital transformation through the use of digital tools by SMEs requires, first and foremost, a robust plan for promoting SMEs in a broader framework. Previous OECD studies have explored guiding principles and good practices for promoting SMEs in SEA.

The use of digital services and applications brings new opportunities as well as challenges for SMEs. Digital tools disrupt value chains and transform processes (Table 5.4). Agencies in SEA that promote SMEs need to take these changes into consideration so that these firms are prepared for the new dynamics.

Table 5.4. How digital services and applications have changed SMEs

Effects within six key elements of the value chain

Value chain activities	Export value chain		Impact of digital services and tools	
	Details		Traditional scenario	Digital scenario
Market research	Identification and quantification of foreign business opportunities Obtaining information and a rigorous understanding of the target market		Labour intensive: dedicated staff, market research agency, potential field trip Potential travel to market	Desktop research Digital market research tools (e.g. online surveys) Reduced need for travel
Marketing	Targeting of customers in the foreign market through advertising Dissemination of promotional material through various advertising channels		Procurement of local advertising space in foreign market (e.g. newspaper, radio and TV ads)	Digital advertising channels (search engine optimisation, display, social, video) Leveraging market platforms
Insurance and financing	Access to product shipment insurance and securing funding for export ventures Obtaining information on and procuring insurance and securing loans		Limited transparency Time-intensive, paper-based approach Dedicated brokers	Product comparison sites Single window view into market Digital financial products
Regulatory compliance	Regulations, rules and laws in the foreign market applicable to the SMEs Costs of complying with foreign regulations including document filing and legal services		Time-intensive, paper-based approach Dedicated consultant	National single window
Distribution	Physical delivery of goods to the foreign market Product delivery and sales channels		Manual management of supply chains Limited information on causes of inefficiencies	Automated and digitalised supply chain management (e.g. the IoT)
Operational support	Day-to-day operations of the business, e.g. processing orders, back office tasks IT heavy tasks such as database management, accounting, communication		Special IT equipment (e.g. servers, office software) Communications services Dedicated travel agents	Cloud computing and software Voice over Internet Protocol (VoIP) Online travel services

Source: Adapted from AlphaBeta framework in Asia Pacific MSME Trade Coalition (2018^[12]), *Micro-Revolution: The New Stakeholders of Trade in APAC*, <http://tradecoalition.org/wp-content/uploads/2018/02/MSME-Report-APAC-final.pdf>.

Singapore, in light of the new dynamics, has recognised that its non-digitally based businesses (typically SMEs in the retail sector) do not always know how to evaluate technology options and their cost implications. To help these firms to navigate the digital landscape, the Singapore government's Infocomm Media Development Authority (IMDA) set up the SMEs Go Digital programme that aims to simplify the process for SMEs. In addition to providing digital consultancy and training, the programme offers a set of solutions, often by innovative start-ups, pre-approved by the IMDA, targeted to meet the needs of SMEs at different stages of growth (Box 5.3).

Box 5.3. Singapore's SMEs Go Digital

Singapore established the SMEs Go Digital programme in 2017 to help SMEs to use digital services and applications, build stronger digital capabilities, and seize the opportunities for growth in the digital economy. SMEs Go Digital takes a structured and inclusive approach towards the adoption of digital tools by SMEs. SMEs Go Digital comprises the following key elements:

- **Industry digital plans.** SMEs can refer to the step-by-step guide in the digital roadmap to better understand their digital readiness and how to improve the digital skills of their employees (including by providing training under the Singapore SkillsFuture Series and Skills Framework).
- **Digital consultancy.** An SME can contact their nearest SME Centre (with locations across the country) for basic advice to plan their digital journey and for referrals to the SME Digital Tech Hub for more advanced digital needs.
- **Digital solutions.** SMEs can take up and implement pre-approved or curated digital solutions that meet their business needs.
- **Digital sector projects.** SMEs can participate in sector pilot projects led by industry leaders to enjoy new growth.
- **Digital project management services.** SMEs can use the pre-approved digital project management services to engage managers who can help them implement their digital solutions to maximise outcomes and make going digital sustainable.

Source: Government of Singapore (2018^[13]), *SMEs Go Digital* (web page), <https://www.imda.gov.sg/smesgodigital>.

Malaysia published an SME Master Plan in 2012 and the government agency, SME Cooperation Malaysia, runs several programmes to promote SMEs. One of these is a programme that subsidises SMEs to access e-payment services so that they are able to accept e-payment as a means of settlement. The agency estimates that 1.1 million e-payment terminals will be distributed by 2020 in Malaysia.

In 2016, Thailand became the first country to receive the then-new service, Facebook Shop, which turns a Facebook page into an e-commerce site. It was chosen to receive this because of the importance of social media in Thailand. It is estimated that 92% of customers in Thailand choose products via social media for e-commerce (Pornwasin, 2016^[14]). Japan has also partnered with Thailand to promote business matching between SMEs in the two countries. Together, they launched the J-Goodtech online platform with 4 000 Japanese and 2 500 foreign SMEs registered to foster online business matching (The Japan Times, 2017^[15]).

The Philippines, through its Department of Trade and Industry, published the Micro, Small, and Medium Enterprise Development Plan 2011-2016. The plan's key goals are to improve the business environment, access to finance, access to markets, and productivity and efficiency.

The Communications and Information Ministry in Indonesia plans to provide free domain names to help SMEs to participate in the growing Indonesian e-commerce sector. The ministry partnered with state-owned Bank Rakyat Indonesia, which is specialised in SME finance and has a large SME customer base, to provide 1 million domains to SMEs by 2018 (The Jakarta Post, 2016^[16]). Additionally, Indonesia's Ministry of Cooperatives and Small and Medium Enterprises and Ministry of State Owned Enterprises will co-operate to provide more assistance to SMEs. Both ministries have support centres around Indonesia and by integrating their initiatives, can provide more support for product development, access to finance and so on.

In addition to the SMEs Go Digital programme, the Singapore government has developed programmes to do the following:

- advise and provide funding assistance for companies ready to pilot emerging technologies and capacity building for cybersecurity skills (done by the Cyber Security Agency of Singapore)
- promote the co-development of intellectual properties and matching of intellectual properties (done by the Agency for Science, Technology and Research) (Channel NewsAsia, 2017^[17]).

