

LEVERAGING TECHNOLOGY AND CONNECTIVITY TO SPUR GROWTH IN ASEAN

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In today's changing global economy, emerging digital products and services are transforming industries, enriching the way many people live, work, play and communicate, while a rise in global trade friction and terrorism has reaffirmed the importance of well-connected, robust, regional economic blocs.

As Singapore assumes chairmanship of ASEAN this year under the tagline "Resilient and Innovative", we need to lead ASEAN to be on the right side of the global divide.

Fortunately, the ASEAN economy is primed with strong fundamentals to benefit from disruption led growth.

A young, educated, and increasingly wealthy population amid growing digital penetration creates a huge, under-tapped potential market for digital goods and services. Coupled with a renewed regional consensus toward economic integration under the ASEAN Economic Community (AEC), ASEAN has the potential to leapfrog to the forefront of the global digital economy.

Furthermore, developments in Fintech such as Dis-

tributed Ledger Technology (DLT) and open banking platforms could potentially integrate millions of unbanked SEAsians into the growing digital economy, while interconnected Smart Cities could allow for joint regional co-development and collaboration on an unprecedented scale.

However, rigid bureaucratic regulations, alongside insufficient state-support and business incentives, hamper potential regional entrepreneurship. Disparity across SEA nations, inadequate logistics and digital infrastructure, alongside lack of consumer trust and awareness amid increasing cyber-attacks, also hinder technology-led growth in ASEAN.

To address these, we propose that Singapore takes charge in: 1) Creating a more Inclusive and Extensive intra-ASEAN Digital Economy, 2) Strengthening Digital and Physical Infrastructure across ASEAN, 3) Fostering Digital Innovation and Entrepreneurship, and 4) Enhancing Trust, Awareness and Reliability of Digital Platforms.

Given Singapore's prevailing successful ventures

into the digital space, Singapore's leadership in this foray would be greatly beneficial to the other member state economies.

Together, ASEAN can leverage on technology and connectivity to achieve future-proofed, sustainable growth in the digital economy.

1. The ASEAN Bloc – Notional or Real?

Since its inception in 1967, ASEAN¹ has served more as an instrument for maintaining regional stability than achieving shared socio-economic growth.

Intra-ASEAN trade stands low (Section 2.1.4), and there is a vast gulf in socio-economic standards (Fig. 1.1) and infrastructure development between member countries (Section 2.1.3).

Importance of building a Connected, Innovative, Intra-ASEAN Economy

The current global economic climate is volatile. Rise in global trade friction and terrorism brings about uncertainty, while emerging technologies could usher in a 4th Industrial Revolution³ that could disrupt many existing industries and displace many from once-

