

Promoting Services Trade in ASEAN

Trade in Computer and Related Services

PAPER 4
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2017



ASEAN-JAPAN
CENTRE

国際機関日本アセアンセンター

**For inquiries, contact ASEAN-Japan Centre
(ASEAN Promotion Centre on Trade, Investment and Tourism)**

1F, Shin Onarimon Bldg., 6-17-19, Shimbashi,
Minato-ku, Tokyo 105-0004 Japan
Phone/Fax: +813-5402-8002/8003 (Planning & Coordination)
+813-5402-8004/8005 (Trade)
+813-5402-8006/8007 (Investment)
+813-5402-8008/8009 (Tourism & Exchange)
+813-5004-8118/8003 (PR)
e-mail address: toiawase_ga@asean.or.jp
<http://www.asean.or.jp>

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NOTES

The terms country and economy as used in this study also refer, as appropriate, to territories or areas; the designations employed and the presentation of the material do not imply the expression of any opinion whatsoever on the part of the ASEAN-Japan Centre concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

The following symbols have been used in the tables:

- Two dots (..) indicate that data are not available or are not separately reported.
- A dash (-) indicates that the item is equal to zero or its value is negligible.
- Use of a dash (-) between dates representing years, e.g., 2015–2016, signifies the full period involved, including the beginning and end years.
- Reference to “dollars” (\$) means United States dollars, unless otherwise indicated.

There are seven papers in total. The other six papers cover professional services; R&D services; courier services; telecommunication services; air, rail and road transport services; and tourism.

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I. INTRODUCTION

Computer and related services are an indispensable input into the economic activities of ASEAN. The General Agreement on Trade in Services (GATS) administered by the World Trade Organization (WTO) lists¹ the following five job categories under “Computer and related services”:²

- a. Consultancy services related to the installation of computer hardware
- b. Software implementation services
- c. Data processing services
- d. Database services
- e. Other

The position and role of computer and related services in value-creating economic activities can be displayed well on a value chain curve (figure 1). The coverage (the shaded square in the figure) of computer and related services is broad, encompassing the whole production chain. Because of this, whereas the industry can operate in a stand-alone manner, it also tends to work in combination with other industries such as telecommunication services (especially for internet services; see paper 3 of this series) and research and development services (see paper 2 of this series) and thereby form the basis for e-commerce businesses or artificial intelligence (AI) businesses. Computer and related services ensure smoother (in the horizontal direction, known as the “value chain”) and more efficient (in the vertical direction, referred to as “value added”) operation of a country’s entire value-creating activities for the entire industry.

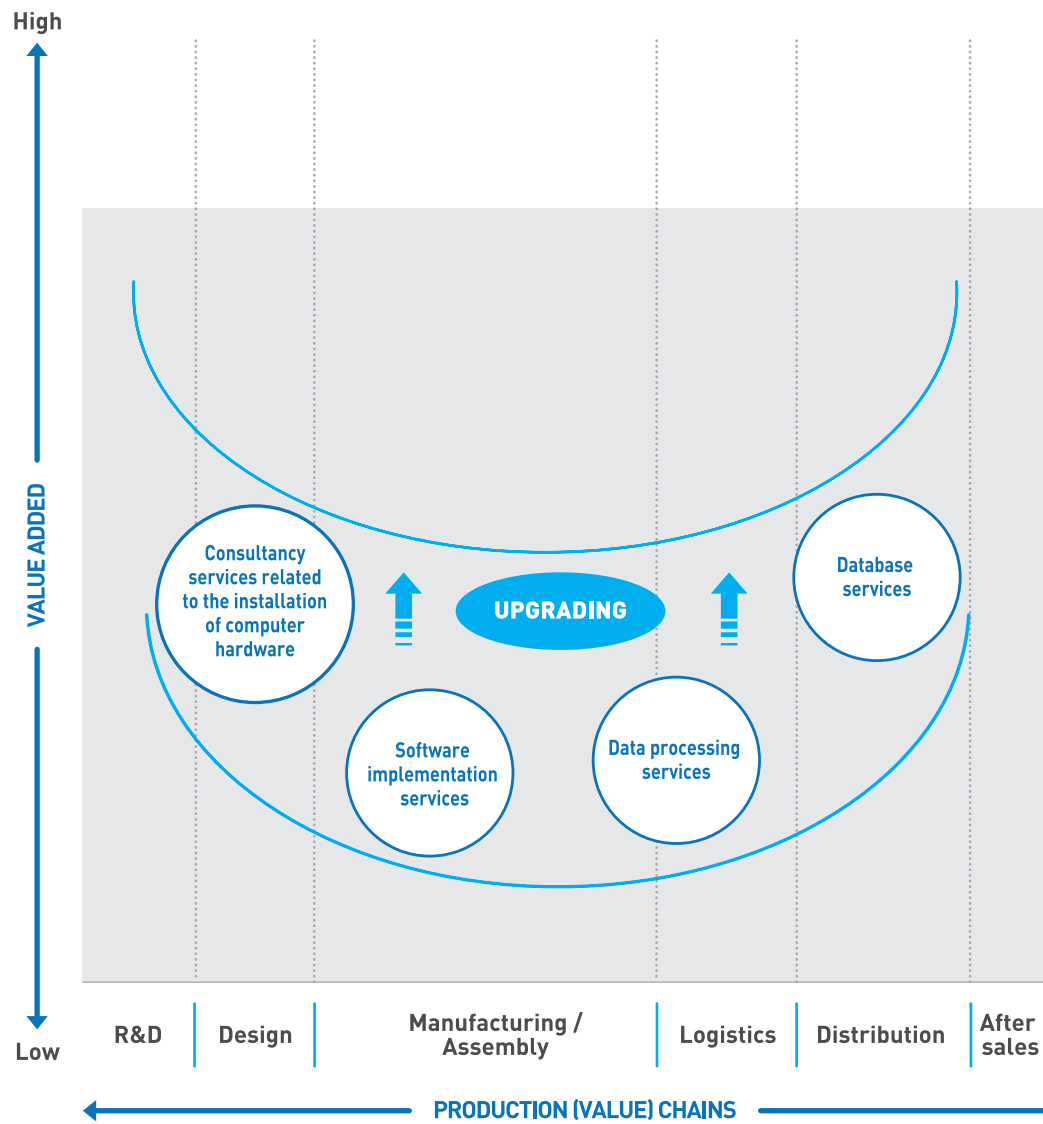
An important and relevant concept to be considered is transaction costs, i.e., the costs associated with accounting transactions and information transactions in connection with business activities. Through the introduction of computer and related services, a significant reduction of (unnecessary) transaction costs could be achieved. Trade in computer and related services is therefore expected to reduce those transaction costs to a large extent, an effect that would not be possible with domestic suppliers of computer and related services, as computer-related firms based in advanced countries, for instance, possess a much greater comparative advantage in providing their services.

Also, the degree of information asymmetry among workers in business firms and across various job categories can be reduced by the use of computer-based information facilities. This is another reason why trade in computer services should be promoted in the ASEAN region as well as in the global economy at large.

¹ “Services Sectoral Classification List” (MTN.GNS/W/120, released 10 July 1991).

² This paper addresses computer and related services using computers as online (internet) and offline instruments; internet services fall under telecommunication services (which is addressed in paper 3 in this series).

Figure 1. Value chains and computer and related services



Source: ASEAN-Japan Centre.

Note: Positions of job categories are simply placed in a relevant place along the value chain and do not necessarily represent the most suitable place.

II. INDUSTRY CHARACTERISTICS

This section presents an overview of the status quo in some ASEAN Member States in three typical industries based on the use of computer and related services – systems integration, consumer software and e-commerce systems.³

1. Systems Integration

Indonesia

Indonesia's systems integration market is a sub segment of the information and communication technology (ICT) services market, which includes infrastructure and application integration services and systems integration consulting services. Indonesia has become a large spender on ICT in ASEAN as the country's public sector invests heavily to upgrade internal infrastructure in line with the Indonesia Economic Master Plan. Banking and financial services, along with telecommunication and utilities services, are the major sectors in Indonesia that have adopted systems integration for their ICT services. The private sector is using the latest technologies to enhance customer service and experience and gain a competitive edge in the marketplace. The rapidly expanding ICT industry has boosted the systems integration industry, as deployment of multiple and complex ICT systems requires an efficient ICT setup.

Malaysia

Over the last two decades, various government initiatives and programs have made Malaysia the second largest enterprise ICT spender in ASEAN. The government has been encouraging foreign investment through tax incentives and local businesses through venture capital funding. The key sectors that have benefited from these measures are health care, manufacturing and the public sector. The Services Sector Blueprint set out in March 2015 also identified the ICT services sector as a key driver of the local economy, playing a critical role in transforming it from being industry driven to being service oriented. Malaysia's systems integration market is projected to be driven by high investment in ICT infrastructure, emerging technologies such as cloud and big data analytics, and high investment in automation solutions. The rapid expansion of the ICT industry has boosted demand for systems integration, as multiple ICT systems can result in confusion, inefficiency and lower productivity.

Philippines

The systems integration market in the Philippines is characterized by high competition between local players and global companies. International players such as HP (United States), IBM (United States), Accenture (Ireland) and NTT Communications (Japan) have already set up operations in the local market to take advantage of the technological advancements in its ICT, telecommunication and business process outsourcing (BPO) industries and the resultant systems integration opportunities. Many small local players who are trying to establish themselves as specialized systems integrators also exist. With the growth in the BPO sector, competition within the systems integration market continues to rise as local players compete with new global players entering the market (annexes A and B).

³ Summary of information provided by the database SPEEDA and publicly available information. E-commerce systems, which are not explicitly mentioned under the GATS, could also be considered under telecommunication services but are covered here for convenience.

Thailand

Thai systems integrators play an important role in implementing ICT infrastructure projects in Thailand. Systems integration services are categorized as software services by the Software Industry Promotion Agency (SIPA). Systems integrators in Thailand carry out end-to-end ICT project implementation, from developing the scope of projects, making technology recommendations, and procuring products to implementation, testing, and continuous maintenance and support after implementation. Systems integrators earn revenue through two sources: (i) reselling ICT systems and products that are deployed at a project and (ii) providing ICT systems integration services. The process of systems integration is complex, due to the size and criticality of the projects. Hence, systems integration companies adhere to project management frameworks for successfully implementing the projects. These project management frameworks involve evaluation of the systems integration project and developing a project plan, estimating resources, mapping processes and developing risk management strategies and thereafter managing project execution (i.e. integration, testing and deployment). These companies generally have strategic alliances with original equipment manufacturers (OEMs) of technologies to procure solutions that meet customer requirements. Systems integrators usually source products for large-scale projects directly from OEMs, whereas they tend to procure products for smaller projects from distributors.

Viet Nam

The systems integration market in Viet Nam is fragmented and is characterized by the presence of a significant number of local players, in addition to a handful of global players. According to Viet Nam's Ministry of Information and Communications, six companies dominate the market: FPT (VNM), HiPT Group (VNM), HPT (VNM), Sao Bac Dau Technologies (VNM), Joint Stock Company for Telecom & Informatics (VNM) and CMC System Integration (VNM).

The market is still in its nascent stages and is primarily driven by the country's emerging ICT industry. Traditionally, the industry has been dependent on government spending to drive its growth. However, the growing presence of multinational enterprises (MNEs) has boosted private sector spending on ICT and increased demand for systems integration services from the private segment. Global end users of system integration such as Intel (United States), Samsung Electronics (Republic of Korea), Hewlett Packard (United States) and Nokia (Finland) are planning to increase investments in the Vietnamese ICT industry to expand their local operations. Furthermore, investments by local hardware companies in modern production lines are improving domestic companies' technological capabilities and driving the country's ICT industry. These developments augur well for the Vietnamese system integration industry.

2. Consumer Software

Indonesia

The consumer software industry in Indonesia is expanding, largely driven by greater sales of devices such as personal computers, smartphones and tablets. An increase in gaming activities and security concerns also bodes well for growth in the industry. Gamers in the country are playing online games as a result of the expanding accessibility of the internet and the high rate of mobile phone penetration. Rampant software piracy has negatively affected the profitability of genuine software developers, as counterfeiters distribute free or cheap software packages.

Malaysia

The demand for consumer software in Malaysia has been on the rise, largely driven by increased sales of devices such as personal computers, smartphones and tablets. Technology initiatives by the government and private players are likely to drive the demand for computers and smartphones in

the future, thereby further boosting demand for consumer software products. Apart from computer sales, an increase in gaming activities and security concerns also bodes well for growth in the industry. Malaysia's younger population is generating the demand for gaming as a result of improved broadband speeds, the introduction of new technologies and improved gaming experiences. However, as in Indonesia, rampant software piracy has negatively affected the profitability of genuine software developers, as counterfeiters distribute free or cheap software packages.

Philippines

The majority of consumer software sold in the Philippines comes from international and regional providers such as Microsoft and Asiasoft. However, a few forms of software are developed in the Philippines, such as game software; these are mainly outsourced to local developers (largely privately owned) and are licensed by foreign publishers. Information technology and BPO are two of the most robust industries in the Philippines at present. Computer and related services have proven to be the largest and fastest-growing industry in the country, with the Philippines becoming an increasingly popular destination for outsourcing software development.

Singapore

The growth of Singapore's consumer software industry is largely due to the high penetration of computers and internet in the country. Its consumer software industry hosts companies involved in the development and marketing of software, including operating systems, antivirus, internet security and productivity software. These companies find applications mainly in computers, smartphones and tablets. Whereas most computer software packages are sold separately from the hardware, those for smartphones and tablets are pre-installed in the devices. Consumer software vendors primarily market products through brick-and-mortar electronics retailers and online retailers.

Thailand

The consumer software industry in Thailand is expanding, primarily driven by greater sales of devices such as personal computers, smartphones and tablets. Consumer software is widely used to create documents, databases and spreadsheets; to play games; to edit pictures and movies; and to provide security while undertaking other productive activities. The emerging culture of online gaming among the younger Thai population is aiding industry growth. Gamers in the country are increasingly playing games online as a result of greater internet and mobile phone penetration. The rise in the use of computers and mobile devices has increased concerns about software security, which in turn have benefitted companies that are developing internet security and antivirus software.