In Viet Nam, the Asian Development Bank helped to set up the business-to-business e-commerce platform, Kiu, to help SMEs to engage in more cross-border trade (Hanoi Times, 2017^[18]).

Some countries in SEA also chose to provide exemptions to certain rules for SMEs to facilitate regulatory compliance. The Cambodia government is providing a two-year tax exemption to SMEs in the country to encourage their registration. However, it is important that policies targeting firms by size do not create disincentives for SMEs to scale up. For instance, in the case of regulatory simplification for SMEs, efficient firms may choose to remain small to avoid the additional regulatory burden that may come once they pass a certain size threshold. (OECD, 2018^[19])

Other policy approaches to encourage the digital transformation of SMEs can include the design of support schemes to facilitate adoption of digital tools that are particularly beneficial and possibly new to SMEs. Digital services and applications such as cloud computing, for example, can offer the flexibility that SMEs need when choosing to either scale up or scale down their activities, and with the advantage of requiring just a limited, upfront investment.

Policies to promote digital start-ups

A start-up is a newly emerged business venture that aims to develop a viable business model to meet a marketplace need or problem. Digital start-ups are designed with digital solutions or platforms within their business models. Due to their disruptive nature, digital start-ups are frequently constrained by legacy regulations.

One of the first steps in promoting start-ups and young firms should be towards reducing their regulatory burdens. In consequence, it is crucial to re-evaluate regulations that may not be fit for the digital age. For example, these could be regulations that require a physical presence or a minimum scale to obtain a permit or offer a service. More generally, revisiting regulations should foster competition, as well as manage the challenges of emerging digital risks. To respond to the rapid changes entailed in digital transformation, some countries have implemented

regulatory sandboxes that promote the flexible application or enforcement of policies (Box 5.4). These mechanisms can be particularly useful for certain kinds of digitally enabled innovation.

Box 5.4. Regulatory sandboxes and innovation

Policy makers around the world have recognised the regulatory challenges associated with digital transformation and have responded in a variety of ways, ranging from wait and see to banning digitally enabled business models. Between these two extremes, some regulators have opted to experiment. Regulatory sandboxes are one example of policy experimentation in support of innovation.

A regulatory sandbox refers to a limited form of regulatory waiver or flexibility for firms that enables them to test new business models with fewer regulatory requirements. Sandboxes often include mechanisms intended to ensure overarching regulatory objectives including consumer protection. Regulatory sandboxes are typically organised and administered on a case-by-case basis by the relevant regulatory authorities. Regulatory sandboxes have emerged in a range of sectors, notably in finance but also in health, transport, legal services, aviation and energy.

Source: OECD (2019^[11]), *Going Digital: Shaping Policies, Improving Lives*, <https://dx.doi.org/10.1787/9789264312012-en>.

Another tool within the reach of many SEA countries is that of promoting and developing start-up incubators and accelerators. Within the start-up ecosystem, the idea of incubating new start-ups and accelerating their growth is fairly recent but can create significant opportunities. Policy makers in SEA have been turning their attention to these potentially powerful tools to ensure that SMEs get the appropriate technology promotion and support they need at each stage of their life cycle.

Several governments in SEA, in an effort to promote innovation, have launched initiatives aimed at helping start-ups or young SMEs through accelerators or incubators). While both accelerators and incubators share the same aim – to help new businesses to grow – their methods differ. Both types of institutions rely on a network of entrepreneurs to promote synergies and learning from other members, as well as some sort of mentorship, but accelerators also provide intensive education along with seed funding for the selected businesses in exchange for taking ownership of a share of the business.

In Malaysia, the Ministry of Science, Technology and Innovation and the Malaysian Digital Economy Corporation (MDEC) have supported initiatives such as the MSC Malaysia initiative to identify and accelerate the growth of local tech champions, advance international companies and attract investors. Moreover, the Malaysian government has also made sure the MDEC becomes a one-stop shop for start-ups, minimising costs, time and effort for start-ups (MDEC, 2018^[20]).

Some governments in SEA have adopted the approach of hosting an incubator in their country themselves or partnering with local organisations to promote start-ups (Table 5.5). An incubator usually charges its members a fee for access to shared office space, educational services and mentorship opportunities. The duration of the membership, from one to five years, is often longer than with an accelerator and the selection process is much less competitive.

In Indonesia, the Ministry of Communications and Information Technology has an initiative called the 100 Digital Startups that seeks to bridge the gap in mentoring and capacity building of start-ups in Indonesia and create 1 000 start-ups by 2020 with a total valuation of USD 10 billion (Government of Indonesia, 2019^[21]). The Indonesia Creative Economy

Agency, responsible for spurring Indonesian crafts and fashion, has designed the BEKUP programme to develop individual projects through workshops of business management and technical product development (Government of Indonesia, 2018^[22]).

Table 5.5. Start-up incubators and accelerators in SEA

Country	Government-led accelerator/incubator	Private accelerator/incubator
Brunei Darussalam	iCentre (start-up incubation and co-working space offering training, bootcamp programmes and networking)	Founder Institute (early stage incubation)
Cambodia	..	Smallworld Cambodia (co-working space, incubator and accelerator of tech start-ups) She (incubator and accelerator for female entrepreneurs) MerahPutih (working space and capital for early-to mid-stage start-ups) InvestIdea (funding and advice for early stage tech/web start-ups)
Indonesia	1000 Digital Startup (incubation) Bekraf for Pre-Startup (Bekup)	Bandung Ventures (seed stage investments) Raja Capital (venture capital for tech start-ups in the seed, early and growth stages) Ideosource (seed investment) Project Eden (start-up accelerator), Batavia Incubator (seed investment in Internet/mobile start-ups)
Lao PDR	..	..
Malaysia	Selangor Accelerator Programme (four-month programme with workshops, mentoring, overseas tours and prize) Magic Startup Accelerator (large-scale accelerator for early traction of start-up founders with lessons and month allowance). Cyberview (training, accelerator, piloting projects and mentoring)	Rave (three-month programme awarding prize to winners) NEXEA (six months of mentoring, consultancy and technical support)
Myanmar	..	Phandeevar (co-working space, makerspace, incubation and acceleration of tech-start-ups) Kanaung Hub (incubation centre)
Philippines	Upscale (incubator focusing on tech-based start-ups)	AIM-Dado Banatao Incubator (focusing on technology start-ups) Cerebro Labs (co-working space and tech business incubator and accelerator for pre-seed and early stage start-ups) IdeaSpace Foundation (incubation programme for tech start-ups).
Singapore	Startup SG (network, incubation and acceleration programmes for founders and tech companies) WaveMaker Labs (tech start-up incubator)	Fat Fish (accelerator for Internet ventures) FocusTech Ventures (incubation for start-ups wanting to solve world problems) Startup Bootcamp (incubator and accelerator focusing in FinTech start-ups)
Thailand	Depa Accelerator Program x Techsauce (incubation and accelerator programme for early stage start-ups) Spark (accelerator programme for early stage start-ups)	Sprint (accelerator programme for science and technology start-ups)
Viet Nam	HBI-IT (Hanoi Innovative Business Incubator of Information Technology)	Hatch! (co-working space, incubator and accelerator for tech start-ups) Topica (start-up incubator and accelerator)