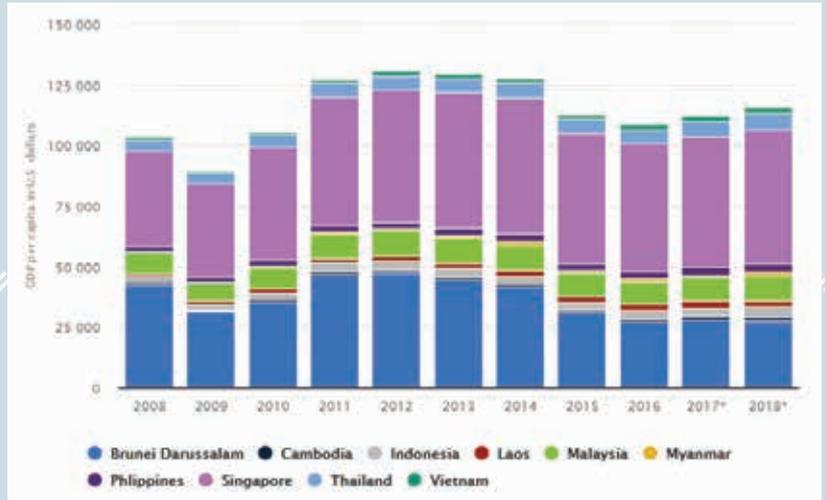


Fig 1.1: GDP per capita of ASEAN countries in U.S. Dollars²

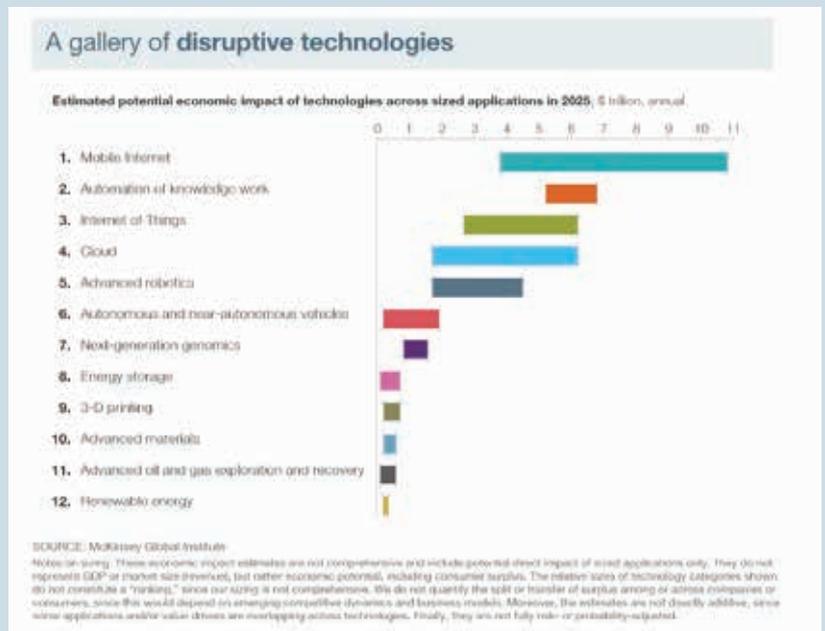


Fig 1.2: Gallery of disruptive technology and potential economic impact⁴

thought stable jobs (Fig. 1.2).

Therefore, to achieve future-proofed sustainable growth, it is necessary to bolster ASEAN connectivity and create a robust, innovative

intra-ASEAN economy that stays abreast of technological disruption.

As Singapore helms ASEAN in 2018, this essay seeks to identify and evaluate

¹ Association of Southeast Asian Nations
² Statista. (2018) Gross Domestic Product (GDP) per capita of the ASEAN countries from 2008 to 2018. Statista. Retrieved April 9, 2018, from <https://www.statista.com/statistics/796245/gdp-of-the-asean-countries/>
³ The 4th Industrial Revolution refers to the emergence of disruptive technologies that are blurring the lines between the physical, digital, and biological spheres. For example, “smart factories” — that is, intelligent networking of product development and production, logistics, and customers by widely deploying sensors and other IoT technologies.
⁴ Manyika, J., Chui, M., Bughin, J., Dobbs, R., Bisson, P., and Marrs, A. (May 2013). Disruptive technologies: Advances that will transform life, business, and the global economy *McKinsey & Company*. Retrieved April 9, 2018, from <https://www.mckinsey.com/business-functions/digital-mckinsey/our-insights/disruptive-technologies>

potential areas for disruption-led growth across ASEAN, with emphasis on Singapore’s role in enabling the process.

2.1 The ASEAN Economy

2.1.1 Market and Consumption

ASEAN is the world’s third largest market by population (Fig 2.1), with a combined nominal GDP of US\$2.55 trillion growing at 6 percent per annum from 2008–2017. (Fig. 2.2)

70% of ASEAN’s population is under 40 years-old, and ASEAN’s middle class is projected to increase from 190 million to over 440 million by 2025⁷.

However, access to financial services remains limited. ASEAN’s population is largely unbanked: only 27% of consumers and SMEs are formally banked, and just 3% protected by insurance⁸ (Fig. 2.3).

2.1.2 Digital Connectivity

Southeast Asia (SEA) is the world’s fastest growing Internet region with approximately 3.8 million unique SEAsians added



Fig 2.1: The ASEAN Economy at a glance⁵

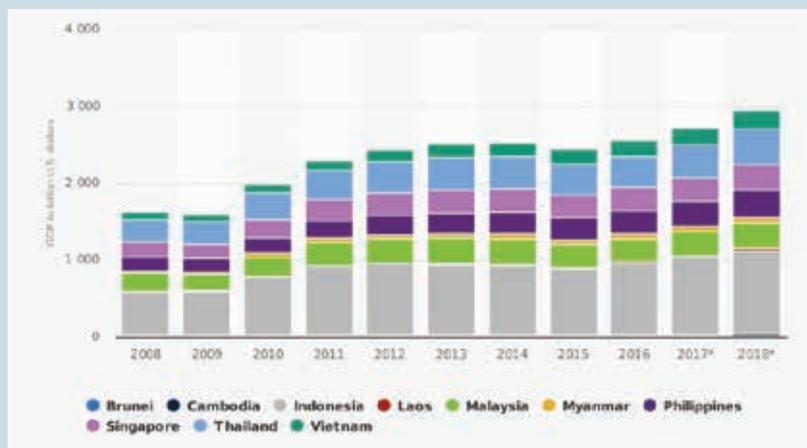


Fig 2.2: Gross Domestic Product (GDP) of ASEAN countries from 2008 to 2018 (in billion U.S. dollars)⁶

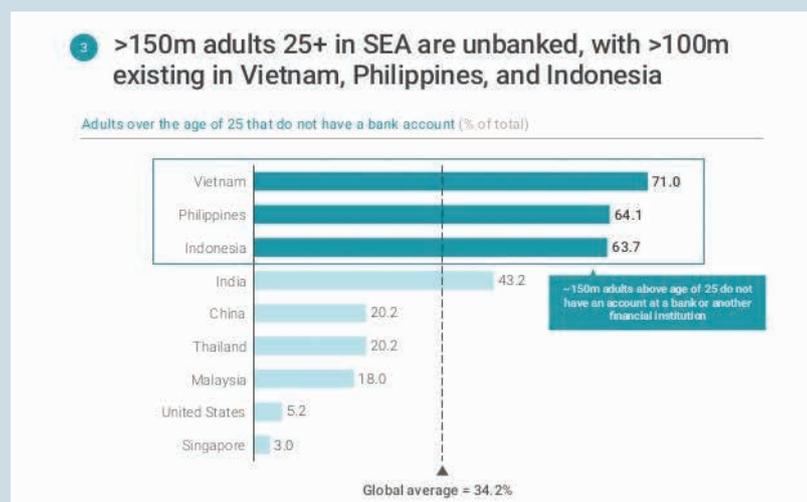


Fig 2.3: Unbanked population (by percentage) in SEA countries compared globally

⁵ ASEAN Economic Community. (March 2017). The ASEAN Economy at a Glance. *ASEANStats*. Retrieved April 18, 2018, from <http://www.aseanstats.org/wp-content/uploads/2017/03/Binder-AEC-at-a-Glance.pdf>