Viet Nam

The growing consumer software industry in Viet Nam is primarily driven by rising sales of devices such as personal computers, netbooks, tablets and smartphones. In addition to this growth, the young population's keen interest in online games and internet denizens' security concerns aids the development of the industry. Viet Nam's youngsters are avid players of games online, courtesy of improved internet connectivity, rising smartphone penetration and frequent launches of new technology. However, the country's internet users are wary about security threats, which are a challenge for the industry. Consumer software is classified into three broad categories: security, gaming, and applications. Distributors sell such software through brick-and-mortar stores or online channels.

3. E-Commerce Systems

Indonesia

The e-commerce industry in Indonesia, although in its early stages, is likely to grow rapidly in the near future with the rising levels of household spending and internet penetration in the country. According to Google, the e-commerce market is expected to reach \$46 billion by 2025 from \$1.7 billion in 2015, making it the largest market in ASEAN.⁴ The number of net users will also double during this period, to 215 million. In Indonesia, e-commerce companies partnering with integrated solutions providers offer diversified services including website design, development and maintenance, payment gateway systems, reporting and analysis, order fulfilment and customer service. Indonesian e-commerce systems providers are likely to grow as greater online sales attract more players into opening online shops. In addition, owing to rapid advancements in technology, newer and improved interfaces are being introduced, thus requiring e-commerce companies to upgrade their websites frequently.

Malaysia

Malaysia's e-commerce systems market is evolving in a highly fragmented manner. Driven by the sustained success of local e-commerce system pioneers, emergence of new start-ups, and entry of international e-commerce system providers, the industry is well positioned to prosper as the number of e-commerce merchants in the country increases. The attractiveness of the Malaysian e-commerce systems market was underlined by the entry of international online store provider Shopify in 2013. Players in this market provide a range of offerings, from specialized solutions and services to comprehensive software suites.

Myanmar

With the dramatic rise in a few years' time in the use of mobile phones, in particular smartphones, internet businesses are emerging. They include Oway (travel reservation), 2C2P (electronic payment system developer) and Webmoney (mobile financial services provider). Mobile phones are used by nearly 100 per cent of the people – compared with only 10 per cent three years ago – of which 70 per cent are smartphone users. Because of the transparency of prices and people's general lack of trust in the established banking system, network businesses are expected to increase dramatically.

Philippines

The fact that the majority of online shoppers visit e-commerce sites through desktops and smartphones has prompted e-commerce system developers to focus more on desktop and mobile-friendly platforms while developing software. The Philippines E-Commerce Road Map, designed for 2016–2020, expects the e-commerce sector to account for 25 per cent of GDP by 2020 from 13 per cent in 2015. This may boost demand for e-commerce system developers. The Electronic Commerce Act of 2000 seeks to regulate the use of transactions, both commercial and non-commercial, in the Philippines and encourage new ventures to enter the e-commerce market. Moreover, given the low rate of acceptance of online payments, the Digital Commerce Association of the Philippines (DCOM), in partnership with DTI, has adopted a DCOM trust seal that is promoting trust between online buyers and sellers. This initiative seeks to safeguard Filipino shoppers from online trade fraud, thus enhancing consumer confidence in web stores and other e-commerce sites. In addition, government initiatives to improve internet access in rural areas is also likely to boost demand for e-commerce services. Likewise, the Government's strong commitment may boost e-commerce transactions and in turn drive demand for e-commerce system developers.

⁴ Nihon Keizai Shimbun, 7 March 2017.

Thailand

E-commerce is one of Thailand's major industries, estimated to grow by 5 per cent to B 2.1 trillion in 2015 from B 2.0 trillion in 2014, after a surge in 2014 of 174 per cent from 2013. In 2014, the industry's value predominantly derived from business-to-business (B2B) deals, which accounted for 61 per cent, followed by business-to-customer (B2C) deals (20 per cent) and business-to-government (B2G) deals (19 per cent). The top three industries expected to contribute the most to e-commerce value in 2015 are accommodation services (38 per cent), manufacturing (20 per cent) and the retail and wholesale industry (19 per cent). As of 2013, small e-commerce businesses constituted 66.8 per cent of the market while medium and large players accounted for 27 per cent and 7 per cent, respectively. Thailand's e-commerce systems market is fragmented but evolving. The industry is poised to prosper as the number of e-commerce merchants in the country increases, driven by the continued success of local e-commerce pioneers. The industry is currently experiencing the emergence of new e-commerce trends such as 'Facebook commerce' (F-commerce). In F-commerce, the social networking site Facebook (United States) is used to promote and/or sell various products. The industry is also driven by the emergence of start-ups, and the entry of international e-commerce system providers such as The Big Dot.

Viet Nam

Viet Nam's e-commerce systems market is evolving steadily as e-commerce activity in the country increases. E-retail (e-tail) is rapidly emerging as the preferred method of shopping, especially among the country's youth, because of changing preferences and rising disposable income. According to Viet Nam's E-commerce and Information Technology Agency (VECITA), e-commerce sales in the country stood at \$ 4 billion in 2016 (\$160 per person, a 22 per cent rise over the previous year) and is forecasted to reach \$10 billion in five years by 2022.⁵ Furthermore, e-commerce penetration is estimated to increase from 0.25 per cent in 2011 to 0.71 per cent in 2016. This would boost the demand for systems and package software and for ordering and fulfilment systems related to e-commerce.

The most popular business model in the Vietnamese e-commerce industry is the online marketplace, followed by e-tail and specialist retail. Notable local players in the online marketplace segment include companies such as Vatgia, Enbac and 5giay. Prominent e-tailers include yes24 Vietnam and Zalora Vietnam. Popular specialist retailers include Thegioididong, Dienmay and Nguyenkim. According to a survey conducted by VECITA (the Vietnam E-Commerce and Information Technology Agency) in 2013, about 71 per cent of online shoppers purchased items on e-commerce websites, followed by social forums (53 per cent), group buying websites (35 per cent), e-marketplaces (25 per cent) and mobile applications (13 per cent). Growth in Viet Nam's e-commerce industry has been bolstered by the number of increasing internet users. The rising internet penetration rate (from 40 per cent in 2013 to 44 per cent in 2015) has played an important role in the growing demand for e-commerce in the country. Viet Nam had an estimated 40 million internet users in 2015, a figure which is likely to increase further as a result of various government initiatives to improve countrywide internet accessibility. The National Telecommunications Development Plan Until 2020 aims to establish broadband networks in most rural areas, which are home to almost 70 per cent of the country's population.

⁵ Nihon Keizai Shimbun, 4 March 2017.

III. ASCENDANCY OF COMPUTER AND RELATED SERVICES TRADE

Table 1 shows the estimated value and share of computer and related services supply by mode of supply (in 2015). Both services supply to foreign markets from ASEAN (exports), and receipts of services from abroad (imports) are estimated at roughly \$1 trillion; computer and related services account for 4 per cent of the former and 6 per cent of the latter (table 1). Like other services, computer and related services are provided through four modes (Mode 1 to Mode 4). Provision through commercial presence (Mode 3) is the largest, 1.5 times greater than cross-border trade (Mode 1) (table 1). Supply of computer and related services through consumption abroad (Mode 2) is limited, and supply through movement of persons providing computer services (Mode 4) amounts is negligible.

Table 1. Estimated value and share of computer and related services supply, by mode of supply, 2015 (Billions of dollars and per cent)

Mode of supply	Receipts from the world (imports)				Supply to the world (exports)			
	Computer services		Total services		Computer services		Total services	
	Value	Share	Value	Share	Value	Share	Value	Share
Mode 1	8 ^a	13	308	30	8 ^a	33	302	30
Mode 2	3 ^b	5	103	10	3 ^b	12	101	10
Mode 3	48 ^c	75	565	55	11 ^c	46	554	55
Mode 4	5 ^d	9	51	5	2 ^d	8	50	5
ASEAN total	64	100	1 027	100	24	100	1 007	100

Source: AJC, based on own estimates, UNCTAD for total services and WTO for the mode shares of total services.

Note: For total services, each mode share as estimated by the WTO for the global supply is applied to ASEAN. The basic data for estimates by mode is cross border-services (Mode 1) from UNCTAD. Shares in each mode are applied to calculate the value of each mode.

^a For Brunei Darussalam, data are available only for Telecommunications, computer and information services. Therefore, the ratio of Computer services to this sector from the Philippines was applied to estimate the Computer services only. For 2015, data are available only for the Services total. Therefore, first, the Telecommunications, computer and information services are estimated by using its ratio to Services total. Then the Philippines' ratio of Computer services was applied.

For Cambodia, Indonesia and Thailand, Information services may be included.

For Lao People's Democratic Republic, data are available only for Telecommunications, computer and information services. Therefore, Myanmar's average ratio of Computer services to this sector from 2014 and 2015 was applied to estimate the Computer services only.

For Malaysia, data are available only for Telecommunications, computer and information services for 2010 onwards. Therefore, the ratio from Computer services to this sector in 2009 was applied to estimate the Computer services only for 2010 onwards. Information services may be included.

For Myanmar, data for Telecommunications, computer and information services only available for 2012 onwards, which is the same as Telecommunications services for 2012 and 2013. From 2014 onwards Computer services became available. Therefore the average ratio of Computer services to this sector from 2014 onwards was applied to estimate the Computer services for 2012 and 2013.

For Singapore, data are available only for Telecommunications, computer and information services. Therefore, the average ratio of Computer services to this sector from Indonesia, Malaysia, the Philippines and Thailand was applied to estimate the Computer services only.

For Viet Nam, data are available only for Telecommunications, computer and information services. Therefore, Myanmar's average ratio of Computer services to this sector from 2014 and 2015 was applied to estimate the Computer services only.

^b Estimated as one third of Mode 1.

^c See table 6.

^d Estimated as one tenth of Mode 3.

1. Mode 1: Cross-border Supply

The export and import statistics for computer and related services show the amounts of cross-border supply from the world to ASEAN and cross-border supply to the world from ASEAN (tables 2 and 3). Unlike other services sectors, the Philippines is the largest exporter in this sector. In terms of share in total exports of services, the Philippines' figures are also the highest, at more than 10 per cent. Other than the Philippines, exports of computer and related services is not part of the comparative advantage of ASEAN Member States. As to imports, Singapore has the largest share, followed by Malaysia. The Philippines imports a small amount.

The basic statistics can be supplemented by additional information such as the trend line and export competitiveness. The former is measured by the slope of these trade data (table 4) and the latter by the revealed comparative advantage (table 5). All countries except Brunei Darussalam, the Philippines and Viet Nam import more than they export, resulting in negative comparative advantages.

- Brunei Darussalam's performance stays rather flat; its export slope is barely positive and below the ASEAN average (reflecting the fact that the country's computer and related services sector has not taken off in a full-fledged manner); yet its export competitiveness is strongly positive.
- Cambodia's figure in 2015 was the second lowest among the ASEAN Member States and its export competitiveness is negative. This reflects the country's recent integration into the ASEAN regional market.
- Indonesia's exports are increasing gradually, and its export slope is about at the level of the ASEAN average; its export competitiveness is rather negative, reflecting that its current comparative advantage is not in the computer and related services sector.
- The Lao People's Democratic Republic's exports remain low (actually the lowest among the ASEAN Member States), as has been the country's recent participation in the ASEAN market.
- Malaysia is performing well, as it has an extensive manufacturing base centered on electronics. It ranked third in terms of export volume in 2015; its export slope was a little below the ASEAN average, and the export competitiveness index was close to zero.
- Myanmar's export figures in 2015 were the third lowest among Member States, but its export slope is above the ASEAN average, presumably because it has been facilitating the marketization of overall economy; its export competitiveness in 2015 was negative.
- The Philippines' figures are the highest among the ASEAN Member States and on a steadily increasing trend, and its export slope is significantly positive (close to 1.0). This is largely because of its established business facilities for exporting ICT-related services, most importantly for undertaking offshore business.
- Singapore's export value in 2015 was the second largest after the Philippines, and its export slope was positive and above the ASEAN average. This reflects the highly developed ICT-related facilities in the country; its export competitiveness, though, is negative and below the ASEAN average as inward investment is dominant overall in this country.
- Thailand's export values remain rather low because the country focuses on the automotive industry. Its export slope is positive yet below the ASEAN average.
- Viet Nam's exports are increasing (reflecting its continuous transition to a more market-based economy), but the level remains rather low. Its export slope, however, is positive and above the ASEAN average; its export competitiveness index is also positive and above the ASEAN average (which is negative).

Table 2. Exports of computer services and its share in total exports of services, goods and services, 2005-2015 (Millions of dollars and per cent)

Country	Annual average 2005-2010	2011	2012	2013	2014	2015
Computer services export						
Brunei Darussalam ^a	16	27	23	21	23	26
Cambodia ^b	1	-	-	-	3	2
Indonesia ^b	137	207	203	204	263	309
Lao People's Democratic Republic ^c	1	1	1	1	2	1
Malaysia ^d	867	1 743	2 105	2 057	1 987	1 916
Myanmar ^e	-	2	3	3	9	5
Philippines	1 016	2 381	2 500	2 835	3 121	3 163
Singapore ^f	662	1 556	1 687	1 947	2 448	2 415
Thailand ^b	18	49	20	37	48	33
Viet Nam ^g	7	9	9	17	17	20
ASEAN total	2 725	5 975	6 551	7 122	7 921	7 890
Share in total exports of services						
Brunei Darussalam ^a	2,2	5,4	4,8	4,3	4,1	4,5
Cambodia ^b	0,1	-	-	-	0,1	0,1
Indonesia ^b	1,0	0,9	0,9	0,9	1,1	1,4
Lao People's Democratic Republic ^c	0,3	0,2	0,2	0,1	0,3	0,1
Malaysia ^d	3,2	4,5	5,2	4,9	4,7	5,5
Myanmar ^e	-	0,3	0,2	0,1	0,2	0,1
Philippines	7,8	12,6	12,2	12,1	12,2	11,2
Singapore ^f	0,9	1,3	1,3	1,4	1,6	1,7
Thailand ^b	0,1	0,1	-	0,1	0,1	0,1
Viet Nam ^g	0,1	0,1	0,1	0,2	0,2	0,2
ASEAN total	1,6	2,4	2,4	2,3	2,5	2,6
Share in total exports of goods and services						
Brunei Darussalam ^a	0,2	0,2	0,2	0,2	0,2	0,4
Cambodia ^b	-	-	-	-	-	-
Indonesia ^b	0,1	0,1	0,1	0,1	0,1	0,2
Lao People's Democratic Republic ^c	0,1	-	-	-	0,1	-
Malaysia ^d	0,4	0,7	0,8	0,8	0,8	0,9
Myanmar ^e	-	-	-	-	0,1	-
Philippines	2,3	4,2	3,7	4,2	4,1	4,4
Singapore ^f	0,2	0,3	0,3	0,3	0,4	0,5
Thailand ^b	-	-	-	-	-	-
Viet Nam ^g	-	-	-	-	-	-
ASEAN total	0,3	0,4	0,4	0,5	0,5	0,5

Source: AJC based on data from WGSITS (ASEAN Working Group on Statistics of International Trade in Services), IMF, UNCTAD and individual country's balance-of-payments data.