Note: .. = not available; Lao PDR = Lao People's Democratic Republic.

In Viet Nam, the government has established the Hanoi Innovative Business Incubator of Information Technology (HBI-IT) under the Hanoi Department of Information and Communication to foster skills and collaboration among start-ups in Hanoi. A successful example from a non-government led entrepreneurship ecosystem builder in Viet Nam is Hatch. Hatch started as an incubator and has become an accelerator. It currently is responsible for organising the HATCH! Fair each year, which is Viet Nam's largest annual start-up exhibition and conference (HATCH!, 2018^[23]).

In Myanmar, Phandeeyar is a community technology hub, which runs an accelerator for start-ups, “makerspace”³ and a co-working space. Alongside with these activities, Phandeeyar conducts workshops, trainings and holds competitions among emerging start-ups of the digital sector (Phandeeyar, 2018_[24]).

In Lao PDR, the Department of Small and Medium Enterprise Promotion and the Ministry of Science and Technology deal with start-ups. However, currently there are no specific registration procedures for technology start-ups or e-commerce businesses. These are subject to the same registration procedure and taxation as SMEs. Moreover, as in other SEA countries, laws limiting foreign investment hinder foreign investors to collaborate or invest in start-ups in the country. While the Lao National Chamber of Commerce and Industry and the Lao ICT Commerce Association have initiatives to help start-ups to scale up, the government could do more to boost digital start-ups in Lao PDR (UNCTAD, 2018_[5]).

Such incubation and acceleration programmes often assist start-ups in basic but important ways, for instance reducing the operational costs of keeping an office or hiring a meeting room. Providing them a co-working space is usually just the starting point for a chain of valuable additional services. These can range from simply connecting individuals for collaborative opportunities (e.g. technology companies, digital marketing firms, lawyers, accountants and intellectual property specialists) and providing tenants with customised services (such as loans, cash management, workshops or even health insurance), to simply giving start-ups access to a safe working space that is open 24 hours a day and has a quality Internet connection (Box 5.5).

Box 5.5. Co-working spaces for start-ups

SEA is experiencing a boom in co-working spaces, according to WeWork. The company, which has more than 280 locations in 77 cities, aims to meet the growing demand, and has opened offices in Singapore and Jakarta. WeWork reported in 2018 that all its locations in the region are full and that its future expansion maybe in Malaysia, the Philippines and Viet Nam, among other countries.

For start-ups, co-working can potentially become a mainstream platform through which entrepreneurs organise and share tangible and intangible resources among themselves. Unlike traditional leased premises, which typically require a two- to three-year commitment, co-working spaces offer more flexibility for businesses to negotiate the duration of the lease based on their needs. Start-ups also do not incur the upfront costs of renovation or purchase office furniture, and do not have to manage tasks such as setting up their utility or Internet access services. Given start-ups’ short time frames, fast-changing plans and low cash flow, the flexibility provided by co-working spaces may make the difference in whether a start-up succeeds or not. As SEA has limited affordable office space, the region is likely to have plenty of untapped potential for this co-working service.

In SEA, a few co-working platforms bundle different services. In Indonesia, the Bank UOB Indonesia has set up a partnership with COCOWORK, whereby tenants benefit from lower rental costs and easy access to business bankers who could provide these emerging enterprises with the financial advisory and banking solutions they need to grow their business. Other examples include Common Ground (Malaysia), WORQ (Malaysia), Toong (Viet Nam) and 80RR Fintech Hub SG (Singapore).

Source: CNBC (2018_[25]), “Asia’s coworking boom: ‘We’re still in the starting out phase’”, <https://www.cnbc.com/video/2018/08/06/asias-coworking-boom-were-still-in-the-starting-out-phase.html>.

Programmes to encourage start-ups can also take the form of government guarantees to help start-ups and SMEs to access finance in their early development stages. Other support programmes include tax incentives or initiatives to foster digital businesses and ICT development at a broader scale, and which can be inserted within broader digital strategies. As discussed in Box 5.6, Singapore is promoting such programmes. Facilitating start-ups' access to finance can also take the form of easing regulatory barriers to financial inclusion as well as making frameworks more flexible to keep pace with innovative solutions such as crowd funding, although many SEA countries have not legalised or regulated such activity. The Malaysian Securities Commission, for example, has moved quickly to approve equity crowd funding platforms, making Kuala Lumpur a hub for crowd funding in the region.

Measures to help SMEs to overcome obstacles and better leverage other intangibles, such as data, can also help to encourage data-driven innovation. Examples include targeted skills development and measures to overcome hurdles to accessing intellectual property; such hurdles include administrative burdens and complex and costly litigation and enforcement mechanisms (OECD, 2018_[19]).