⁶ Statista. (2018) Gross Domestic Product (GDP) of the ASEAN countries from 2008 to 2018. *Statista*. Retrieved May 9, 2018, from <https://www.statista.com/statistics/796245/gdp-of-the-asean-countries/>

⁷ Anandan, R., Sipahimalani, R., Bharadwaj, A., Jhangiani, J., Kim, D., and Ramesh, S. (2016). e-economy SEA: Unlocking the \$200B Digital Opportunity. *Google and Temasek*. Retrieved April 26, 2018, from <https://www.thinkwithgoogle.com/intl/en-apac/trends-and-insights/e-economy-sea-unlocking-200b-digital-opportunity/>

⁸ The 'Unbanked' population refers to the over 70% of the ASEAN population with no access to financial services from banks.

to the Internet every month; current Internet penetration stands at 53% (Fig. 2.4).

Additionally, smartphone penetration is estimated at 35% and growing rapidly¹⁰ over the past five years (Fig. 2.5).

Mobile broadband coverage in SEA is also high at 70%, compared to the global average of 55% (Fig 2.6).

2.1.3 Workforce and Education

Labour force participation rate in ASEAN is estimated at 70%, and is highly varied¹².

Adult literacy rate¹³ ranges from 78–96% (Fig. 2.7), with a consistent growth in higher education, and English being the predominant language for business transactions¹⁴.