^a Data are available only for telecommunications, computer and information services. Therefore, the ratio of computer services to this sector from the Philippines was applied to estimate the computer services alone. For 2015, data are available only for the services total. Therefore, first, the telecommunications, computer and information services are estimated by using its ratio to services total. Then the Philippines' ratio of Computer services was applied.

^b Information services may be included.

^c Data are available only for telecommunications, computer and information services. Therefore, Myanmar's average ratio of computer services to this sector from 2014 and 2015 was applied to estimate the computer services alone.

^d Data are available only for telecommunications, computer and information services for 2010 onward. Therefore, the ratio of computer services to this sector in 2009 was applied to estimate the computer services only for 2010 onward. Information services may be included.

^e Data for telecommunications, computer and information services available only for 2012 onward, which is the same as telecommunications services for 2012 and 2013. From 2014 onward, computer services became available. Therefore the average ratio of computer services to this sector from 2014 onward was applied to estimate the computer services for 2012 and 2013.

^f Data are available only for telecommunications, computer and information services. Therefore, the average ratio of computer services to this sector from Indonesia, Malaysia, the Philippines and Thailand were applied to estimate the computer services alone.

^g Data are available only for telecommunications, computer and information services. Therefore, Myanmar's average ratio of computer services to the total sector from 2014 and 2015 was applied to estimate the computer services alone.

Table 3. Imports of computer services and share in total imports of services, goods and services, 2005-2015 (Millions of dollars and per cent)

Country	Annual average 2005-2010	2011	2012	2013	2014	2015
Computer services import						
Brunei Darussalam ^a	5	9	8	8	8	6
Cambodia ^b	1	1	3	5	39	73
Indonesia ^b	629	715	726	852	973	1 085
Lao People's Democratic Republic ^c	2	-	-	1	1	1
Malaysia ^d	732	1 443	1 689	1 947	1 913	1 959
Myanmar ^e	-	-	-	-	4	13
Philippines	81	187	142	282	253	341
Singapore ^f	857	1 917	2 185	2 770	3 282	3 968
Thailand ^b	46	76	52	67	121	124
Viet Nam ^g	3	4	4	10	11	11
ASEAN total	2 356	4 352	4 809	5 942	6 605	7 581
Share in total imports of services						
Brunei Darussalam ^a	0,4	0,5	0,3	0,3	0,4	0,3
Cambodia ^b	0,1	0,1	0,2	0,3	2,1	3,8
Indonesia ^b	2,6	2,3	2,1	2,4	2,9	3,6
Lao People's Democratic Republic ^c	1,9	-	-	0,2	0,2	0,2
Malaysia ^d	2,7	3,8	3,9	4,3	4,2	4,9
Myanmar ^e	-	-	-	-	0,2	0,5
Philippines	0,9	1,5	1,0	1,7	1,2	1,4
Singapore ^f	1,1	1,6	1,7	1,9	2,1	2,8
Thailand ^b	0,1	0,1	0,1	0,1	0,2	0,2
Viet Nam ^g	-	-	-	0,1	0,1	0,1
ASEAN total	1,4	1,6	1,6	1,9	2,0	2,4
Share in total imports of goods and services						
Brunei Darussalam ^a	0,1	0,2	0,1	0,1	0,1	0,1
Cambodia ^b	-	-	-	-	0,3	0,5
Indonesia ^b	0,6	0,4	0,3	0,4	0,5	0,7
Lao People's Democratic Republic ^c	0,1	-	-	-	-	-
Malaysia ^d	0,5	0,7	0,8	0,9	0,9	1,0
Myanmar ^e	-	-	-	-	-	0,1
Philippines	0,1	0,3	0,2	0,4	0,3	0,4
Singapore ^f	0,3	0,4	0,4	0,5	0,6	0,9
Thailand ^b	-	-	-	-	-	0,1
Viet Nam ^g	-	-	-	-	-	-
ASEAN total	0,3	0,3	0,3	0,4	0,5	0,6

Source: AJC, based on data from WGSITS (ASEAN Working Group on Statistics of International Trade in Services), IMF, UNCTAD and individual country's balance-of-payments data.

^a Data are available only for telecommunication, computer and information services. Therefore, the ratio of computer services to this sector in the Philippines was applied to estimate computer services alone. For 2015, data are available only for the services total. Therefore, first, the telecommunications, computer and information services were estimated by using their ratio to the services total. Then the Philippines' ratio of computer services was applied.

^b Information services may be included.

^c Data are available only for telecommunication, computer and information services. Therefore, Myanmar's average ratio of computer services to the sector total from 2014 and 2015 was applied to estimate the computer services alone.

^d Data are available only for telecommunications, computer and information services for 2010 onward. Therefore, the ratio of computer services to this sector in 2009 was applied to estimate the computer services only for 2010 onward. Information services may be included.

^e Data for telecommunications, computer and information services were available only for 2012 onwards, which is the same as telecommunications services for 2012 and 2013. From 2014 onward, computer services became available. Therefore, the average ratio of computer services to this sector from 2014 onward was applied to estimate the computer services for 2012 and 2013.

^f Data are available only for telecommunication, computer and information services. Therefore, the average ratios of computer services to the total sector in Indonesia, Malaysia, the Philippines and Thailand were applied to estimate the computer services alone.

^g Data are available only for telecommunication, computer and information services. Therefore, Myanmar's average ratio of computer services to the total sector from 2014 and 2015 was applied to estimate the computer services alone.

Table 4. Export trend line for computer and related services

Country	Slope (in log)
Brunei Darussalam	0,05
Cambodia	-
Indonesia	0,14
Lao People's Democratic Republic	0,06
Malaysia	0,12
Myanmar	0,20
Philippines	0,19
Singapore	0,23
Thailand	0,10
Viet Nam	0,22
ASEAN average (excluding Cambodia)	0,15

Source: Calculated from tables 2 and 3.

Table 5. Export competitiveness index of computer and related services, 2005–2015

Country	Average, 2005–2010	2011	2012	2013	2014	2015
Brunei Darussalam	0.52	0.50	0.48	0.45	0.48	0.63
Cambodia	0.00	-	-	-	-0.86	-0.95
Indonesia	-0.64	-0.55	-0.56	-0.61	-0.57	-0.56
Lao People's Democratic Republic	-0.33	-	-	0.00	0.33	0.00
Malaysia	0.08	0.09	0.11	0.03	0.02	-0.01
Myanmar	-	-	-	-	0.38	-0.44
Philippines	0.85	0.85	0.89	0.82	0.85	0.81
Singapore	-0.13	-0.10	-0.13	-0.17	-0.15	-0.24
Thailand	-0.44	-0.22	-0.44	-0.29	-0.43	-0.58
Viet Nam	0.40	0.38	0.38	0.26	0.21	0.29
ASEAN average	0.03	0.14	0.10	0.06	0.03	-0.11

Source: Calculated from tables 2 and 3.

Note: Export competitiveness index = Exports – Imports / Exports + Imports.

2. Mode 3: Commercial Presence

Table 6 shows estimated sales of computer and related services through foreign presence (Mode 3) (box 1). As shown, in this mode, unlike in Mode 1, the ASEAN Member States all record deficits in services trade (receipt being greater than supply). In other words, the presence of foreign companies in ASEAN is much larger than the ASEAN presence abroad for individual Member States. In terms of the number of inward investments, Singapore is attracting the largest number of investors, followed by Malaysia and the Philippines (box 2). As for the sales value, Singapore, Malaysia and

the Philippines are faring well. On the export side, Singapore dominates ASEAN's services supply market abroad in computer and related services (annex B).

Table 6. Estimated sales of computer-related services through foreign presence, 2015
(Number and millions of dollars)

Country	Receipts from abroad		Supply to the world	
	Number of foreign entities	Estimated sales ^a	Number of ASEAN entities abroad	Estimated sales ^a
Brunei Darussalam	5	23 (4)	1	0 (0)
Cambodia	5	153 (1)	1	- (1)
Indonesia	98	2 463 (46)	16	325 (8)
Lao People's Democratic Republic	1	63 (0)	0	-
Malaysia	246	12 108 (32)	93	299 (47)
Myanmar	4	77 (2)	0	-
Philippines	161	5 385 (11)	22	151 (6)
Singapore	572	20 144 (92)	227	10 021 (89)
Thailand	119	1 575 (33)	13	59 (7)
Viet Nam	109	5 662 (17)	25	46 (3)
ASEAN total	1 320	47 651	398	10 901

Source: AJC, based on data from Toyo Keizai Shimposha, UNCTAD, Thomson Reuters and Orbis.

Note: For estimated sales, see the estimation procedure in the main text.

^a Figures in parentheses indicate the number of entities for which sales cannot be estimated.

Box 1. How to estimate services supply in Mode 3

Almost no developing countries compile foreign affiliate statistics (FATS). ASEAN Member States are no exception. The supply of computer and related services as well as other services through commercial presence must therefore be estimated from the sales of foreign affiliates engaged in such services. The AJC estimated this supply using the following steps:

- (1) Identify foreign affiliates in each country by examining the lists of foreign companies compiled from various sources, including Toyo Keizai's database for Japanese affiliates in ASEAN, Orbis and Who Owns Who databases for non-Japanese foreign affiliates in ASEAN, and individual foreign investment cases from Thomson One and the *Financial Times'* fDi Markets database.
- (2) Because many of these identified foreign affiliates do not provide sales data, calculate the ratio of sales to firm size on the basis of affiliates that have information on both sales and firm size (i.e. capital size, asset size or investment size). To estimate sales, apply this ratio to affiliates that have at least data on firm size.
- (3) Do not include affiliates for which estimates of sales were not possible, effectively assuming that they are small and do not affect the totality.

For sales by ASEAN affiliates abroad, the same estimation procedure is applied. In both estimates (supply of services by foreign affiliates in ASEAN and supply of services by ASEAN affiliates abroad), the AJC's estimates tend to be underestimated because they include only those affiliates that are identified and only those whose main business is computer and related services. Companies whose main business is not computer services can provide such services. However, in the calculations for Mode 3, supply by this type of firms is not covered.

Annexes A and B provide some of the identified foreign affiliates established through foreign direct investment (FDI).

Box 2. BPO in the Philippines

Revenues of the computer and related services industry grew from \$9 billion in 2010 to \$22 billion in 2015 and the number of employees from 525,000 to 1.1 million during the same period.^a The figures are expected to rise to \$40 billion in revenues and 1.8 million in employment by 2022. Large offshore processing firms such as Accenture (United States) and TCS (India) are operating in the Philippines. The country has been very successful in trying to benefit from the growing demand for BPO, i.e. firms' outsourcing back-office and information technology functions abroad (in the Philippines) in order to take advantage of the advanced skills and lower labour costs of specialized service providers (ASEAN and the World Bank, 2015: 106). The success of the Philippines has been possible because of several favourable structural factors, notably modest labour compensation costs, a large pool of suitably qualified talent, and low telecommunication and real estate costs.

^a *Financial Times*, 24 January 2017; BPAP, "The Philippines IT/BPO Road Map 2011–2016".

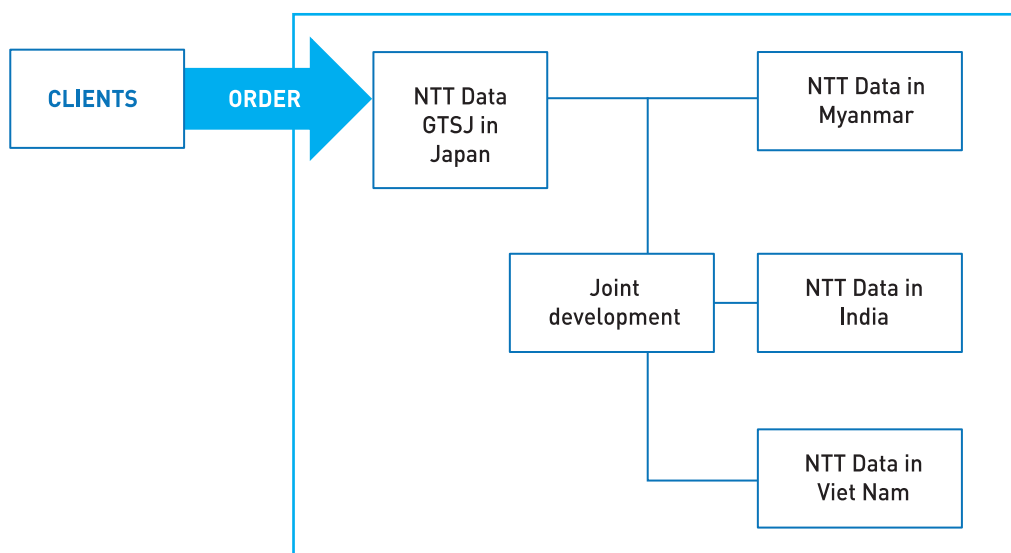
Table 7 shows foreign affiliates in ASEAN and ASEAN affiliates abroad in computer and related services by source and destination country. There are some 1,300 foreign computer services companies in ASEAN and 400 ASEAN computer services companies abroad. These numbers are substantial, when compared with those of telecommunication services companies. As for FDI inflows into ASEAN, the dominant position of the United States in the number of affiliates as well as in estimated sales is clear. Europe and Japan follow the United States. Although parent firms are large, many affiliates established in ASEAN are small. Some, such as NTT Data, create networks in Asia to undertake joint development of software (box 3). Affiliates from other ASEAN countries also show significant presence (annex B).