Box 5.6. Fostering digital businesses in Singapore

In the context of fostering digital skills, Singapore has been championing the following programmes:

- **TechSkills Accelerator (TeSA)** is a SkillsFuture initiative driven by the IMDA in partnership with strategic partners including Workforce Singapore and SkillsFuture Singapore and in collaboration with industry partners and hiring employers. TeSA aims to enhance training and placement opportunities for ICT jobs across the economy by facilitating the reskilling or up-skilling of individuals to meet industry needs.
- **Code@SG** is a movement to teach coding and computational thinking to students from an early age so that these become a Singapore national capability. The IMDA is working with partners to introduce coding and computational thinking to more students in schools through a combination of info communications clubs, competitions and enrichment programmes.
- **Accreditation@SDG** is a key contributor to the digital economy strategy, and has a vital role in growing and nurturing the local information, classification and management (ICM) technology ecosystem by:
 - accrediting promising and innovative Singapore-based, high-growth ICM product companies to establish credentials and position them as qualified contenders to government and large enterprise buyers
 - providing potential end users with the assurance of the accredited companies' product core functionalities and ability to deliver
 - building an innovative technology entrepreneur (technopreneur) ecosystem to drive economic growth, inspire the younger generation, and build more innovative products and tech product companies that can scale up overseas.

Source: Government of Singapore (2018_[26]), *TechSkills Accelerator* (web page), <https://www.imda.gov.sg/imtalent/about-us/frameworks-and-initiatives/techskills-accelerator--tesa>.

Notably, telecommunication operators in SEA have introduced their own initiatives of incubator and accelerator initiatives for start-ups. In Indonesia, Indigo Incubator, part of Telkom Indonesia, runs two competitions per year to select start-ups that receive initial funding and mentoring. Telkom Indonesia sets the theme of each competition. After the incubation programme, the chosen start-ups benefit from market access to millions of customers of Telkom and partners. Several programmes are underway in Thailand. For instance, the Telenor group runs the Digi Start-up Accelerator. The True Corporation has an accelerator, True Incube, that focuses on mobile solutions for agriculture and the IoT. The other Thai operators, AIS and DTAC, also have established accelerators. In Myanmar, Ooredoo has launched an incubation centre and a showroom to improve awareness among SMEs of available digital solutions.

SMEs in the region are increasingly considering application programming interfaces (APIs) and mobile solutions as part of their development strategies from their inception, thus creating an opportunity for telecommunication operators and especially mobile operators. Many of these operators have already identified the need to have specific departments to customise their services to the needs of SMEs, which usually means improving affordability, flexibility, responsiveness and packages size, as well as adding services related to cloud services, API development and business management.

In this sense, operators have an advantage in relation to business, as they have direct contact with the needs of smaller businesses. Government agencies seeking to address SME issues should use the private sector to good advantage in their plans and programmes to promote technology start-ups. In Thailand, for example, the government's Digital Economy Promotion Agency has collaborated with the operator AIS to create a start-up space offering co-working space, mentoring and coaching.

Similarly, programmes that raise awareness of and create opportunities for linkages and partnerships between SMEs and larger firms – in general, domestically and internationally – can help SMEs to exploit their potential to produce intermediate goods and digital services. Governments should consider these programmes when devising strategies to promote digital start-ups.

Policy frameworks for promoting e-commerce

Among SEA countries, Singapore is a very mature market for e-commerce, with well-developed infrastructures and a digitally skilled population. Malaysia and Thailand also have been investing in initiatives to continue to reinforce their e-commerce markets (Box 5.7).

While global e-commerce platforms have expanded the opportunities for all sizes of businesses and allowed them to reach a vaster pool of consumers, SMEs still sometimes encounter barriers to access these services. For some SMEs, for instance, the cost of membership fees or the commission on sales may be prohibitive. An International Trade Centre (ITC) (2017^[27]) survey found that SMEs that are already on line ranked the cost of membership fees on cross-border e-commerce platforms third among all major challenges (15%). In terms of ongoing charges, some e-commerce platforms may charge up to 40% commission on sales, for example, and large international platforms usually charge a commission of between 7% and 15%. Usually the rates depend on the estimated or perceived operational costs and risks, which often means that low-income countries with the most vulnerable SMEs will have their rates set higher.

Moreover, the ITC survey found that on some occasions, SMEs in developing countries have been hampered from accessing e-commerce platforms. Among the reasons cited for the denial of access were that the e-commerce platform did not allow registration by companies

from the SME's country; that the SME was unable to provide proof of formal company registration, trading history, or identity of directors or managers of the firm; and that the SME did not have access to an online payment mechanism (International Trade Centre, 2017^[27]). To register as a seller on Amazon, for example, companies or individuals need to be a resident of one of 103 authorised countries, have a local phone number and have an internationally chargeable credit card, which could be a challenge to obtain in some SEA countries.

Box 5.7. Promoting e-commerce in SEA

Singapore

Singapore launched the SkillsFuture for Digital Workplace programme in 2017 to equip Singaporeans with the digital skills that suit their needs. The courses offered cover simple topics such as the use of e-payments and e-commerce platforms, as well as advanced and practical knowledge related to data analytics and automation. An estimated 100 000 people will benefit from this programme from 2017 to 2020.

Malaysia

Several Malaysia governmental agencies, including the Ministry of International Trade and Industry and the Malaysia Digital Economy Corporation, are working to promote e-commerce. In October 2016, the National eCommerce Strategic Roadmap was launched and the National eCommerce Council, comprising various ministries and agencies, was established to drive the implementation of a roadmap. Its target is to double Malaysia's e-commerce growth rate and reach a gross domestic product contribution of USD 51.5 billion (MYR 211 billion) by 2020.¹

Thailand

The Electronic Transactions Development Agency (ETDA), a public organisation, is responsible for developing digital economy policies related to the trustworthiness of the digital technology used in electronic transactions. The ETDA has developed curricula and conducted training to foster knowledge and understanding in applying IT to e-commerce. It also is engaged in the development of the Thaiemarket.com website, which assembles Thailand's various quality e-commerce websites in one place and provides a website for state agencies where they can advertise to the global market. These initiatives will contribute to economic growth by creating increased opportunities and income for e-commerce entrepreneurs. Furthermore, the website provides collected knowledge about online transactions that can be disseminated through published media, exhibitions, electronic media, and mass media like radio, television, newspapers, websites and social media. Currently, the Thai government is focusing on its Thailand 4.0 policy, whereby a budget is allocated for the specific purpose of constructing a broadband network for all villages across the country. Having a nationwide broadband network will help to bridge the digital divide and promote modern economic development through the e-commerce channel.

1. These figures are based on an exchange rate of MYR 4.1/USD 1 for the year 2016, using the official World Bank exchange rate at <http://wdi.worldbank.org/table/4.16>.