2.1.4 Intra- and Extra-ASEAN Trade

While intra-ASEAN export is increasing around 1.5% each

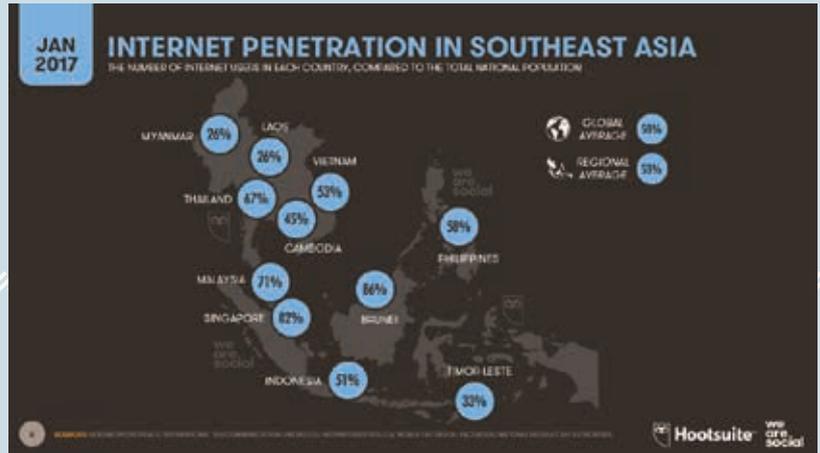


Fig 2.4: Internet Penetration (by percentage) across ASEAN countries⁹

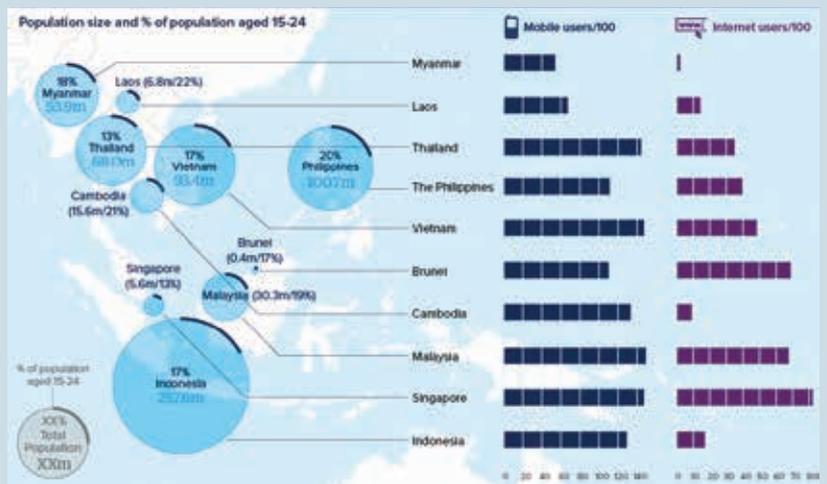


Fig 2.5: Mobile Telephone and Internet Penetration across ASEAN Countries¹¹

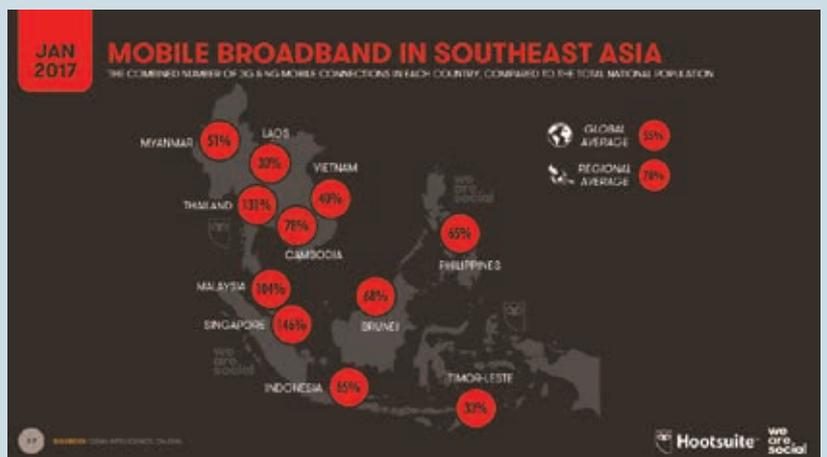


Fig 2.6: Mobile Broadband across ASEAN countries

⁹ Kemp, S. (February 8, 2017). The full guide to Southeast Asia's digital landscape in 2017. *TechnAsia*. Retrieved May 8, 2018, from <https://www.techinasia.com/talk/full-guide-southeast-asia-digital-landscape-2017>

¹⁰ Over the past five years (2013-2017), mobile phone connectivity has increased in Myanmar by 93%, Cambodia by 173%, Vietnam by 131% and Thailand by 133%.

¹¹ Source: World Bank; International Telecommunication Union; UN; Eurostat; Secretariat of the Pacific Community; US Census Bureau; Oxford Analytica. Note: Not unique mobile phone users.

¹² ASEAN's workforce is highly varied, ranging from predominantly productive and cost-competitive labor in less developed states, to predominantly highly-skilled industry practitioners and licensed professionals in more developed states.

¹³ Adult literacy rate is defined as the percentage of population over 15 years of age who can read and write.

¹⁴ According to the 2012 Business English Index, Southeast Asia attained a business English index (BEI) of 5.02, higher than the BEI scores of 12 other regions covered by the study. The Philippines attained a BEI score of 7.11 and emerged on top of the list worldwide.

year¹⁵, extra-ASEAN trade is over three times that of intra-ASEAN (Fig. 2.8).

2.1.5 State of Collaboration within ASEAN

The ASEAN community comprises shared initiatives promoting regional stability and socio-economic growth (Fig. 2.9).

Specifically, the implementation of the ASEAN Economic Community (AEC) in 2015 has promoted a renewed sense of optimism and urgency for economic integration¹⁷, while ongoing efforts in the Master Plan on ASEAN Connectivity (MPAC)¹⁸ and the ASEAN Financial Innovation Network (AFIN)¹⁹ could create greater connectivity and financial solutions within ASEAN.

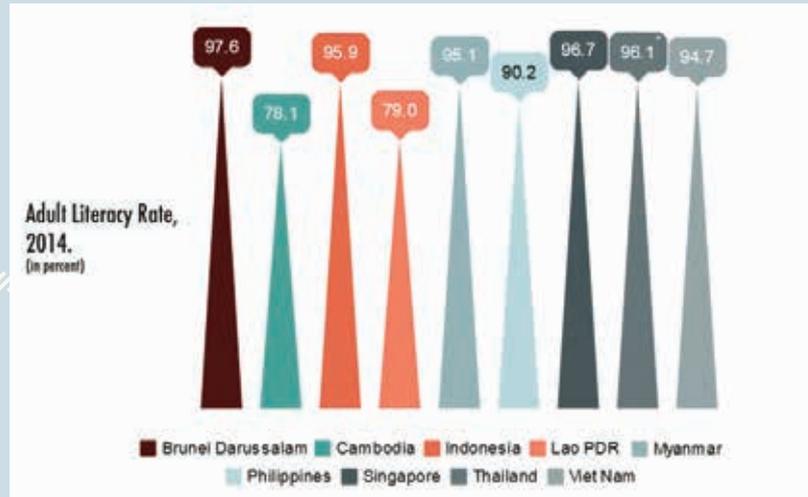


Fig 2.7: Adult Literacy Rate in ASEAN

Country	Intra-ASEAN trade		Extra-ASEAN trade		Total trade (US\$million)
	Value (US\$million)	% Share to total trade	Value (US\$million)	% Share to total trade	
Brunei Darussalam	2,645	27.6	6,947	72.4	9,592
Cambodia	4,462	22.7	15,214	77.3	19,676
Indonesia	63,610	21.7	229,452	78.3	293,061
Lao PDR	4,357	64.4	2,407	35.6	6,763
Malaysia	102,848	27.4	272,321	72.6	375,169
Myanmar	11,467	39.4	17,637	60.6	29,104
Philippines	25,601	19.9	103,343	80.1	128,944
Singapore	182,051	27.5	481,059	72.5	663,109
Thailand	104,821	25.1	312,327	74.9	417,147
Viet Nam	41,891	12.8	285,853	87.2	327,744
ASEAN	543,751	24.0	1,726,559	76.0	2,270,310