As for outflows from ASEAN, other ASEAN countries as a group – intraregional investments – rank the highest, followed by Europe and the United States (table 7). In terms of the number of ASEAN affiliates abroad, India and Hong Kong hold almost as many as Europe and the United States. ASEAN firms' investment in Japan is not as active.

Box 3. A Japanese ICT company's offshore development centers in Asia

NTT Data Global Technology Service Co., Ltd. Japan (NTT Data GTSJ), is fully utilizing bases in Viet Nam and Myanmar, with a main focus on India. The company offers a software development system that is suitable for any project. It has software development centers in India (in six cities), Myanmar, Singapore, Viet Nam (in two cities) and Japan. More specifically, development and testing of software are done in Myanmar, while design, development and testing are undertaken in India and Viet Nam. With the reduction of transactions cost (or service-link costs), the company is contributing to lowering the scale of the digital divide in ASEAN in software development.

No financial data are available for these affiliates in ASEAN, and thus they are not included in annex A.



Source: ASEAN-Japan Centre, based on company information.

Table 7. Foreign affiliates in ASEAN and ASEAN affiliates abroad in computer and related services, by source and destination country
(Number and millions of dollars)

	Country	Foreign affiliates in ASEAN		ASEAN affiliates abroad	
		Number of affiliates	Estimated sales ^a	Number of affiliates	Estimated sales ^a
Developed countries	United States	420	13 803 (30)	33	1 427 (19)
	Europe	280	9 146 (27)	36	3 474 (10)
	Japan	216	5 599 (45)	16	247 (2)
	Others ^b	72	3 217 (14)	27	1 116 (6)
	Subtotal	988	31 765 (116)	112	6 264 (37)
Developing countries	ASEAN ^c	140	2 527 (76)	157	2 633 (80)
	China	10	162 (2)	26	746 (8)
	Korea, Rep. of	13	1 792 (1)	6	54 (0)
	India	83	4 988 (14)	32	286 (11)
	Hong Kong (China)	24	3 835 (6)	32	458 (14)
	Taiwan Province of China	6	876 (1)	9	368 (4)
	Others ^d	42	1 558 (9)	24	93 (7)
	Subtotal	318	15 738 (108)	286	4 637 (124)
Unspecified	14	149 (12)	0	0 (0)	
World	1 320	47 651 (236)	398	10 901 (161)	

Source: AJC, based on data from Toyo Keizai Shimposha, UNCTAD, Thomson Reuters and Orbis.

Note: For estimated sales, see the estimation procedure in the main text.

^a Figures in parentheses indicate the number of affiliates for which sales cannot be estimated.

^b Includes Australia, Canada and New Zealand.

^c The number of foreign affiliates in ASEAN and ASEAN affiliates abroad should balance. However, either the destination or the source country of some of these affiliates is not available. Therefore they do not match.

^d Includes, for foreign affiliates in ASEAN, Bermuda, Brazil, Belarus, Israel, Kenya, Cayman Islands, Marshall Islands, Mongolia, Mauritius, Panama, Qatar, Russian Federation, Saudi Arabia, Turkey, the Virgin Islands (British) and South Africa. Similarly, for ASEAN affiliates abroad, the United Arab Emirates, Argentina, Bangladesh, Ghana, Israel, Lebanon, Sri Lanka, Oman, Pakistan, Saudi Arabia, Tokelau, Turkey, the Virgin Islands (British) and South Africa.

3. Modes 2 and 4: Consumption abroad and movement of computer services staff

Purchases of computer repair services by foreign residents visiting a supplier country are recorded as exports of computer services in Mode 2 (consumption abroad). Services provided by self-employed workers who travel to a customer's country are considered as exports in Mode 4 (movement of natural persons). In the ASEAN context, local engineers with computer-related skills could provide such services in Mode 2 or Mode 4. As such services suppliers are often affiliated with companies and not self-employed, these transactions could be part of activities related to or incorporated into Mode 3 (supply of services through commercial presence). For these reasons, there are no publicly available data on computer and related services in Mode 2 or Mode 4.

IV. TRADE AGREEMENTS AND REGULATIONS AMONG AND IN THE ASEAN MEMBER STATES

Table 8 shows the Hoekman Index⁶ for computer and related services. As shown, the ASEAN averages in Modes 1–3 are rather high. Individually, most ASEAN Member States are committed fully to this sector. This signifies that in terms of market access and national treatment, computer and related services are already fairly open. Mode 1 and Mode 2 exhibit the same level of liberalization in all countries. In Mode 3, only four countries (Cambodia, the Lao People’s Democratic Republic, Myanmar and Viet Nam) have committed to full liberalization, whereas in Modes 1 and 2, seven countries have already fully liberalized. As in other services sectors, Mode 4 is the least liberalized.

Table 8. Hoekman Index of AFAS and AMNP commitments for computer and related services

Country	Mode 1 under AFAS (9th package)	Mode 2 under AFAS (9th package)	Mode 3 under AFAS (9th package)	Mode 4 under AMNP	AMNP Total (as a reference)
Brunei Darussalam	1.00	1.00	0.95	0.50	0.50
Cambodia	1.00	1.00	1.00	0.50	0.49
Indonesia	0.80	0.80	0.65	0.50	0.39
Lao People’s Democratic Republic	1.00	1.00	1.00	0.50	0.32
Malaysia	1.00	1.00	1.00	0.50	0.39
Myanmar	1.00	1.00	0.30	0.50	0.18
Philippines	1.00	1.00	0.50	0.50	0.34
Singapore	0.80	0.80	0.80	0.50	0.50
Thailand	1.00	1.00	0.75	0.50	0.30
Viet Nam	1.00	1.00	1.00	0.50	0.40
ASEAN average	0.96	0.96	0.80	0.50	0.38

Source: AJC, calculated from the specific commitment tables of the AFAS (9th package) and the text of the AMNP.

Note: The AFAS (9th package) was signed in November 2015; the AMNP was signed in November 2012. In the index calculation, the least conservative interpretation of the specific commitment tables is made. For example, when only the subsectors in the sector (computer and related services) are liberalized (partially), the index value is given full scores and calculated as such.

⁶ Hoekman (1995) proposes an indexation method for measuring the GATS-style degree of commitment in the services sector. The index takes a value between 0 and 1, with 0 referring to the most restricted situation and 1 being the most open. The method assigns values to each of eight cells (four modes and two aspects – market access or national treatment), as follows: assign the value 1 for a sector that is “fully liberalized”; 0.5 for one that is “limited (but bound)”; 0 for one that is “unbound” (government has not committed to liberalize) by subsector, by mode and by aspect (market access or national treatment), and take the simple average for aggregation; then calculate the average value by services sector and by country. The higher the figure, the more liberal the country’s services trade commitments are to members of a free trade agreement. Using the database constructed for this paper series, the Hoekman Index is derived for each of 155 subsectors. Then the simple average for the 11 sectors is calculated

The status of restrictions in computer and related services by country is as follows (table 9 and annex C):

- **Brunei Darussalam:** Not much restriction is used; the use of F (limitations on the participation of foreign capital) is observed.
- **Cambodia:** The sector is fully liberalized for trade.
- **Indonesia:** Among the restrictions used, F (limitations on the participation of foreign capital) is dominant; a 49 per cent upper limit for foreign equity participation is used more frequently than a 70 per cent limitation.
- **Lao People's Democratic Republic:** The sector is fully liberalized for trade.
- **Malaysia:** The sector is fully liberalized for trade.
- **Myanmar:** The use of D (limitations on the total number of natural persons) and E (measures that restrict or require specific types of legal entity) are dominant; F (limitations on the participation of foreign capital) is not used.
- **Philippines:** F (limitations on the participation of foreign capital) is dominant, and 100 per cent foreign equity participation⁷ is allowed.
- **Singapore:** This sector is already open (although there is no mention of "other (services)" in its commitment table).
- **Thailand:** The use of E (measures that restrict or require specific types of legal entity) and F (limitations on the participation of foreign capital) is dominant; a 70 per cent limit on foreign equity is the figure applied.
- **Viet Nam:** The sector is fully liberalized for trade.

An important aspect of the AFAS (the most recent publicly available version is its 9th package, which was signed in November 2015) is its expected positive spillover effect for the ongoing negotiations on the Regional Comprehensive Economic Partnership (RCEP), involving the ASEAN Member States as well as their dialogue partners (Australia, China, India, Japan, the Republic of Korea and New Zealand). The AFAS could be utilized as a common template for the RCEP negotiations. In this sense, the specific measures under computer and related services in the AFAS (listed as annex C) provide useful information for considering the region's trade in computer and related services.

⁷ This might imply that there is no restriction (as 100 per cent equity participation means fully foreign owned). The way that the Philippines reports on this part is distinct from simply stating "no limitations"; hence this remark.

Table 9. Status of restrictions in computer services subsector under the AFAS (9th package)

Country	N = none/no limitation	D = limitations on the total number of natural persons	E = measures which restrict or require specific types of legal entity	F = limitations on the participation of foreign capital	G = Government approval requirement	H = tax or fee payment requirement
Brunei Darussalam	17	0	0	1 (51%:1)	0	0
Cambodia	6	0	0	0	0	0
Indonesia	35	0	7	7 (49%: 6; 70%: 1)	0	0
Lao People's Democratic Republic	6	0	0	0	0	0
Malaysia	8	0	1	1 (70%:1)	0	0
Myanmar	4	2	2	0	0	0
Philippines	15	0	0	3 (100%:3)	0	0
Singapore	36	0	0	0	0	0
Thailand	40	0	8	8 (70%: 8)	0	0
Viet Nam	6	0	0	0	0	0

Source: Calculated from each country's specific commitment table.

Notes: The way commitments are reported differs across the ASEAN members, hence the diversity in the number of N (no limitation).

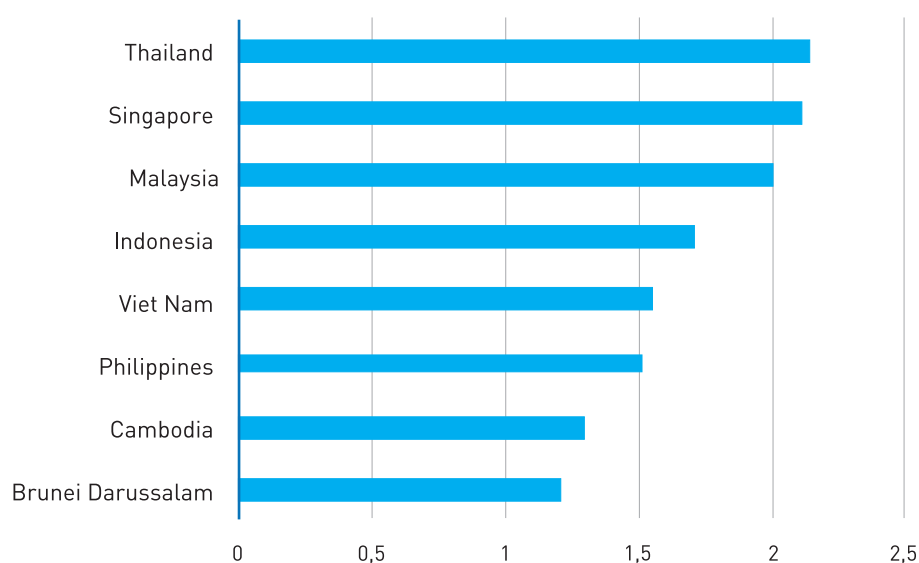
V. IMPACTS OF FURTHER LIBERALIZATION OF COMPUTER AND RELATED SERVICES ON ECONOMY

1. Economic Impacts

Computer-related services are an essential input to any product, influencing the level of a product's competitiveness in markets. Products embodying more computer software such as automobiles and electronic products are more competitive than other similar products. Game software, a direct derivative of software development, is another product that can be sold at high prices. Computer-related services, both alone and in the use of another product, do affect the competitiveness of other products. The multiplier effects (which measure the overall impact of the economy due to one unit increase in the demand for computer and related services) ranges from 1.2 for Brunei

Darussalam to more than 2 for Thailand, Singapore and Malaysia (figure 2). There are ripple effects on other industries. In particular, Thailand has the largest impact among ASEAN Member States. Given that this country has also a relatively small amount of outputs and value added (table 10), it needs measures to promote investment in this sector.

Figure 2. **Multiplier effects of computer and related services in ASEAN^a, 2011**



Source: AJC, based on OECD Input-Output table database.

Note: The Lao People's Democratic Republic and Myanmar are not covered in the OECD database.

^a Refers to computer services.

Computer and related services account for less than 1 per cent of ASEAN economies' value added in ASEAN. The impact of investment in this services sector on the economy is 50 per cent more than what is spent in this subsector, as in most ASEAN Member States the multiplier effects are more than 1.5 (figure 2). However, productivity in this subsector is not necessarily high. In other words, the ratio of value added to output in this subsector is lower than that of the whole economy (table 10). The largest producer country, Singapore, has the lowest ratio. For this and other countries with lower ratios, policy measures should include greater engagement in value-creating computer software products and processing activities.