Sources: Infocomm Media Development Authority of Singapore, Malaysia Digital Economy Corporation and Electronic Transaction Development Agency (Thailand).

Having local e-commerce platforms and e-commerce platforms with targeted services for customers and businesses in SEA countries can help to minimise these barriers to access. As noted in this chapter, start-ups in SEA tend to see challenges as opportunities to create new solutions and become platforms for micro-entrepreneurs and SMEs. If the level of commission taken by some platforms is a concern, it can act as an incentive for innovation and competition. It is worth highlighting the example of Tada, a ride-hailing app that started in Singapore. Tada promises zero commission fee for drivers and other incentives, such as a cryptocurrency-based rewards programme (See Kit, 2018^[28]). Singapore has one of the most competitive ride-sharing and ride-hailing markets in the world, as evidenced by Uber's exit, and new firms such as Tada are seeking to disrupt incumbents by fundamentally changing the commission model.

Developments in e-commerce can be challenging for policy makers, given the complex landscape of converging technologies, blurred boundaries between goods and services, the increasing role of online platforms and payment intermediaries, and uncertainties around the geography and jurisdiction of sales transactions (OECD, 2019^[29]).

The first challenge concerns measuring e-commerce. Lack of data as well as an often-partial and often-biased perspective on e-commerce transactions hinder evidence-based policy making. Moreover, e-commerce policy frameworks should also take into account other policy issues (OECD, 2019^[29]). These include:

- consumer protection as it relates to both traditional and new commerce issues such as services offered for free in exchange for gaining access to a user's personal data and enforcement of national and regional consumer protection regimes, particularly for product safety and recalls
- tax policy, as new digital business models, including for e-commerce, have raised issues around how and where value is created, further testing existing income taxation systems that are based predominantly on physical factors to determine a taxable presence and allocate profits
- competition policy, as a range of different competition dynamics have emerged for online sellers, platforms and other actors in the brick-and-mortar space, including on the role that algorithms may play in facilitating such collusion
- trade policy, given the legal and regulatory uncertainties for firms participating in cross-border e-commerce due to the blurring of boundaries in the traditional distinction between goods and services in which trade agreements rely upon
- environmental policy, as e-commerce raises concerns related to e-waste and the efficiency of small-scale residential deliveries.

Technological developments and new business models are altering the e-commerce landscape, and these changes affect policy frameworks along several dimensions. Therefore, policy makers should ensure that policy action is not unilateral but instead is developed simultaneously with thoughtful consideration of the impacts across policy domains.

Notes

¹ This approach follows closely the OECD guidance on developing a Digital Transformation Strategy (OECD, 2019^[11]).

² A model for this approach is used by Common Networks Inc. See the company's website at <https://common.net>.

³ Makerspace offers do-it-yourself spaces where people can gather to create, invent and learn, often by using 3D printers, software, electronics, and craft and other hardware supplies and tools.

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6. Recommendations for empowering SMEs in Southeast Asia for the digital transformation

This chapter summarises the main recommendations for policy makers in Southeast Asia to harness the potential of communication technologies and digital applications and services for the transformation of small and medium-sized enterprises (SMEs). It describes good practices for enhancing access to broadband to empower SMEs, increasing effective use, unleashing innovation, promoting inclusiveness, strengthening trust, fostering e-commerce, leveraging regional integration, and establishing a strategic and coherent policy vision.

Key areas for empowering SMEs for the digital transformation

The Southeast Asia (SEA) region faces a number of challenges that need to be overcome to fully benefit from the digital transformation, particularly in terms of the integration of small and medium-sized enterprises (SMEs) in the digital economy. On the supply side, the main challenge is connectivity, which plays an essential role in the digital transformation of SMEs. On the demand side, other regulatory frameworks inhibit innovation of digital services and applications that would be fundamental for SMEs to “go digital”, such as policy frameworks that promote the effective use of these services, enhance trust, facilitate digital financial services and stimulate e-commerce. The following section sets out recommendations to foster national and cross-border regulatory measures and policies to enable SMEs to go digital in SEA.

Enhancing access to broadband to empower SMEs

Strengthen the institutional and regulatory frameworks for connectivity and implement regulatory measures and policies that are based on consistent, clear and transparent principles, to foster competition in both fixed and mobile broadband markets and extend access to affordable and high-quality communication services.

It is widely recognised that access to high-speed broadband networks accelerates economic and social development. The United Nations recently acknowledged the importance of such access for the three pillars of development – economic development, social inclusion and environmental protection – by setting universal and affordable access to the Internet in least developed countries by 2020 as a Sustainable Development Goal target (UN, 2015^[1]). The OECD Going Digital Integrated Policy Framework has further highlighted that high-quality access to communication networks and services at competitive prices is fundamental to digital transformation (OECD, 2019^[2]).

In this context, enhancing connectivity for SMEs in the SEA region offers enormous potential, given that the use of broadband is key to fostering firm productivity and, by extension, development in SEA. Regulators and policy makers in the region have an important role to play – to promote competition in communication markets, remove barriers to investment in networks and thus boost connectivity, which will allow SMEs to leverage the opportunities of the digital transformation.

Within the SEA region, countries have evolved at different paces in terms of the percentage of people and businesses using broadband services. For many countries in SEA, the lack of broadband or poor provision of these services hinders local economies and SMEs from harnessing the opportunities of the digital transformation, particularly in areas outside major cities and urban business centres. For other countries where access to digital services is more advanced and as more people and things go on line, continued investment in communication networks is still needed to support future technologies and increased demand for speed and capacity of networks.

In general, fostering broadband networks and services requires that regulatory frameworks and public policies be based on consistent, clear and transparent rules for all market actors involved in the value chain since deploying broadband networks is a capital-intensive undertaking. These frameworks and policies should be evidence-based and grounded in

competition principles; as such, they will cultivate an environment of predictability and effectiveness that facilitates competition in the broadband market, furthers the deployment of networks and advances innovation in services. National digital strategies and national broadband plans have proven to contribute to increased broadband access and usage when developed through a whole-of-government approach and when they include clear targets and objectives.