Fig 2.8: Intra- and Extra-ASEAN Trade, 2016¹⁶

Overview of the ASEAN Community

- ASEAN Political Security Community (APSC)
 - Ensures that the peoples and Member States of ASEAN live in peace with one another and with the world at large in a just, democratic and harmonious environment.
- ASEAN Economic Community (AEC)
 - Transforms ASEAN into a stable, prosperous, and highly competitive region with equitable economic development, and reduced poverty and socio-economic disparities.
- ASEAN Socio-Cultural Community (ASCC)
 - Contributes to realising an ASEAN Community that is people-oriented and socially responsible with a view to achieving enduring solidarity and unity among the peoples and Member States of ASEAN.
- Narrowing the Development Gap (NDG)
 - Progressing together through cooperation in development.

Fig 2.9: Overview of ASEAN Community

¹⁵ PWC. (October 19, 2017). Intra-ASEAN trade could exceed US\$375 billion by 2025. PWC. Retrieved May 3, 2018, from <https://press.pwc.com/News-releases/intra-asean-trade-could-exceed-us-375-billion-by-2025/s/597b2c9a-9710-4568-9971-69bfd8e8910c>

¹⁶ Intra-regional trade in ASEAN is low compared to most other regional economic blocs. By comparison, it took just five years after the implementation of NAFTA (North American Free Trade Agreement) for intra-NAFTA trade levels to exceed extra-NAFTA trade.

¹⁷ The ASEAN Economic Community pledges to promote free movement of goods, services, investment, skilled labor, and free flow of capital. The AEC 2025 Consolidated Strategic Action Plan includes a number of strategic measures that harmonise with the ASEAN ICT Masterplan 2020 and the ASEAN Telecommunications and IT Ministers Meetings.

¹⁸ MPAC, adopted in 2010, aims to promote sustainable infrastructure, digital innovation, seamless logistics, regulatory excellence, and people mobility. It has already led to significant digital and physical infrastructure investments to enhance connectivity across ASEAN: between 2011 and 2015, almost US\$50 billion were invested by ASEAN countries in building communication infrastructure in the region, and 39 initiatives in MPAC 2010 has been successfully completed.

¹⁹ The International Finance Corporation (IFC) and MAS signed a memorandum of cooperation in 2017 to establish AFIN. AFIN aims to support financial services innovation and inclusion in less developed markets within the ASEAN region and to provide a platform for collaboration and innovation for financial institutions and FinTech firms.

2.2 Opportunities

The areas explored show that ASEAN has strong fundamentals to pursue disruption-led growth. We will be looking at key sectors where opportunities for growth are abundant, with a focus on the digital economy.

2.2.1 The Digital Economy

The ASEAN digital economy currently generates approximately \$150 billion in revenue annually, but e-commerce is still relatively nascent (Fig 2.10).

Currently, ASEAN makes up less than 1% of global retail in e-commerce²⁰, making it a hugely under-tapped, fast growing market.

With a young, increasingly educated and wealthy middle class (section 2.1.1, 2.1.3), alongside rapid growth in digital penetration (section 2.1.2), e-commerce is expected to grow at 32% CAGR²¹, with ASEAN potentially becoming one of the world's top 5 digital economies by 2025 (Fig. 2.11).