Export competitiveness in computer and related services might be driven by external factors, e.g., through imports of key inputs from abroad. Trade in value added provides such data (table 11). Most ASEAN members listed have higher levels of foreign value added content in their computer and related services exports than China, Japan and the Republic of Korea, ranging from 12 per cent for Brunei Darussalam and Indonesia to nearly 50 per cent for Singapore. Only Japan uses little foreign inputs in their exports, at 4 per cent. In other words, foreign input is dominant in ASEAN's exports of computer and related services.

Table 10. Value added and output of computer and related services^a, 2011
(Millions of dollars and ratio)

Country	Computer and related services			All industries		
	Value added	Output	Ratio of value added to output	Value added	Output	Ratio of value added to output
Brunei Darussalam	14	19	0,73	16 697	23 709	0,70
Cambodia	17	25	0,67	12 042	25 145	0,48
Indonesia	1 524	3 107	0,49	815 181	1 606 973	0,51
Malaysia	2 965	7 937	0,37	280 687	829 419	0,34
Philippines	1 207	2 416	0,50	209 529	429 792	0,49
Singapore	3 987	25 694	0,16	254 808	711 535	0,36
Thailand	678	2 168	0,31	343 407	893 396	0,38
Viet Nam	204	397	0,51	126 630	332 716	0,38
ASEAN total	10 595	41 762	0,25	2 058 981	4 852 685	0,42

Source: OECD Input-Output table database.

Note: The Lao People's Democratic Republic and Myanmar are not covered in the OECD database.

^aRefers to computer services.

Table 11. Foreign value added share of gross exports (to the world) for computer and related activities, 1995-2011 (Per cent)

Country	1995	2000	2005	2008	2009	2010	2011
ASEAN members							
Brunei Darussalam	10	14	10	12	12	10	12
Cambodia	15	18	18	18	16	16	15
Indonesia	11	12	15	14	12	12	12
Malaysia	16	19	21	18	17	16	17
Philippines	16	16	20	22	22	23	24
Singapore	44	53	50	47	50	50	49
Thailand	11	13	14	16	14	15	17
Viet Nam	19	15	20	26	21	20	22
Memorandum							
China	6	9	12	12	11	13	13
Japan	2	3	3	4	3	3	4
Korea, Republic of	11	12	15	19	18	17	17

Source: OECD, Measuring Trade in Value Added: An OECD-WTO joint initiative

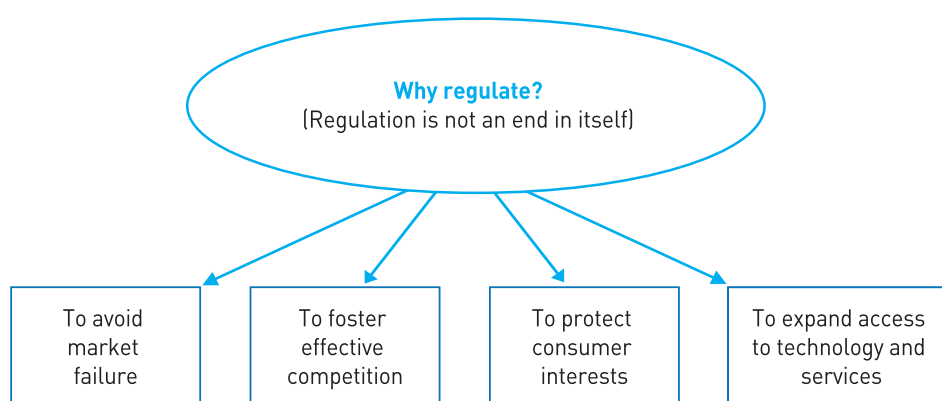
(<http://www.oecd.org/sti/ind/measuringtradeinvalue-addedanoecd-wtojointinitiative.htm>).

2. Impacts of Trade Liberalization in Computer and Related Services

It is worthwhile to consider the issue of why and when regulation is needed in computer and related services. Figure 3 categorizes four reasons why regulation is needed. In the presence of perfect market functioning, there would be no need for regulation because the market does the business of matching demand and supply at a fair price. In computer and related services, that is not achievable because emerging new technologies cause positive and negative externalities throughout the industry. Positive externalities include de facto establishment of standards in new computer services (e.g. internet phones and online businesses including e-commerce, gaming and chatting); negative externalities involve coping with security concerns, including e-mail spam and fraud on the internet. Fostering effective competition and protecting consumer interests while securing access to new technologies and services are also important reasons why regulation is needed.

When regulations are retained and competition-promoting liberalization is undertaken at the same time, the ASEAN economy as a whole can further move up the value chain curve (as shown in figure 1). The impact is not easy to quantify though, precisely because of the all-encompassing nature of computer and related services. Ubiquitous technology (i.e. computer chips embedded in virtually all commodities for geographical detection) and the internet of things, for instance, would reduce business-related transaction costs and wholly change the business landscape in manufacturing activities and logistics services in an as yet unfathomable manner.

Figure 3. **Goals of regulation in computer and related services**



Source: ASEAN-Japan Centre, based on company information.

VI. POLICY RECOMMENDATIONS AND PROMOTION MEASURES FOR COMPUTER AND RELATED SERVICES

Promotional measures targeting trade in computer and related services alone might not be the right focus, as the sector requires that telecommunication facilities (including the internet) allow such services. It would be more appropriate to combine telecommunication services (see paper 3 of this series) and computer services in addressing policy issues. For example, ICT requires services from telecommunication- and computer-related areas as well as liberalization in other subsectors.

As most ASEAN Member States have already liberalized trade in computer and related services, and considering the fact that such services require smaller-scale facilities than telecommunication services (both are part of ICT services), it is important as a next step to implement workable promotional measures. Very few regulatory measures and promotion exist at the regional and multilateral levels, with the exception of the Trans-Pacific Partnership (TPP) (box 4).

Box 4. Facilitation and regulations on e-commerce under multilateral agreements: case of the Trans-Pacific Partnership (TPP)

E-commerce, which is not covered under the GATS-style service classification, is a growing and important area pertinent to trade in computer services. Although the future of the TPP is uncertain, it provides useful key regulations (chapter 14):

Cross-border electronic data transfers. Article 14.11 requires each TPP party (government) to allow the cross-border transfer of information, including personal information, by electronic means, “when this activity is for the conduct of the business of a person. Article 14.11 allows a party (government) to adopt or maintain a measure inconsistent with this obligation only “to achieve a legitimate public policy objective”.

Ban on forced localization of computing facilities. Under Article 14.13, no party (government) may require a person to use or locate computing facilities in that party’s territory as a condition for conducting business in the territory.

Ban on requiring transfers of source code. Article 14.17 prohibits any party (government) from requiring the transfer of, or access to, software source code as a condition for the import, distribution, sale or use of such software, or products containing such software, in the party’s territory.

Customs duties on electronic transmissions. Article 14.3 prohibits parties (governments) from imposing customs duties on cross-border electronic transmissions, including content, between citizens of the various TPP countries. This commitment largely follows the moratorium on e-commerce customs duties agreed among WTO members in 1998. Article 14.3, however, does not preclude parties from imposing internal taxes, fees or other charges on “content transmitted electronically”, provided such measures are imposed in a manner consistent with the TPP.

Non-discriminatory treatment of digital products. Article 14.4 prohibits a party (government) from providing less favourable treatment to digital products and the creators and owners of those digital products, of other parties than it accords to “other like digital products”.

Access to the internet for e-commerce. Article 14.10 secures the benefit of consumers being able to access and use online services and applications of their choice, and to connect the devices of their choice to the internet.

ASEAN, in this context, already has released a road map – the ASEAN ICT Masterplan 2020 (AIM 2020), which is expected to be implemented from 2016 to 2020. Promotion of trade in ICT services should be undertaken in line with the AIM 2020.⁸ Its “[i]mplementation will take into account the complexity, priority and resource availability of each of the initiative and action point. The proposed timeline is heavily loaded towards the first half of the five-year calendar to allow for flexibility and the opportunity to conduct future refinements to further strengthen the objectives of the initiatives.” Figure 4 shows the schedule of the 2020 Masterplan.

Along with this broad road map, it would then be important to consider what sort of promotional measures (as concrete activities) best fit each of the ASEAN Member States. In view of their socioeconomic status, the promotional measures should cover four areas:

- (a) Database construction for trade in ICT services (because detailed statistical information on ICT-related trade is lacking)
- (b) Addressing of the digital divide in the form of either Mode 2 trade or capacity building as economic cooperation (as ASEAN Member States seem to be divided in terms of ICT utilization)
- (c) Participation of small and medium-size enterprises (SMEs) (the majority of ASEAN-based firms)
- (d) Implementation of ICT farming (because ASEAN Member States are located mainly in tropical areas where unique agro-based businesses can prosper)

More specifically, the proposed measures and policies include the following:

For (a), database construction for trade in ICT services, information on ICT-based trade is rather limited since the majority of international ICT-related transactions takes place *inside* companies, in diverse and rather confidential forms. A concrete pilot project to understand and measure the business modality and price level of ICT-related trade could be launched by international and/or regional organizations (including the ASEAN-Japan Centre) in cooperation with the relevant agencies of the ASEAN Member States. This type of bottom-up project implementation is expected to lead to the establishment of a broader-scale database on ASEAN-wide ICT trade in all four modes.

On (b), addressing of the digital divide in the form of either Mode 2 trade or capacity building as economic cooperation, relevant workshops could be organized to highlight how the digital divide happens: both the lack of physical ICT facilities and the lack of knowledge on how to use them effectively can contribute to the digital divide. In such workshops (including the seminar organized by the ASEAN-Japan Centre in February 2017 for ASEAN), information exchange on these two aspects could be carried out. As the trade policy framework for ICT is already fairly open, the important point would be to start small and grow later; in this sense, the implementation of small-scale workable projects is as important as meticulous but rather time-consuming planning. Importantly, this process itself could also be facilitated by utilizing ICT-based offshoring of inputs in Mode 1.

Concerning (c), participation of SMEs, indigenous companies – especially those based in Brunei Darussalam, Cambodia, the Lao People’s Democratic Republic and Myanmar – could be invited to workshops where they could receive necessary ICT-related training (which could be seen as Mode 2 import of ICT services).

Regarding (d), implementation of ICT farming, a concrete example would be growing tropical plants that are fit for either direct eating or medicinal use (after pharmaceutical treatment). ICT-based technology can be useful for monitoring the growth of such plants. Database construction as well as analyses of business potential along the value chain (i.e. where to export and how much to sell)

⁸ For details, see ASEAN Secretariat (2015).

and more upstream, agro-based R&D using ICT technologies (e.g. DNA coding of tropical plants to increase yields at the time of harvesting), could all be undertaken by utilizing ICT facilities. Concrete pilot projects could be launched in this respect for the purpose of raising awareness.

The measures described here are all fully in line with the AIM 2020: the proposed pilot projects could be aligned closely with the 2020 Masterplan, as shown in table 12.⁹

In connection with concrete promotional measures, representatives of ASEAN Member States discussed and provided various policy options to promote trade in ICT services at the second Seminar on Promoting Services Trade in ASEAN Member States (for telecommunication services and computer and related services specifically) on February 23–25, 2017. Box 5 details a list of policy options suggested by each of the ASEAN Member State representatives at the seminar.

Table 12. Matching of ASEAN-Japan Centre's promotional measures and activities in the 2020 Masterplan activities

ASEAN-Japan Centre's promotional measure	Most relevant activity in the 2020 Masterplan (in figure 4)
(a) Database construction for trade in ICT services	(1)-1. Promotion of Digital Trade (1)-2. Over-The-Top (OTT) Service Providers' Consultative Approach (8)-1. Data Security Principles (8)-2. Network Security Best Practices (8)-3. Critical Info Infra Coordination (8)-4. Cyber Incident Collaboration
(b) Addressing of the digital divide in the form of capacity building as economic cooperation	(2)-1. Address Digital Divides (2)-2. Universal Service Obligation (USO) 2.0 (2)-3. Next Generation Telecentres (3)-1. Open Data, Big Data Framework (3)-2. Smart City Development (3)-3. New Technology Trends Tracking (5)-1. ICT human resource (HR) (5)-2. ICT Skills Standards (7)-1. Encourage New Media (7)-2. Local Content Development (7)-3. Develop e-Service Delivery (7)-4. Develop and Foster Cyber Wellness
(c) Participation of small and medium sized enterprises (SMEs)	(6)-1. Facilitate ICT Investment and Participation (6)-2. Lower Roaming Charges Framework (6)-3. Harmonize Regulations (6)-4. Nurture ICT Products and Services Trade (4)-1. Broadband Access and Affordability, Interoperability (4)-2. Submarine Cable Repair and Resilience (4)-3. Infrastructure Resilience Best Practices (4)-4. Cloud Computing Platform
(d) Implementation of ICT farming	(1)-3. Sustainable and Green ICT Practices (3)-4. Supportive Ecosystem Development

Source: Made by the author.

⁹ Note that the best effort is made to match these activities and measures, although some activities in the 2020 Masterplan do not perfectly align with the ASEAN-Japan Centre's promotional measures. For example, (1)-3. Sustainable and Green ICT Practices and (3)-4. Supportive Ecosystem Development in the ASEAN 2020 ICT Masterplan (figure 4) do not perfectly relate to (4) implementation of ICT farming (table 12).

Box 5. Policy options suggested by ASEAN Member State representatives for promoting trade in telecommunication services and computer and related services

These policy options are categorized along the most updated list of ICT indicators approved by the International Telecommunications Union (ITU).¹⁰ To ensure anonymity, names of the Member States are intentionally not disclosed.