For both broadband and SMEs policies alike, co-ordination of different levels of government is crucial to eliminate administrative redundancies, reduce deployment costs and promote access by businesses. To foster the expansion of broadband networks, establishing a co-ordination mechanism for infrastructure deployment is a recommended good practice. For example, developing and implementing common regulations for laying cables along municipal and regional roads with a view to establishing as uniform a practice as possible help to further reduce costs and contribute to broadband expansion, as does adopting a so-called state “dig once” policy to leverage non-broadband infrastructure projects.

In order to increase competition and thus enable affordable services and innovation in the market, it is recommended to enhance access to resources for network operators and to eliminate existing barriers to accessing passive infrastructure (backhaul, poles, ducts, etc.) and restrictive rights. It is also particularly important to make sufficient spectrum available, given that a large proportion of SMEs access the Internet via mobile networks. Moreover, encouraging the reuse of existing infrastructure, such as the rooftops of public buildings and property, on reasonable terms offers an easily attainable way to reduce costs and expand broadband availability.

Policy makers and regulators have an important role to play in encouraging investment and facilitating network deployment in underserved areas. Bottom-up models to finance and deploy high-speed networks, for example municipal or community networks, can facilitate and reduce costs of broadband provision to the final user in the absence of sufficient private supply. These can also serve as a mechanism to assist underserved areas cope with unmet or continuously growing demand for higher broadband capacity.

Even as more and more SMEs connect wirelessly, the speed and rate of download of wireless connections ultimately depend on the capacity of fixed networks. This is why fixed and mobile networks play a complementary role in digital transformation, while also acting as substitutes for some services. Therefore, it is important to promote the deployment of both fixed and mobile broadband networks.

Measuring the penetration as well as the affordability of broadband services helps policy makers to better understand the state, and existing challenges, of connectivity. In addition, analysing the specific needs of particular groups – for example, populations in rural and remote areas and businesses, such as SMEs, that may be lagging behind – helps them to take a more targeted policy approach.

Finally, regional co-operation among countries can create and increase connectivity. This can be done by improving connectivity through submarine cables between countries, for instance, and by a fibre backhaul and an efficient Internet traffic exchange using Internet exchange points (IXPs), as discussed in the recommendation on leveraging regional integration. Such measures can contribute to lowering the prices of international connectivity (including roaming) and enhancing cross-border data flows.

Increasing the effective use of digital services

Increase the effective use of digital services by SMEs by fostering digital skills for people and firms, supporting SMEs to overcome challenges in adopting digital tools, and harnessing the potential of digital government to promote relevant digital content.

Adoption and diffusion of digital services by SMEs in SEA are still lagging, as only a few frontrunners enterprises, typically larger ones, have mastered the new opportunities created by digital services. Promoting the deployment of broadband networks does not automatically translate into broadband services being adopted by SMEs. Policy makers should consider issues related to the use of broadband services such as awareness, affordability, digital literacy, relevant content and trust when formulating an overarching strategy for SMEs to go digital.

Greater attention by policy makers to the effective use of digital services by SMEs could help the SEA region to increase innovation, productivity and inclusiveness. A range of policy options are available to encourage SMEs to adopt digital services, including more advanced digital tools such as cloud computing, artificial intelligence and big data. By adopting these tools and adapting them to local market conditions (supply side), SMEs could help expand the use of digital services by consumers (demand side).

To accomplish this, both public and private stakeholders need to make a concerted effort to guide SMEs to embrace the digital transformation. Telecommunication operators and digital application providers are well placed to understand the needs of SMEs and establish a trusting relationship that can be used to communicate the importance of using additional digital services. Engaging SMEs in sector pilot projects led by industry leaders, for example, can lead to effective take-up and growth of digital tools.

Promoting digital skills in schools, universities and in lifelong education is essential to increase the overall effective use of digital tools and services in society. It is important not only to develop digital skills among consumers, but also to nurture digital businesses. Some partnerships among industry players (e.g. communications service providers, content providers and digital platforms) and the public sector already include programmes focused on developing digital businesses. National awareness campaigns that show the benefits of the digital transformation to those who are not currently digitally engaged also can spur adoption of digital tools. SMEs should be a priority target of such campaigns.

Policy makers can promote the effective use of digital tools by helping SMEs to understand their digital readiness and how to increase the digital skills of their employees. For example, SME centres can serve as hubs where SMEs can find counselling to develop digital roadmaps – that is, step-by-step guides to help them to evaluate their digital readiness – and pre-approved or curated digital solutions that meet their specific business needs. Such services would reduce risks of SMEs encountering asymmetric information, as they often do when acquiring digital solutions, and hence would facilitate the sustainability of their projects.

Unleashing innovation in start-ups and young firms

Unleash innovation by re-evaluating regulations that are not fit for a fast-changing digital age, promote digital start-ups and young firms with the support they need at each stage of their life cycle, and foster policy experimentation in support of the digital transformation.

An essential step towards promoting the creation of start-ups and young firms is reducing the regulatory burden on these firms. This means re-evaluate regulations that may not be fit for the digital age, for example regulations that require a physical presence or a minimum scale to obtain a permit or to offer a service. Some countries have chosen to implement regulatory sandboxes that promote the flexible application of new policies to respond to rapid changes brought about by the digital transformation. Regulatory sandboxes are one example of the kinds of policy experimentation that has emerged in a range of sectors such as finance, health and transport and that enable firms to test new business models with fewer regulatory requirements.

In addition to regulatory barriers, funding is considered as a bottleneck for start-ups and young firms. They need access to a range of financial instruments to unleash their full potential to contribute to inclusive economic growth. Digital technologies such as big data analytics can enhance the provision of financing services to these companies. Moreover, increased private investment and government-backed initiatives can expand entrepreneurship and help start-ups and young firms to innovate. In this regard, accelerators and incubators usually share the same aim of helping new businesses to grow, although usually they rely on different methods.

Both incubators and accelerators rely on a network of entrepreneurs to promote synergies and learning among other members and to provide some sort of mentorship. Some incubators can assist with small volumes of funding. However, what distinguishes accelerators from incubators is that the former typically provide intensive education along with seed funding for selected businesses, often in exchange for ownership of the businesses they are supporting. Beyond financial backing to entrepreneurs, investors can help to recruit talented managers and use their networks to garner resources for young companies.

Other measures that help start-ups and young firms to overcome obstacles and leverage other intangibles such as enhanced access to data may have the added benefit of promoting data-driven innovation. These measures may include targeted skills development for innovative entrepreneurship.