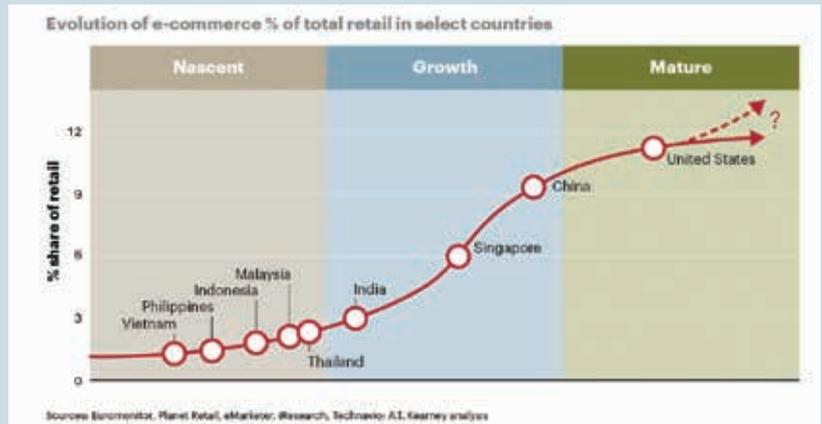


Fig 2.10: ASEAN Countries still fairly nascent in E-commerce

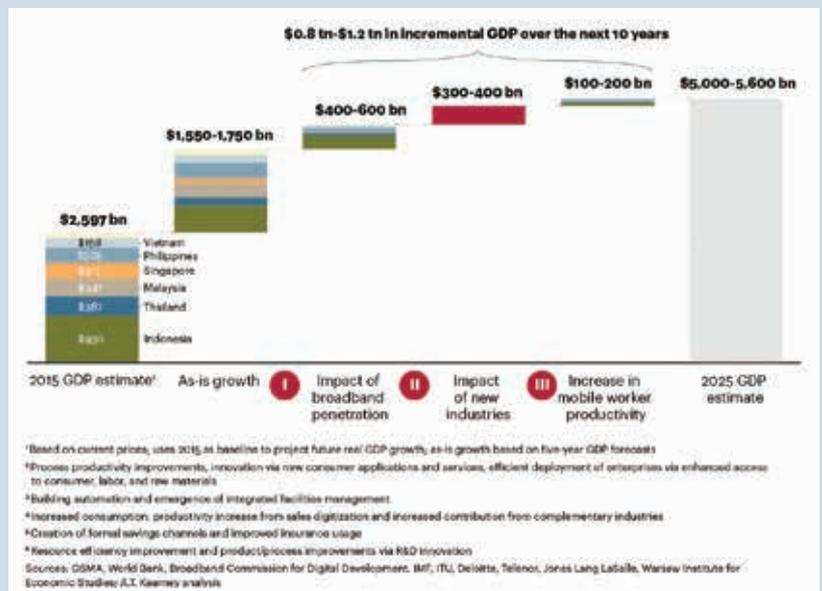


Fig 2.11: ASEAN's Digital Economy has potential to add an Incremental \$1 trillion in GDP by 2025

²⁰ Chua, S.G., and Dobberstein, N. (February 2016). The ASEAN Digital Revolution. *AT Kearney*. Retrieved May 5, 2018, from http://www.southeast-asia.atkearney.com/innovation/asean-innovation/asean-digital-revolution/full-report/-/asset_publisher/VHe1Q1yQRpCb/content/the-asean-digital-revolution/10192

²¹ Anandan, R., Sipahimalani, R., Bharadwaj, A., Jhangiani, J., Kim, D., and Ramesh, S. (2016). e-economy SEA: Unlocking the \$200B Digital Opportunity. *Google and Temasek*. Retrieved April 26, 2018, from <https://www.thinkwithgoogle.com/intl/en-apac/trends-and-insights/e-economy-sea-unlocking-200b-digital-opportunity/>.

2.2.2 Innovation and Adoption of Fintech

ASEAN is also primed for early adoption and innovation of FinTech services: high broadband coverage and mobile penetration (section 2.1.2) gives the opportunity of mobile banking²² development to provide access to financial services. This could directly increase GDP by 9–14 per cent²³, and significantly more via integration into the digital economy (see section 3.1).

Development in Distributed Ledger Technology (DLT)²⁴ could potentially revolutionize the cashless ecosystem (Fig 2.12), providing an alternative to e-payments that are massively scalable at significantly lower costs²⁵.

2.2.3 Developing Human Capital

An educated, growing workforce (section 2.1.3) presents the opportunity for

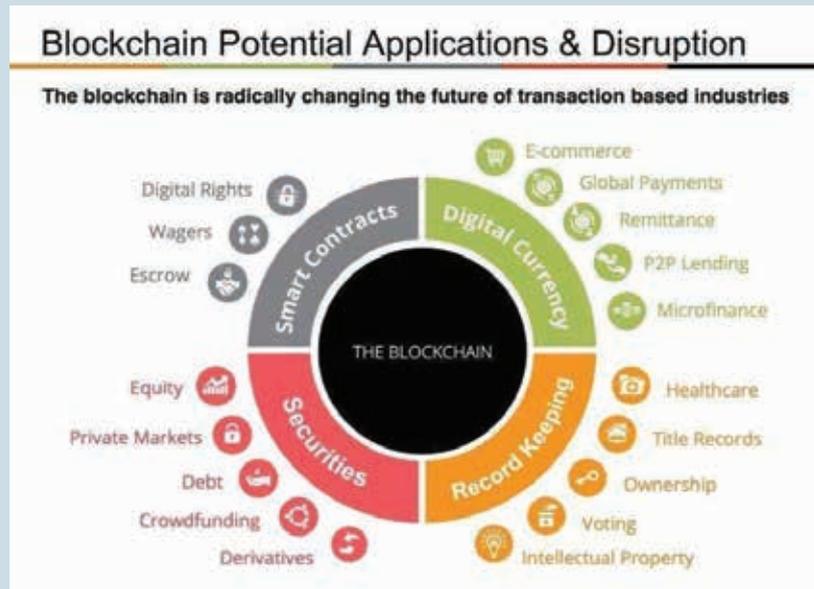


Fig 2.12: Potential Applications and Disruption of Blockchain

greater skills upgrading and development, to excel in the future economy in Industry 4.0.

ASEAN could harness improved regional connectivity for shared resources for skills training, and foster greater entrepreneurship and innovation to harness disruption-led growth across ASEAN states. (section 3.3)

2.2.4 Regional Collaboration and Co-development in Innovation

The AEC and AFIN initiatives (section 2.1.5) set a clear vision for greater economic integration in ASEAN, which could improve intra-ASEAN trade (section 2.1.4).

CAGR: Compound Annual Growth Rate.

The claim that ASEAN could 'potentially become one of the top 5 digital economies by 2025' is also taken from the above report.