(1) ICT infrastructure and access

- Affordable connectivity nationwide
- Reduced roaming charges
- Reducing the cost of internet for public and/or end users; increasing the speed of internet lines; reducing tariff and non-tariff barriers that inhibit internet trade among ASEAN countries
- Harmonized domestic and international legislation
- Establishing market competition at an affordable price
- Strong policy for liberalization of telecommunication market
- Infocomm Media 2025 plan seeks to address shortcomings related to infrastructure and access
- A new economic model aimed at pulling the country out of the middle-income trap and developing it as a high-income country
- Three elements mark a significant change in a country's economy and production:
 - > The first aims to enhance the country's standing to become a high-income nation through developing as a knowledge-based economy, with an emphasis on research and development, science and technology, creative thinking and innovation.
 - > The second moves toward an inclusive society with equitable access to the fruits of prosperity and development.
 - > The third focuses on sustainable growth and development, without destroying the environment.
- Tight management of service prices
- Consider this area as the core sector to encourage.
- Accelerating the application of ICT in government management systems
- Digital economy and society development plan consisting of six strategic actions as follows:
 - > Build country-wide high-capacity digital infrastructure
 - > Boost the economy with digital technology
 - > Create a quality and equitable society through digital technology
 - > Transform into digital government
 - > Develop workforce for the digital era
 - > Build trust and confidence in the use of digital technology

(2) ICT access and use by households and individuals

- Establish regional e-commerce platform
- Build a national digital payment system
- Build trust and confidence through data security, data protection and privacy
- Free Wi-Fi in public areas
- Getting more involvement from housewives, students and the rural population
- Universal service obligation policy
- Establish telecommunication plan
- Licensing for permission for telecommunication and/or internet service providers and operators
- Transparency in licensing procedures
- Strengthening services introduction to local households and individuals through free public services channels (telephone, internet, TV, cable, ...)
- Digital economy and society development plan

¹⁰ ITU, "Core List of ICT Indicators, March 2016 version", http://www.itu.int/en/ITU-D/Statistics/Documents/coreindicators/Core-List-of-Indicators_March2016.pdf.

Box 5. Policy options suggested by ASEAN Member State representatives for promoting trade in telecommunication services and computer and related services (continued)

(3) ICT access and use by enterprises

- Awareness of ICT benefits to businesses; e.g. cloud computing
- Encourage businesses to have extranet services
- Establish regional e-commerce platform
- Subsidies for exportation of ICT products and services
- Facilitate exports
- Promote usage of *fintech*
- Build a national digital payment system
- Build trust and confidence through data security, data protection and privacy
- Affordable, fast and reliable connectivity
- Improved performance of supporting enablers such as logistics, digital banking and offline banking
- ICT master plan
- Law and regulations regarding e-commerce and cyber security
- Follow practices such as SAP (System, Applications and Product) and ERP (Enterprise Resource Planning)
- Encourage the use of ICT in every sector
- Scope for improvement, through building stronger digital capabilities for enterprises, especially among SMEs.
- Digital economy and society development plan.
- Publishing quickly of laws and circulars on e-commerce transactions, IT, intellectual property

(4) ICT sector and trade in ICT goods

- Develop attractive investment incentives for foreign ICT companies, experts, VCs in focus areas
 - > Incentives for R&D in focus areas
 - > Embassy assistance to facilitate trade
 - > Establish shared innovation facilities
 - > Business matching programs in focus areas
 - > Establish technology and knowledge transfer system
 - > Introduce Industry 4.0 program
 - > Seek opportunities in the global value chains
 - > Promote innovative local and foreign start-ups
- Universal categorization system for ICT goods that enables accurate data collection, which supports comparative and qualitative analysis
- Standardization of ICT goods
- Export promotion in ICT goods
- Government encouragement of the ICT sector
- Cooperation should harmonize government and private sector efforts
- Building of stronger digital capabilities for trade, especially among SMEs.
- Strengthening international cooperation (experts exchange, training seminars, exhibition, business matching and so on)

(5) ICT in education

- Increase STEM passing rate
- Produce Industry 4.0-ready workforce
- Promote e-learning
- The Government needs to improve ICT services for education as early as from secondary school.
- Increase usage and appreciation of ICT as a tool in education.

Box 5. Policy options suggested by ASEAN Member State representatives for promoting trade in telecommunication services and computer and related services (continued)

- Provide e-library in every school, especially in primary schools, through cooperation with ministries and government
- Multimedia class room facilities in school and universities
- Reduce the digital divide between urban and rural areas”
- Beyond young students, the country aims to support continuous workforce skills upgrading through the Skills Future movement, which provides re-training programs to equip citizens of all ages with skills relevant to the future economy.
- Consider pricing subsidy for the education sector
- Encouraging sponsorship for local and remote area.

(6) ICT in government

- Enhance marketing of the country’s value propositions to investors and experts
- Enhance open data platform
- Improve e-government services
- Continuous improvement in the level of ICT skills for Government employees in various sectors
- Implementation according to the e-Government master plan
- Promote co-operation between line ministries and other related fields
- Develop human resources in ICT fields to nurture ICT skillful persons
- Each government agency is currently connected by intranet. User-friendly, online services are also available to citizens. Areas of possible advances could be to improve cyber security, to develop deeper capabilities in analytics and to strengthen engagement with citizens via online and mobile platforms.
- Digital Government Master Plan (2016–2018)

Policy options are also categorized in table 12 specifically by ASEAN Member States.

(a) Database construction for trade in ICT services

- Committee set-up, to enhance existing online business registration platform
- Gather baseline data
- Have a database of trade in ICT services, but we lack technology and human resources; thus we need to improve in this respect, as well as capacity building.
- To establish a secured and framework and infrastructure of personal data protection
- Promotion of digital trade and data security principles
- Improving data compilation at the company level as well as compiling data from micro companies
- Establish cyber law
- Make enhanced cyber security a best practice with the cooperation of ASEAN and dialogue partners
- National ICT web portal
- Promotion of digital trade
- Data security principles
- Network security best practices
- Build country-wide high-capacity digital infrastructure
- Build trust and confidence in the use of digital technology
- Strengthening data and network security capacity

(b) Addressing of the digital divide in the form of capacity building as economic cooperation

- Enhance capacity building programs for micro and SMEs
- Strengthen capacity building between ASEAN and Japan
- Develop ICT human resources and promote e-service delivery

Box 5. Policy options suggested by ASEAN Member State representatives for promoting trade in telecommunication services and computer and related services (continued)

- Promoting and/or encouraging economic cooperation activities in business contract negotiations (after sales capacity-building work programs that allow for technology transfer)
- Develop human resource development to nurture skillful ICT persons
- Providing ICT infrastructure
- ICT awareness promotion through seminars and workshops to close the digital divide
- Address digital divides
- Smart city development
- New technology trends tracking
- Build country-wide, high-capacity digital infrastructure
- Create a quality and equitable society through digital technology
- Ensure inclusive and equal access to digital technology
- Develop digital literacy and/or media and information literacy
- Create local digital content and knowledge resources
- Provide education opportunities with digital technology
- Increase access to health care with digital technology

(c) Participation of SMEs

- Support and facilitate the exportation of innovative ICT products and services
- Embassy assistance to facilitate trade
- Holistic outreach programmer for micro and SMEs (MSMEs) on free trade agreements
- Inclusion of MSMEs in policy and regulatory reforms
- Expose MSMEs to participation in capacity-building programs within ASEAN, APEC, etc.
- Nurture and provide access and framework for startups
- Harmonize regulations, broadband access and affordability, interoperability, infrastructure resilience best practices
- Measures to enable the security of the supply chain; measures that encourage cost efficiency in the ICT infrastructure available – competitive rates and fast service
- SMEs are very important and the core of national economic development
- ICT always brings innovation, so promotion of the SMEs sector by using ICT can benefit national economic development
- Provide e-commerce platform that can encourage SMEs, startups and entrepreneurs in business development and market penetration
- Systematic road map for SMEs
- Nurture ICT products and services trade
- Infrastructure resilience: best practices
- Cloud computing platform
- Raise capacity and competitiveness in all economic sectors with digital technology, including agriculture, manufacturing and services, with a strong focus on SMEs and community businesses
- Boost the economy with digital technology
- Create and foster digital technology startups
- More SMEs in agriculture, manufacturing and services sectors will leverage digital technology to compete regionally and globally.
- Creating policies for lowering roaming charges
- Publishing law on SME support
- Competitiveness capacity building (seminars, training workshops, international experiences exchange)
- Supporting SMEs in trade promotion, market access information

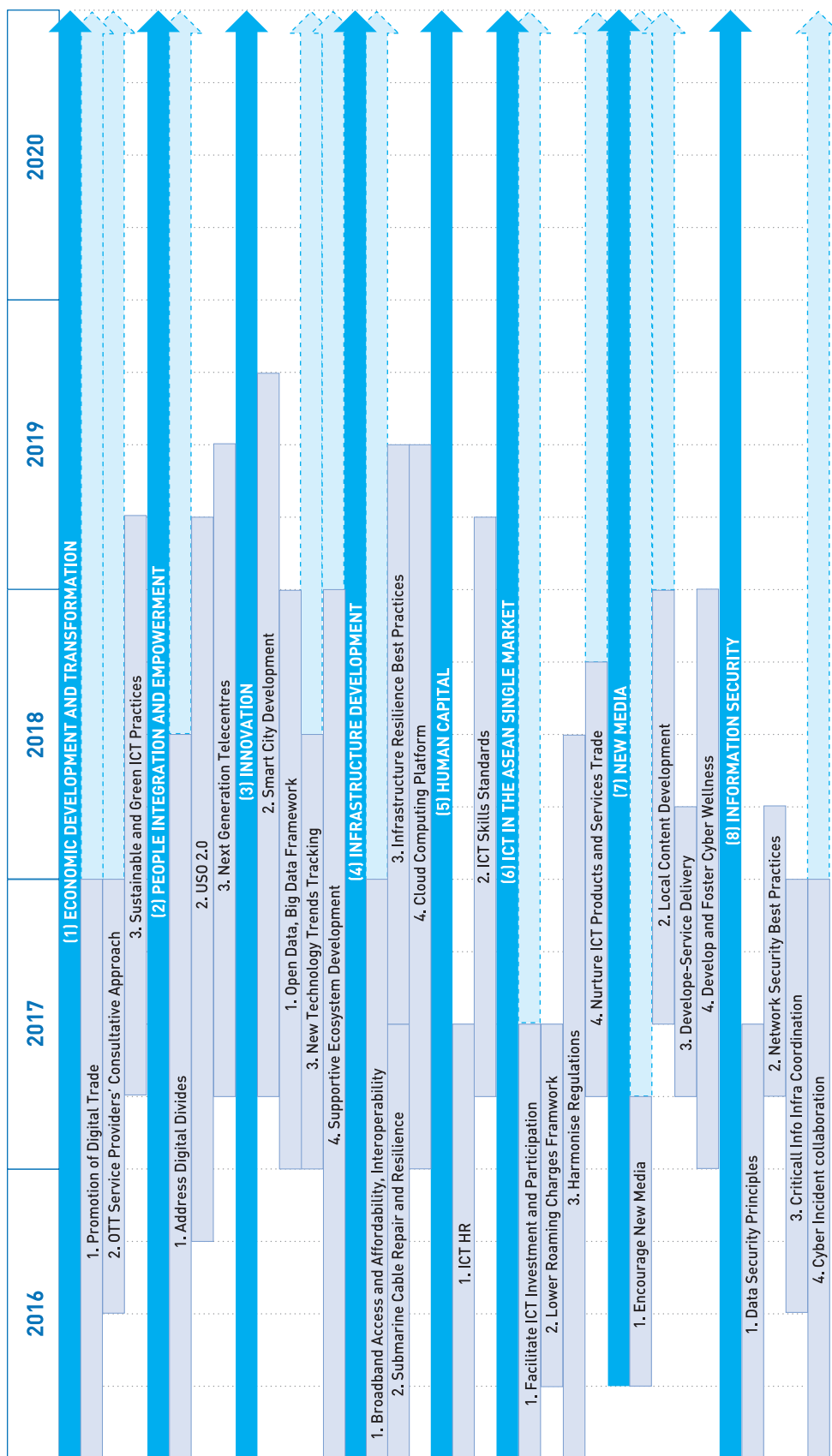
Box 5. Policy options suggested by ASEAN Member State representatives for promoting trade in telecommunication services and computer and related services (concluded)**(d) Implementation of ICT farming**

- Public-private-people partnership with Japan on innovative farming solutions by local universities
- Need to learn from countries with best practices, especially Japan
- Equip remote areas with ICT facilities
- Sustainable and green ICT practices
- Limited ICT farming requires measures to increase awareness of ICT in selected strategic segments (e.g. aquaculture)
- Should promote awareness of ICT farming through seminars, exhibitions and television programs
- Supports for round-the-clock continuous electricity
- Financial support by government and development partners from international organizations
- Sustainable and green ICT practices
- Supportive ecosystem development
- To raise capacity and competitiveness in all economic sectors with digital technology, including agriculture, manufacturing and services, with a strong focus on SMEs and community businesses
- Inviting international farming expert to introduce and training ICT application in farming
- The Government publishes new policies on supporting farmers in applying ICT to producing processes and to daily life as well
- Encouraging ICT providers to build up particular favourable subscriptions for farmers
- Building a mechanism to accelerate ICT enterprises to develop new farming application

Productivity growth is driven by services, which require both fixed investment in building and ICT technologies (ASEAN and the World Bank, 2015). Utilizing ICT technology for ASEAN-wide productivity improvement is a cross-cutting policy issue and not just for a single line ministry mandated to cover ICT services. A major hindering factor for most ASEAN Member States as they stand at present seems to be the low level of in-country as well as international coordination to capture ICT-based network externalities. An ASEAN-wide implementation of concrete projects could be launched, possibly coordinated by international organizations and led by the ASEAN Member States.

Further, implementing ICT-related activities would not only contribute to intra-ASEAN promotion of trade in ICT services but also facilitate the ongoing RCEP involving the ASEAN Member States as well as their dialogue partners (including Japan). Although technological advances in computer and related services normally overwhelm the effectiveness of policy-driven productivity improvement, there is much to be done by policy makers in the ASEAN Member States to capture the technological advances in ICT services, a highly promising market for trade expansion.

Figure 3. The ASEAN ICT 2020 Masterplan



Source: ASEAN (http://www.asean.org/storage/images/2015/November/ICT/15b%20--%20AIM%202020_Publication_Final.pdf).