Promoting an inclusive digital transformation

Promote inclusiveness by increasing access to and use of digital services and applications by vulnerable and rural populations, addressing gender digital divides, and preparing SME employees for the changing work environment brought about by the digital transformation.

Quantitative and qualitative information on data access and usage gaps is necessary to understand – and address – the bottlenecks to the digital transformation of SMEs. The information needed relates not only to firm size, but also to different groups represented across SMEs

that may face specific barriers to realising full uptake of digital options, among them rural communities, ageing populations, women and certain minority groups. Assessing these gaps is a pre-condition for designing appropriate and targeted policy action.

Increasing adoption gaps among rural populations could alleviate the problem seen across SEA of youth leaving rural areas and traditional activities such as agriculture to live in urban centres. Targeting rural SMEs as part of efforts to enhance adoption of digital tools (e.g. the Internet of Things) for example, could increase productivity in agriculture and other sectors. This also could attract more individuals and new firms to locate in a small towns or regions, thus creating a more appealing ecosystem for young people. Enabling teleworking and home learning outside urban areas also can exponentially improve conditions for businesses that rely on digital services and applications, which would welcome lower real estate costs and less traffic congestion. This in turn would benefit rural communities, and potentially contribute to slowing down migration from rural to urban areas.

Another gap to consider is that of women's participation in the digital economy. Women across SEA face different types of barriers to their full realisation of the benefits of the digital transformation. Among these are affordability, skills and limited access to finances. Yet, digital technologies can contribute to empowering women economically through enhanced access to information, markets and entrepreneurship. If all SMEs are to be able to seize the opportunities offered by the digital transformation, everyone, and especially every woman, should be able to pursue and achieve to achieve their aspirations.

Promoting inclusiveness means considering the changing business models and jobs in the digital economy. As new digital services and business models emerge in SEA, both labour markets and jobs themselves are transforming, for instance with some jobs being lost or changed and new kinds of jobs being created. Traditional SMEs and their workers, who usually are low skilled, are most likely to be the first affected by these disruptions and the least likely to receive training to develop new skills. Digital SMEs, workers in digital platform markets and sellers in e-commerce platforms often benefit from low entry barriers and substantial flexibility. However, attention should be paid to ensuring that the quality of so-called on-demand jobs is maintained and that the risks of adverse effects (i.e. greater job strain, less exposure to training, and lower wages and social protection) are minimised.

To adapt to technological progress, new forms of business models and jobs, policy makers in the region will need to make sure that all workers across different firm sizes, industries, regions, communities and occupations are part of the digital transformation.

Strengthening trust

Strengthen trust of SMEs in digital tools and services by raising awareness about digital security risk management, developing privacy and digital security frameworks with a whole-of-society perspective, and continuing to facilitate cross-border data flows.

Limited data exist on the level of trust in digital services in SEA, particularly with respect to SMEs. But experience among OECD countries shows that SMEs may not be making the most of the business opportunities that the online environment has to offer, due to concerns related to trust.

The potential impacts of a digital security incident or privacy breach – loss of consumer confidence, reputational damage or negative impacts on revenue – drive some of these trust-related concerns. The establishment and harmonisation of good practices in digital security, personal data protection and privacy laws, and e-signature across SEA would help to address these concerns.

In the area of privacy, an objective for the region could be to develop and implement a policy framework that protects privacy while also encouraging the use of digital services for economic and social prosperity and enabling cross-border flows of personal data through appropriate international policy and legal interoperability. Properly designed privacy safeguards help to enhance the trust of consumers and SMEs, and ensure that the flow of data is not impaired at the national level or across borders. In addition, it is recommended to undertake awareness campaigns for SMEs that educate them on how to deal with personal data and put in place mechanisms to deal with data breaches.

Policy makers in SEA also should develop policy frameworks that address digital security with a strategic perspective and clear vision for the future. This means considering digital security policy as a means of increasing economic and social prosperity through a sound risk management approach.

As more people and businesses in SEA connect to the Internet, digital security risks will doubtless increase and become more complex in nature. Greater efforts from various stakeholders will be needed to tackle them. Policies now in place, however, often lack the appropriate level of co-ordination between governments and other stakeholders. This undermines public policy efforts to encourage the use of information and communication technologies and, by extension, limits the understanding of the economic and social dimensions of digital security. The economic and social benefits of the digital transformation in SEA, and in particular for businesses in the region, can only be realised if stakeholders manage digital security risks – that is, they manage the security risks associated with the use of the digital services and applications.

Fostering e-commerce

Foster e-commerce by removing barriers to e-commerce, including those that distinguish between online and offline commerce, and by harmonising national regulatory frameworks in the SEA region to minimise frictions and costs for cross-border trade by SMEs.

SMEs typically lag behind larger firms in terms of e-commerce participation, but evidence-based policy can help to address specific constraints they face. One important bottleneck is lack of access to high-speed communication networks in certain parts of the region, which is essential for e-commerce transactions. For SMEs to leverage e-commerce to expand their customer base and increase revenues, significant communication infrastructure improvements are needed in much of the region (see also the recommendation on enhancing access to broadband).

Payment methods are a further constraint on e-commerce expansion in SEA, and constitute a greater barrier to e-commerce than they do to traditional offline commerce. In general, payment models for e-commerce should allow for a quick and effective value transfer while imposing a minimum of additional costs and risks. Policy makers in the region can help to promote economic activity by promoting a framework for electronic settlements and payments

that allows for innovative payment methods such as mobile payments. The OECD (2014^[3]) Digital Economy Paper “Consumer policy guidance on mobile and online payments” provides a wealth of information on policy actions to build a framework for e-commerce that can be tailored to the SEA region. E-commerce can be further fostered in the region through the very important ASEAN Coordinating Committee on Electronic Commerce.

In addition to addressing these constraints, policy makers can have an impact by reducing regulatory uncertainty, and should work to create an inclusive business environment that helps SMEs trade on line and across borders and integrate successfully with larger service providers such as online platforms. An example of good practice is better communicating to firms in general the existing regulations and how they apply specifically to e-commerce.

It is further recommended to work towards regulatory approaches in SEA that are flexible, transparent and experimental so as to foster new e-commerce business models. For example, regulatory waivers may help firms to test new technologies and business models such as drones, digital payment applications, cryptocurrencies and 3D printing.