²² Mobile banking is a service provided by a bank or other financial institution that allows its customers to conduct financial transactions remotely using a mobile device such as a smartphone or tablet. MAS managing director, Ravi Menon, has stated that mobile devices could play an important role in the spread of basic banking, insurance and payment services to under-served markets in ASEAN.

²³ An Asian Development Bank 2017 report stated that addressing financial exclusion could increase gross domestic product (GDP) by 9-14 per cent in countries with a significant unbanked population, with the potential boost to GDP as high as 32 per cent in Cambodia.

²⁴ Distributed Ledger Technology, or blockchain, is a consensus of replicated, shared, and synchronized digital data geographically spread across multiple sites, countries, or institutions, that has significant potential applications in Fintech.

²⁵ Potential future development to blockchain technology could result in massive scalability with significantly lowered transaction costs (elaborated in section 3.1).

Economies of scale could be gained via collaboration of enterprises regionally, and positive externalities could originate from co-working hubs in an intra-ASEAN network of smart cities.

2.3 Challenges

Nonetheless, there remain prominent issues that stand in the way of ASEAN connectivity and growth.

2.3.1 Limitations to Regional Entrepreneurship and Innovation

Regulations are in place inhibiting innovation in financial services and E-commerce: regulations against operator-led mobile banking solutions are still prevalent²⁶, and inconsistent custom duties hamper widespread cross-border e-commerce growth (Fig 2.13).

Lack of post-seed funding capital²⁷ for firms, and lack of financial incentive to expand

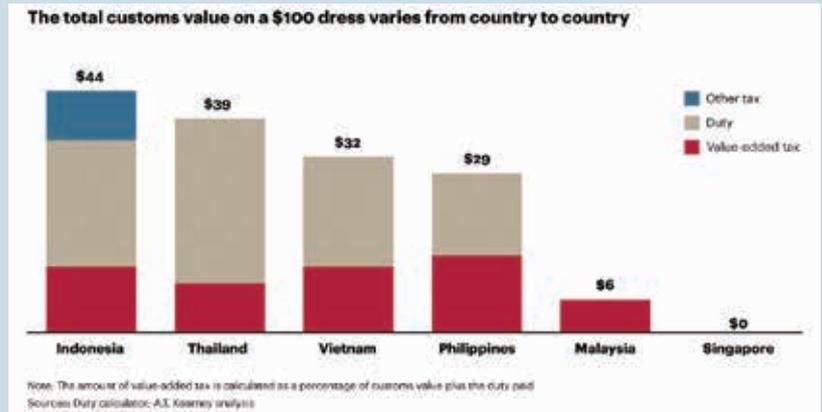


Fig 2.13: Inconsistent Import Duties across ASEAN countries



Fig 2.14: Low number of Internet Startups in ASEAN compared to other Tech Hubs worldwide, except for Singapore

regionally²⁸ also limit the number of Internet startups across ASEAN (Fig 2.14), while educational systems that hinder entrepreneurship and innovation²⁹ have also led to outsourcing of senior developer and leadership roles.

Furthermore, a lack of a single digital market³⁰ and no scalable e-payment alternative to bankcards (such as AliPay in China) will increase costs and limit transaction speeds of cross-border payments.

²⁶ Debate between operator-led and bank-led models for mobile financial services are prevalent within policymakers across SEA, which hinders development and adoption of financial solutions, such as mobile banking.

²⁷ Most funds (VC and government) for ASEAN startups are focused on seed state investments than early state investments; <7% have raised funding post seed.

²⁸ For example, the business case for expansion of broadband as well as other Internet business is weak.

²⁹ Entrepreneurship is being hindered by an educational system that doesn't foster an innovative spirit. Research has shown that in countries that perform well in traditional education, fewer citizens are confident in their entrepreneurial capabilities.

³⁰ A single ASEAN digital market would require member states to align their digital visions and strategies to create a single, borderless digital market and harmonized digital regulations. Currently, only Singapore, Malaysia, and Philippines have a mature and comprehensive digital strategy.

2.3.2 Inadequate Logistics and Internet Infrastructure

Weak last-mile delivery options across ASEAN³¹ (less Singapore) and inadequate physical infrastructure addressing challenging topographical structure³² will inhibit cost-effective E-commerce growth.

Additionally, insufficient transport connectivity between ASEAN cities also limits movement of human capital and goods.

Furthermore, Internet penetration remains low for several ASEAN territories³³ due to high cost of deploying broadband in rural areas, as well as the poor allocation of broadband spectrum and aggressive competition amongst teclo-players putting off potential investors³⁴.

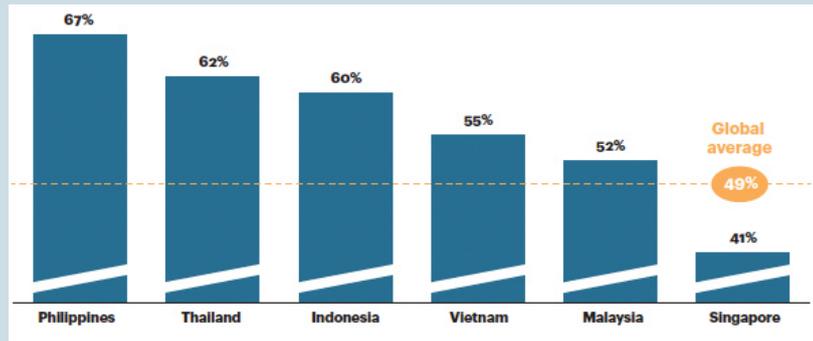


Fig 2.15: Percentage of ASEAN Digital Buyers reluctant to share Financial Information online

2.3.3 Lack of Consumer Trust and Awareness

Indonesia, Philippines, Thailand and Myanmar are part of the 10 countries most at risk of cyber-attacks³⁵, and 58% of SEAsians are reluctant to share financial information online (Fig 2.15).