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Annex A. Fifty large foreign affiliates engaged in computer and related services in ASEAN, 2015 (continued)

	Name of foreign affiliates	Host country	Estimated sales (\$ million)	Name of parent firms	Home country
1	ECS Holdings Ltd	Singapore	3 314	VST Holdings Ltd	Hong Kong
2	Celestica Holdings Pte Ltd	Singapore	1 789	Onex Corp	Canada
3	Ecart Services Malaysia Sdn Bhd	Malaysia	1 450	Investor Group	United Kingdom
4	--	Malaysia	1 234	Mahindra Satyam (Satyam Computer Services)	India
5	Link Net PT	Indonesia	1 095	Asia Link Holdings Ltd	Jersey
6	SK Hynix Asia Pte Ltd	Singapore	1 089	SK Hynix Inc	Korea, Rep. of
7	FPT Corp	Viet Nam	888	Investor Group	United States
8	Hewlett-Packard (Malaysia) Sdn Bhd	Malaysia	847	Hewlett Packard Enterprise Co	United States
9	--	Malaysia	837	IBM	United States
10	--	Viet Nam	837	Teco Electric & Machinery	Taiwan
11	Toshiba Electronics Asia (Singapore) Pte Ltd	Singapore	709	Toshiba Corp	Japan
12	Autodesk Asia PTE Ltd	Singapore	593	Autodesk Inc	United States
13	Packet One Networks (Malaysia) Sdn Bhd	Malaysia	580	SK Telecom Co Ltd	Korea, Rep. of
14	RunSystem Corp	Viet Nam	571	--	Japan
15	OpenNet Pte Ltd	Singapore ^a	570	CityNet Infrastructure Management Pte Ltd	Singapore ^a
16	--	Viet Nam	558	Mahindra Satyam (Satyam Computer Services)	India
17	Accenture PTE Ltd	Singapore	515	Accenture Plc	India
18	ECS ICT Berhad	Malaysia	443	VST Holdings Ltd	Cayman Islands
19	--	Malaysia	419	National Instruments	United States
20	Sabre Asia Pacific Pte Ltd	Singapore	344	Sabre Corp	United States
21	--	Singapore	286	HCL Technologies	India
22	Tata Consultancy Services Asia Pacific Pte Ltd	Singapore	280	Tata Consultancy Services Ltd	India
23	--	Philippines	279	UST Global	Kenya
24	PropertyGuru Group	Singapore	271	Immobilien Scout GmbH	Germany
25	--	Philippines	251	Wipro Technologies	India
26	--	Singapore	234	Mercury Interactive	United States
27	--	Malaysia	231	Hewlett-Packard (HP)	United States
28	MOL Ventures Pte Ltd	Singapore	230	MOL.COM Bhd	Malaysia
29	NEC Asia Pacific Pte Ltd	Singapore	229	NEC Corp	Japan

Annex A. Fifty large foreign affiliates engaged in computer and related services in ASEAN, 2015 (concluded)

	Name of foreign affiliates	Host country	Estimated sales (\$ million)	Name of parent firms	Home country
30	Hewlett-Packard Multimedia Sdn Bhd	Malaysia	221	HP Inc	United States
31	Abundant Global Ltd	Malaysia	216	Inovisi Infracom Tbk PT	Indonesia
32	Hewlett-Packard International Pte Ltd	Singapore	208	HP Inc	United States
33	Merrill Lynch Global Services Pte Ltd	Singapore	208	Bank of America Corp	United States
34	Zuji	Singapore	200	Travelocity.com LP	United States
35	Trans Infotech Pte Ltd	Singapore	195	Wirecard AG	Germany
36	--	Philippines	193	Accenture	Ireland
37	Techbase Vietnam Co, Ltd	Viet Nam	183	--	Japan
38	DTS Software Vietnam Co, Ltd	Viet Nam	175	--	Japan
39	--	Philippines	167	Tech Mahindra	India
40	--	Philippines	167	Tata Consultancy Services (TCS)	India
41	--	Singapore	167	Platform Computing	Canada
42	--	Singapore	167	Infosys Technologies	India
43	Oracle Financial Services Software Pte Ltd	Singapore	165	Oracle Corp	United States
44	--	Singapore	149	Fujitsu	Japan
45	Danang Nippon Seiki Co, Ltd	Viet Nam	146	--	Japan
46	Smart Checker Ltd	Indonesia	145	Undisclosed Acquiror	unspecified
47	Nissho Electronics Vietnam Co, Ltd	Viet Nam	141	--	Japan
48	--	Philippines	140	Teradata Philippines	United States
49	--	Viet Nam	140	Robert Bosch	Germany
50	--	Philippines	134	UST Global	Kenya

Source: AJC, based on data from Toyo Keizai Shimposha, UNCTAD, Thomson Reuters and fDi Markets.

Note: These 50 firms are not necessarily the largest. They are provided for illustrative purposes. Sales are estimated in the following manner: First the ratio of sales to size of foreign affiliates (investment value, capital size, employment size, etc.) is calculated for available foreign affiliates in each ASEAN host economy; second, this ratio is applied to the affiliates whose size is available from the sources given; and third, some adjustment are made to eliminate unreasonable estimates by searching information of the affiliates in question. Nevertheless there are likely to be some, sometimes large, errors, and readers should use these data with utmost caution.

^a Immediate investing country is different.

Annex B. Fifty large ASEAN affiliates abroad engaged in computer and related services, 2015 (continued)

	Name of ASEAN affiliate abroad	Host country	Estimated sales (\$ million)	Name of ASEAN investing company	ASEAN home country
1	Indra Sistemas SA	Spain	3 160	TT International Limited	Singapore
2	JobStreet Corp Bhd	Singapore ^a	1 497	Jobstreet.com Pte Ltd	Singapore ^a
3	Bill Express Ltd	Australia	855	IPAY Express Pte Ltd	Singapore
4	Amobee Inc	United States	803	Singapore Telecommunications Ltd	Singapore
5	Shanda Games Ltd	China	649	Government of Singapore Investment Corp Pte Ltd (GIC)	Singapore
6	Computer Generated Solutions Inc	United States	350	Keppel Telecommunications & Transportation Ltd	Singapore
7	Global Voice Networks GmbH	Germany	261	Horizon Education & Technologies Ltd	Singapore
8	KDDI Corp	Taiwan	260	KKBox Inc	Singapore
9	OpenNet Pte Ltd	Singapore ^a	246	CityNet Infrastructure Management Pte Ltd	Singapore ^a
10	Hughes Software Systems Ltd	India	166	Flextronics International Ltd	Singapore
11	Gazillion Entertainment Inc	United States	150	Investor Group	Singapore
12	Vanda Systems & Communications Holdings Ltd	Hong Kong	149	DBS Nominees Pte Ltd	Singapore
13	DMX Technologies Group Ltd	Hong Kong	129	Venture Corp Ltd	Singapore
14	Mitra Mandiri Mantap PT	Indonesia ^a	119	Mitra Mandiri Mantap PT	Indonesia ^a
15	Tecmo Ltd	Japan	113	Effissimo Capital Management Pte Ltd	Singapore
16	104 Corp	Taiwan	107	JobStreet Corp Bhd	Malaysia
17	Abundant Global Ltd	Malaysia	93	Inovisi Infracom Tbk PT	Indonesia
18	Alphawest Limited	Australia	86	Singapore Telecommunications Ltd	Singapore
19	CS Loxinfo PCL	Thailand	82	Singapore Telecommunications Ltd	Singapore
20	Great World Ltd	Hong Kong	81	Inovisi Infracom Tbk PT	Indonesia
21	Perpetual Systems Pty Ltd	Australia	80	Singapore Telecommunications Ltd	Singapore
22	Pixable Inc	United States	66	SingTel Digital Life Pte Ltd	Singapore
23	CNA Group Ltd	Singapore ^a	65	Mitsubishi Electric Asia Pte Ltd	Singapore ^a
24	One Mobikwik Systems Pvt Ltd	India	63	Investor Group	Singapore
25	NEC India Pvt Ltd	Indonesia	55	NEC Asia Pacific Pte Ltd	Singapore
26	Woodland Corp	Japan	53	MAC Asset Management PTE Ltd	Singapore
27	Berjaya Philippines Inc	Philippines ^a	51	Berjaya Philippines Inc	Philippines ^a
28	Wallflower Global Ltd	New Zealand	50	Global Satellite Broadcasting Corp Ltd	Thailand
29	NEC Corporation of Malaysia Sdn Bhd	Malaysia	46	NEC Asia Pacific Pte Ltd	Singapore

Annex B. Fifty large ASEAN affiliates abroad engaged in computer and related services, 2015 (concluded)

	Name of ASEAN affiliate abroad	Host country	Estimated sales (\$ million)	Name of ASEAN investing company	ASEAN home country
30	Wafer Systems Ltd	Hong Kong	42	Investor Group	Singapore
31	Infomart Corp	Japan	41	Infomart Corp	Singapore
32	Efficient E-Solutions Bhd	Malaysia	41	Singapore Post Ltd	Singapore
33	SPI Technologies Inc	Philippines ^a	38	ePLDT Inc	Philippines ^a
34	BrainBees Solutions Pvt Ltd	India	38	BrainBees Solutions Pvt Ltd	Singapore
35	Golfzon Co Ltd	Korea, Rep. of	36	OSSF Capital Sdn Bhd	Malaysia
36	Netsila SAL	Lebanon	34	Dapur Masak Pte Ltd	Singapore
37	Tata Consultancy Services Malaysia Sdn Bhd	Malaysia	27	Tata Consultancy Services Asia Pacific Pte. Ltd.	Singapore
38	Prolexic Technologies Inc	United States	26	IPVG Corp	Philippines
39	Code Wireless Pte Ltd	Singapore	26	Inovisi Infracom Tbk PT	Indonesia
40	Harbour Networks Holdings Ltd	China	25	Temasek Holdings (Pte) Ltd	Singapore
41	InMyShow Inc	China	25	InMyShow Inc	Singapore
42	Decillion Solutions Pte Ltd	Singapore ^a	22	NEC Solutions Asia Pacific Pte Ltd	Singapore ^a
43	RWE AG	Slovak Republic	22	RWE IT Slovakia SRO	Viet Nam
44	Swist Technology Solutions (Pty) Ltd	South Africa	19	Allied Technologies Ltd	Singapore
45	SCS Computer Systems Sdn Bhd	Malaysia ^a	18	Sistem Kompakar Sdn Bhd	Malaysia ^a
46	SCS Computer Systems Sdn Bhd	Malaysia ^a	18	Yam Tunku Dato Seri Shahabuddin Bin Tunku Besar Burhanuddin	Malaysia ^a
47	MOL Global Inc	Turkey	18	Sihirli Kule Bilgi Sistemleri Yayin Gida ve Tekstil Sanayi Ticaret Ltd Sti	Malaysia
48	OpenNet Pte Ltd	Singapore ^a	18	Singtel Interactive Pte Ltd	Singapore ^a
49	Sunshine Oil Technology Co Ltd	China	16	Dialog Systems (Asia) Pte Ltd	Singapore
50	Scipher PLC-3D Sound Business	United Kingdom	16	Creative Technology Ltd	Singapore

Source: AJC, based on data from Toyo Keizai Shimposha, UNCTAD, Thomson Reuters and fDi Markets.

Note: These 50 firms are not necessarily the largest. They are provided for illustrative purposes. Sales are estimated in the following manner: First the ratio of sales to size of foreign affiliates (investment value, capital size, employment size etc.) is calculated for available foreign affiliates in each ASEAN host economy; second, this ratio is applied to the affiliates whose size is available from the sources given; and third, some adjustment was made to eliminate unreasonable estimates by searching information of the affiliates in question. Nevertheless there are likely to be some, sometimes large, errors, and readers should use these data with utmost caution.

^a Immediate investing country is different.

ANNEX C.

SPECIFIC SCHEDULE OF COMMITMENTS FOR “COMPUTER AND RELATED SERVICES” UNDER AFAS (9TH PACKAGE, SIGNED IN NOVEMBER 2015) BY ASEAN MEMBERS

Legend for this Annex:

(1) means mode 1 (cross-border supply of services); (2) means mode 2 (consumption abroad); (3) means mode 3 (commercial presence); (4) means mode 4 (movement of natural persons).

The meaning of the alphabetical classification in the right hand column of each specific commitment table is as follows.

N: none (no restriction)

A: limitations on the number of service suppliers whether in the form of numerical quotas, monopolies, exclusive service suppliers or the requirements of an economic needs test;

B: limitations on the total value of service transactions or assets in the form of numerical quotas or the requirement of an economic needs test;

C: limitations on the total number of service operations or on the total quantity of service output expressed in terms of designated numerical units in the form of quotas or the requirement of an economic needs test;¹¹

D: limitations on the total number of natural persons that may be employed in a particular service sector or that a service supplier may employ and who are necessary for, and directly related to, the supply of a specific service in the form of numerical quotas or the requirement of an economic needs test;

E: measures which restrict or require specific types of legal entity or joint venture through which a service supplier may supply a service; and

F: limitations on the participation of foreign capital in terms of maximum percentage limit on foreign shareholding or the total value of individual or aggregate foreign investment” (Part III: Specific Commitments, Article XVI: Market Access, subparagraph 2).

Under AFAS, the restriction types A, B and C are actually not used by the ASEAN member states in the sector “Computer and Related Services”. In addition to these six types of market-access restrictions, the following two restrictions are observed.

G: Government approval requirement; and

H: Tax or fee payment requirement.

¹¹ Subparagraph 2(c) does not cover measures of a Member which limit inputs for the supply of services.