Finally, e-commerce policy making should take a holistic approach because as e-commerce affects policy frameworks along several dimensions, among them data protection, consumer protection, competition, tax and trade. To maximise the benefits of e-commerce, then, co-operation and collaboration across policy areas, including at the highest levels of government and at the regional and international level, will be crucial.

Leveraging regional integration

Leverage regional integration, regional connectivity infrastructures, cross-border data flows and sharing of experiences in the SEA region to minimise frictions and costs for cross-border trade by SMEs and to improve connectivity across countries.

Policy makers and regulatory authorities in SEA should continue to cultivate the sharing of good practices and approaches on connecting SMEs and, when possible, their experience with demonstrable outcomes.

Expanded regional co-operation on SME development could allow countries to better leverage domestic resources. The Association of Southeast Asian Nations has a number of regional co-operation programmes and projects in the area of market access and internationalisation and some in the area of productivity, technology and innovation.

Effective regional co-operation is a valuable tool for co-ordinating the efforts to build international connectivity infrastructure, which encompasses regional terrestrial backbones, submarine cables and international gateways. An efficient Internet traffic exchange is important to foster regional connectivity and meet domestic demand for Internet bandwidth and self-sufficiency in a cost-efficient manner. IXPs are the main tool in this respect; they can lower international bandwidth costs and improve the quality of service for all stakeholders. Above all, competition should be encouraged, and dominance issues addressed, so that all players can benefit from the international connectivity needed for SMEs to reap the benefits of the digital transformation. Common public policies in SEA can assist in attracting investment to the region, where economies of scale are in place, and can improve cross-border trade.

However, more could be done to operationalise the lessons learned from cross-country exchanges, for instance via the secondment of staff between national institutions and the development of joint projects between SME agencies and other government institutions. These could be particularly valuable in the development of better regulations and the creation of digital governance systems. A standardised system for the exchange of financial information could also be very beneficial. This would require more complete company registers and the establishment of harmonised credit reporting systems and information, and can therefore be seen as a long-term goal.

Regional co-operation and integration play a pivotal role in accelerating economic growth and development, reducing economic disparity, raising productivity and opportunities for employment, and strengthening institutions. Increased co-ordination among SEA countries would ultimately lead to better policies for connectivity of SMEs, encourage economies of scale, foster investment, increase competition and ultimately increase the region's competitiveness.

Establishing a strategic and coherent policy framework

Establish and effectively implement a strategic and coherent policy framework for the digital transformation of SMEs through co-ordinating the government institutions and stakeholders dealing with both SME and digital policy issues, identifying the main challenges and policy objectives, and building an evidence-based action plan with clear milestones and allocation of responsibilities.

To design and implement a strategic and coherent framework for the digital transformation of SMEs in SEA, it is crucial to develop a governance mechanism, measurement plan, and clear strategy for both SME promotion and digital transformation strategies. Where one of these policy areas is not substantially developed in a given country, the creation of a digital SME strategy could serve as an opportunity to strengthen digital economy policy frameworks and governance models in parallel.

Implementing strategic change at the intersection of SME policies and digital transformation policies means including aspects of the digital transformation within SME policy initiatives and tailoring digital transformation policies to include the needs of SMEs. Such strategic change can be accomplished by opening dialogue between these two policy groups. First, government agencies responsible for elaborating and implementing policies for SMEs should be made aware of the opportunities and challenges that different technologies, digital services and applications can bring to SMEs. It is further recommended to empower these agencies to identify the specific barriers faced by SMEs in a context of digital transformation in order to develop cross-cutting solutions. Second, policy makers and regulators responsible for digital economy policy (i.e. for enabling access, promoting adoption and/or fostering trust) should incorporate the perspective of SMEs in their analysis; this will help them to understand the specific challenges SMEs may face in terms of connectivity and when adopting digital business processes and services.

A first step in this direction is establishing a governance approach for policies seeking to promote the digital transformation of SMEs – with effective co-ordination among both SME and digital economy policies and with a clear assignment of responsibilities and milestones for policy implementation. Articulating a strategic vision contributes to ensuring coherence

by identifying the main priorities and objectives for the digital transformation of SMEs and also taking into account domestic, regional and international strategies and agendas.

Another key step relates to measurement and analysis. Strengthening collection of accurate and comprehensive data can ensure that policies are evidence-based and well targeted. In many countries in the SEA region, such statistics are missing or are not collected systematically. Moreover, policy makers should assess the key digital trends that affect SMEs. This will help to identify opportunities and challenges for these firms and can include evaluating current policies, regulations and strategies to identify gaps or lack of coherence in the face of technological developments.

A comprehensive and coherent strategy should also engage all relevant stakeholders, including different parts and levels of government, non-governmental actors such as industry players, SME associations, civil society and international partners. A multi-stakeholder working mechanism could be established with the objective of discussing and agreeing an action plan to foster the digital transformation of SMEs.

Finally, a strategy to foster digital SMEs can be successfully implemented by issuing an action plan with specific milestones that is backed up by indicators, key responsibilities, timeframes and measurable targets. In addition, the strategy should anticipate challenges related to existing institutions, social preferences and administrative capacity.

The digital transformation affects all aspects of the economy and society in complex and interrelated ways, challenging existing policies in many areas. This means that stronger co-operation and collaboration among different parts of government and stakeholders are critical. It also calls for breaking down policy silos within governments and re-thinking how policy is developed and implemented.

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Southeast Asia Going Digital

CONNECTING SMEs

The digital transformation opens a range of opportunities for small and medium-sized enterprises (SMEs) in Southeast Asia (SEA). It enables product and service innovation, eases SMEs' access to talent and finance, and enhances competitiveness in local and global markets. An essential element for SMEs to “go digital” is connectivity, without which the digital transformation cannot be realised. In this regard, the *Southeast Asia Going Digital: Connecting SMEs* report analyses the state of connectivity in SEA (i.e. access to high-quality communication networks and services at affordable prices), examines how SMEs benefit from accessing and using digital tools, and provides policy recommendations to foster an enabling environment for the digital transformation in SEA. This report is designed to share good practices to harness broadband-based services to increase productivity, social welfare and to, ultimately, contribute to regional integration.