Brunei Darussalam

Sector or Subsector	Limitation on Market Access	A-H classification of MA	Limitation on National Treatment	A-H classification of NT	Additional Commitments
Consultancy Services related to the Installation of Computer Hardware (CPC 841) Software Implementation Services (CPC 842) Data Processing Services (CPC 843)	(1) None (2) None (3) None	(1) N (2) N (3) N	(1) None (2) None (3) None	(1) N (2) N (3) N	
Database Services (CPC 844)	(1) None (2) None (3) Commercial presence is permitted only through a company which is registered in Brunei Darussalam with foreign equity not exceeding 51%.	(1) N (2) N (3) F51	(1) None (2) None (3) None	(1) N (2) N (3) N	
Maintenance and repair services of office machinery and equipment including computers (CPC 845) Other computer Services (CPC 849)	(1) None (2) None (3) None	(1) N (2) N (3) N	(1) None (2) None (3) None	(1) N (2) N (3) N	

Cambodia

Sector or Subsector	Limitation on Market Access	A-H classification of MA	Limitation on National Treatment	A-H classification of NT	Additional Commitments
(a) Consultancy services related to the installation of computer hardware (CPC 841) (b) Software implementation services (CPC 842) (c) Data processing services (CPC 843) (d) Data base services (CPC 844) (e) Other (CPC 845+849)	(1) None (2) None (3) None	(1) N (2) N (3) N	(1) None (2) None (3) None	(1) N (2) N (3) N	

Indonesia

Sector or Subsector	Limitation on Market Access	A-H classification of MA	Limitation on National Treatment	A-H classification of NT	Additional Commitments
Consultancy Services related to the installation of computer hardware (CPC 841)	(1) None (2) None (3) Only through a locally incorporated joint-venture corporation in the form of Limited Liability Enterprise (Perseroan Terbatas/PT) with Indonesian individuals or Indonesian-controlled corporations or both and the aggregate foreign shareholding in the joint-venture corporation shall not exceed 49 per cent	(1) N (2) N (3) EF49	(1) None (2) None (3) None	(1) N (2) N (3) N	

Software Implementation Services (CPC 842)	(1) None (2) None (3) Only through a locally incorporated joint-venture corporation in the form of Limited Liability Enterprise (Perseroan Terbatas/PT) with Indonesian individuals or Indonesian-controlled corporations or both and the aggregate foreign shareholding in the joint-venture corporation shall not exceed 49 per cent	(1) N (2) N (3) EF49	(1) None (2) None (3) None	(1) N (2) N (3) N	
Input Preparation Services (CPC 84310)	(1) None (2) None (3) Joint venture with foreign equity participation not exceeding 70 per cent	(1) N (2) N (3) EF70	(1) None (2) None (3) None	(1) N (2) N (3) N	
System Analysis Services (CPC 84320) Time Sharing Services (CPC 84330) Other Data Processing Services (CPC 84390)	(1) None (2) None (3) Only through a locally incorporated joint-venture corporation in the form of Limited Liability Enterprise (Perseroan Terbatas/PT) with Indonesian individuals or Indonesian-controlled corporations or both and the aggregate foreign shareholding in the joint-venture corporation shall not exceed 49 per cent	(1) N (2) N (3) EF49	(1) None (2) None (3) None	(1) N (2) N (3) N	
Data Base Services (CPC 84400*)	(1) None (2) None (3) Only through a locally incorporated joint-venture corporation in the form of Limited Liability Enterprise (Perseroan Terbatas/PT) with Indonesian individuals or Indonesian-controlled corporations or both and the aggregate foreign shareholding in the joint-venture corporation shall not exceed 49 per cent	(1) N (2) N (3) EF49	(1) None (2) None (3) None	(1) N (2) N (3) N	
Maintenance and repair Services of Office Machinery and Equipment Including Computers (CPC 845)	(1) None (2) None (3) Only through a locally incorporated joint-venture corporation in the form of Limited Liability Enterprise (Perseroan Terbatas/PT) with Indonesian individuals or Indonesian-controlled corporations or both and the aggregate foreign shareholding in the joint-venture corporation shall not exceed 49 per cent	(1) N (2) N (3) EF49	(1) None (2) None (3) None	(1) N (2) N (3) N	
Other Computer Services (CPC 849)	(1) None (2) None (3) Only through a locally incorporated joint-venture corporation in the form of Limited Liability Enterprise (Perseroan Terbatas/PT) with Indonesian individuals or Indonesian-controlled corporations or both and the aggregate foreign shareholding in the joint-venture corporation shall not exceed 49 per cent	(1) N (2) N (3) EF49	(1) None (2) None (3) None	(1) N (2) N (3) N	

Lao People's Democratic Republic

Sector or Subsector	Limitation on Market Access	A-H classification of MA	Limitation on National Treatment	A-H classification of NT	Additional Commitments
Consultancy services related to the installation of computer hardware (CPC 841) Software implementation service (CPC 842) Data base services (CPC 844) Data processing services, excluded sensitive data and for non-commercial purpose (CPC 843) Other: Maintenance and repair services of computer (Part of CPC 84500)	(1) None (2) None (3) None	(1) N (2) N (3) N	(1) None (2) None (3) None	(1) N (2) N (3) N	

Malaysia

Sector or Subsector	Limitation on Market Access	A-H classification of MA	Limitation on National Treatment	A-H classification of NT	Additional Commitments
a. Consultancy services related to the installation of computer hardware (CPC 841) b. Software implementation service (CPC 842) c. Data processing services (CPC 843) d. Data base services (CPC 844 / 84400) e. Other • Maintenance and Repair Services of office machinery and equipment including Computers (CPC 845) • Data preparation services from clients not involving data processing services (CPC 84910) • Other computer services not elsewhere classified (CPC 84990**): - covering training services for staff of clients; data recovery services; and development of creative content.	(1) None (2) None (3) None	(1) N=>1.0 (2) N (3) N	(1) None (2) None (3) None	(1) N (2) N (3) N	(3) Horizontal Limitation does not apply to these sub-sectors

Myanmar

Sector or Subsector	Limitation on Market Access	A-H classification of MA	Limitation on National Treatment	A-H classification of NT	Additional Commitments
a. Consultancy services related to the installation of computer hardware [CPC 841] b. Software implementation services [CPC 842] System and software consulting services [CPC 8421] System analysis services [CPC 8422] System design services [CPC 8423] Programming services [CPC 8424] System maintenance services [CPC 8425] c. Data processing services [CPC 843] Input preparation services [CPC 8431] Data-processing and tabulation services [CPC 8432] Time-sharing services [CPC 8433] Other data processing services [CPC 8439] d. Data base services [CPC 844] e. Other [CPC 845 + 849] Maintenance and repair services of office machinery [CPC 845] Other computer services [CPC 849] Data preparation services [CPC 8491] Other computer services [CPC 8499] System integration services Software development services	(1) N (2) N (3) Commercial presence of foreign service suppliers and/or providers are permitted in accordance with the Foreign Investment Law (2012), the Republic of Union of Myanmar. The investment may be carried out in any of the following forms. i. carrying out an investment by a foreigner with one hundred percent foreign capital on the business permitted by the Commission ii. carrying out a joint venture between a foreign and a citizen or the relevant Government department and organization; iii. carrying out by any system contained in the contract which approved by both parties.	(1) N (2) N (3) DE	(1) N (2) N (3) a. Foreign service suppliers and/or providers have to comply with existing Laws, rules and regulations concerning investment, taxation, immigration and labour b. Foreign organisations and persons are not allowed to own land in Myanmar. However, land may be on long term lease, depending on the individual circumstances	(1) N (2) N (3) DE	

Philippines

Sector or Subsector	Limitation on Market Access	A-H classification of MA	Limitation on National Treatment	A-H classification of NT	Additional Commitments
Consultancy services related to the installation of computer hardware* [CPC 841]	(1) None (2) None (3) 100% foreign equity participation is allowed	(1) N (2) N (3) F100	(1) None (2) None (3) None	(1) N (2) N (3) N	
Software implementation services [CPC 842]**	(1) None (2) None (3) 100% foreign equity participation is allowed	(1) N (2) N (3) F100	(1) None (2) None (3) None	(1) N (2) N (3) N	
Data Processing Services [CPC 843] Data base services [CPC 844] Others [CPC 845+849]	(1) None (2) None (3) 100% foreign equity participation is allowed	(1) N (2) N (3) F100	(1) None (2) None (3) None	(1) N (2) N (3) N	

Singapore

Sector or Subsector	Limitation on Market Access	A-H classification of MA	Limitation on National Treatment	A-H classification of NT	Additional Commitments
Consultancy Services Related to the Installation of Computer Hardware (CPC 84100)	(1) None (2) None (3) None	(1) N (2) N (3) N	(1) None (2) None (3) None	(1) N (2) N (3) N	
Software Implementation Services (CPC 842)	(1) None (2) None (3) None	(1) N (2) N (3) N	(1) None (2) None (3) None	(1) N (2) N (3) N	
Information Technology Consultancy Services	(1) None (2) None (3) None	(1) N (2) N (3) N	(1) None (2) None (3) None	(1) N (2) N (3) N	
Data Processing	(1) None (2) None (3) None	(1) N (2) N (3) N	(1) None (2) None (3) None	(1) N (2) N (3) N	
Database Services (CPC 84400)	(1) None (2) None (3) None	(1) N (2) N (3) N	(1) None (2) None (3) None	(1) N (2) N (3) N	
Maintenance and Repair Services of Computers	(1) None (2) None (3) None	(1) N (2) N (3) N	(1) None (2) None (3) None	(1) N (2) N (3) N	

Thailand

Sector or Subsector	Limitation on Market Access	A-H classification of MA	Limitation on National Treatment	A-H classification of NT	Additional Commitments
(a) Consultancy services related to the installation of computer hardware (CPC 841)	(1) None (2) None (3) As indicated in 3.3 of the horizontal section	(1) N (2) N (3) EF70	(1) None (2) None (3) None	(1) N (2) N (3) N	
Hardware consultancy services (CPC Version 1.1: part of 83141)	(1) None (2) None (3) As indicated in 3.1 of the horizontal section	(1) N (2) N (3) EF70	(1) None (2) None (3) None	(1) N (2) N (3) N	
(b) Software implementation services (CPC 842)	(1) None (2) None (3) As indicated in 3.3 of the horizontal section	(1) N (2) N (3) EF70	(1) None (2) None (3) None	(1) N (2) N (3) N	
Software consultancy services (CPC Version 1.1: part of 83142)	(1) None (2) None (3) As indicated in 3.1 of the horizontal section	(1) N (2) N (3) EF70	(1) None (2) None (3) None	(1) N (2) N (3) N	
(c) Data processing services (excluding those provided over public telecommunications network) (CPC 843)	(1) None (2) None (3) As indicated in 3.3 of the horizontal section	(1) N (2) N (3) EF70	(1) None (2) None (3) None	(1) N (2) N (3) N	
Data processing services (excluding those provided over public telecommunications network) (CPC Version 1.1: 85960)	(1) None (2) None (3) As indicated in 3.1 of the horizontal section	(1) N (2) N (3) EF70	(1) None (2) None (3) None	(1) N (2) N (3) N	

Viet Nam

Sector or Subsector	Limitation on Market Access	A-H classification of MA	Limitation on National Treatment	A-H classification of NT	Additional Commitments
Computer and Related Services (CPC 841 – 845 + 849)	(1) None (2) None (3) None, except: The chief of the branch has to be a resident in Viet Nam. Since 11 January 2010, branching is allowed.	(1) N (2) N (3) N	(1) None (2) None (3) None	(1) N (2) N (3) N	

Sources: http://myservices.miti.gov.my/widget/web/guest/protocol/-/56_INSTANCE_cxTW8VKZiDDD
 For Brunei Darussalam, [http://www.miti.gov.my/miti/resources/AFAS_9_Consolidated_Schedule_-_BD_SOC_\(CCS_78\).pdf](http://www.miti.gov.my/miti/resources/AFAS_9_Consolidated_Schedule_-_BD_SOC_(CCS_78).pdf)
 For Cambodia, [http://www.miti.gov.my/miti/resources/AFAS_9_Consolidated_Schedule_-_CA_HC_\(AFAS_5\).pdf](http://www.miti.gov.my/miti/resources/AFAS_9_Consolidated_Schedule_-_CA_HC_(AFAS_5).pdf)
 For Indonesia, [http://www.miti.gov.my/miti/resources/AFAS_9_Consolidated_Schedule_-_ID_SOC_\(CCS_78\).pdf](http://www.miti.gov.my/miti/resources/AFAS_9_Consolidated_Schedule_-_ID_SOC_(CCS_78).pdf)
 For Lao P.D.R., [http://www.miti.gov.my/miti/resources/AFAS_9_Consolidated_Schedule_-_LA_SOC_\(CCS_78\).pdf](http://www.miti.gov.my/miti/resources/AFAS_9_Consolidated_Schedule_-_LA_SOC_(CCS_78).pdf)
 For Malaysia, [http://www.miti.gov.my/miti/resources/AFAS_9_Consolidated_Schedule_-_MY_SOC_\(CCS_78\).pdf](http://www.miti.gov.my/miti/resources/AFAS_9_Consolidated_Schedule_-_MY_SOC_(CCS_78).pdf)
 For Myanmar, [http://www.miti.gov.my/miti/resources/AFAS_9_Consolidated_Schedule_-_MM_SOC_\(20140312\).pdf](http://www.miti.gov.my/miti/resources/AFAS_9_Consolidated_Schedule_-_MM_SOC_(20140312).pdf)
 For the Philippines, [http://www.miti.gov.my/miti/resources/AFAS_9_Consolidated_Schedule_-_PH_SOC_\(21Aug2015\).pdf](http://www.miti.gov.my/miti/resources/AFAS_9_Consolidated_Schedule_-_PH_SOC_(21Aug2015).pdf)
 For Singapore, [http://www.miti.gov.my/miti/resources/AFAS_9_Consolidated_Schedule_-_SG_SOC_\(20130509\).pdf](http://www.miti.gov.my/miti/resources/AFAS_9_Consolidated_Schedule_-_SG_SOC_(20130509).pdf)
 For Thailand <http://myservices.miti.gov.my/documents/10180/f0c1be7c-124f-47bf-b4f9-2fd6300ab7d1>
 For Viet Nam, [http://www.miti.gov.my/miti/resources/AFAS_9_Consolidated_Schedule_-_VN_SOC_\(20150911\).pdf](http://www.miti.gov.my/miti/resources/AFAS_9_Consolidated_Schedule_-_VN_SOC_(20150911).pdf)

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