Moreover, consumer awareness across ASEAN (less Singapore) is limited: despite growing mobile penetration

(section 2.1.2), only <4% of Indonesians have heard of mobile banking, while many in Vietnam only use basic mobile services³⁶. A push for digitalisation has also led to more cyber-attacks and online terrorism³⁷. Cyberattacks poses a serious threat to ASEAN’s economy³⁸, and current efforts by member countries are insufficient³⁹.

³¹ Last mile delivery is defined as the movement of goods from a transportation hub to the final delivery destination.

³² 2 major markets in ASEAN, Philippines and Indonesia, are archipelagos, e.g. in Indonesia delivering goods outside of Java can take over 10 days and sea and freight costs could exceed \$1,000 for a 20 ft container).

³³ 67% of the ASEAN population (close to 417 million people) still live without access to basic internet services (lack of access is more severe in CLMV (Cambodia, Laos, Myanmar and Vietnam) countries), and connection speed lags behind global averages (with the exception only of Singapore and Thailand).

³⁴ Allocating a finite resource such as spectrum to too many operators will result in spectrum bloc fragmentation and limit throughput speeds. Also, operators have large investments in infrastructure but their revenues are under pressure from competition from OTT players and an unfavorable pricing structure.

³⁵ Security Threat Report, 2013 Sophos; Akamai

³⁶ In Vietnam, the majority of smartphone users do not download their own apps and rely on local smartphone stores to preload new phones with apps prior to purchase

³⁷ “ISIS continues to propagate its ideology and foment trouble in Southeast Asia, despite having been defeated militarily in the Middle East. We are also seeing more cyber-attacks as we push for digitalisation.” — Prime Minister Lee Hsien Loong at the Opening Ceremony of the 32th ASEAN summit, 2018.

³⁸ A report by A.T. Kearney suggests that top 1,000 ASEAN companies could lose \$750 billion due to cybersecurity threats.

³⁹ ASEAN countries are under-spending on cybersecurity. Only about 0.07% of ASEAN’s GDP is spent on cybersecurity, compared to the global spending average at 0.13%. Also, there is an uneven distribution in spending on cyber security across the region with countries like Laos, Brunei, Cambodia, and Myanmar falling far behind.

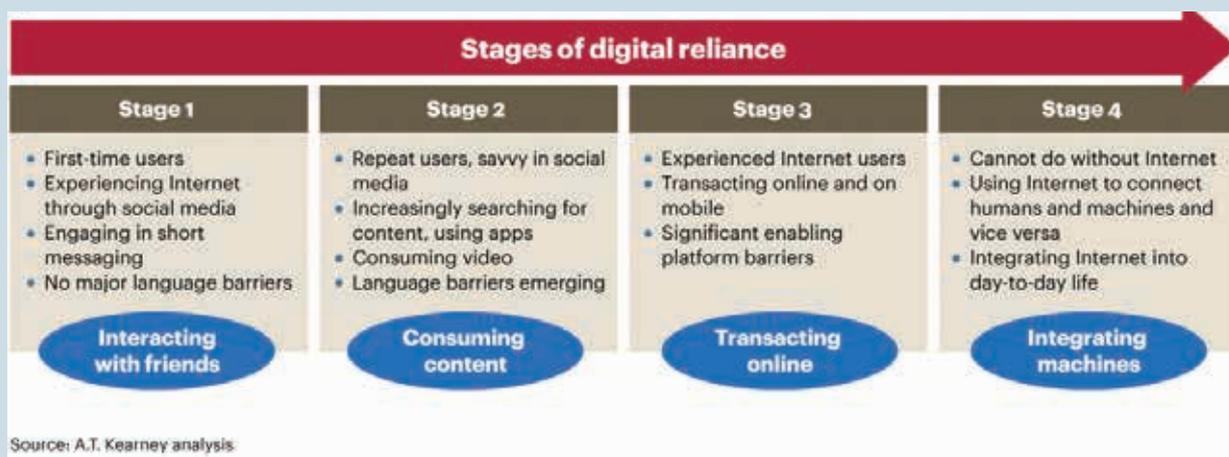


Fig 3.1: Internet users' gradual increase in reliance on Digital Technologies and Services⁴⁰

3. Harnessing Technology and Connectivity for Future-Proofed, Sustainable Growth across ASEAN

To exploit the opportunities available and overcome the challenges, we propose a four-pronged solution for Singapore and her enterprises to lead ASEAN to success in the digital economy.

3.1 Creating a More Inclusive and Extensive Intra-ASEAN Digital Economy

First, we aim to include the financially-excluded ASEAN population and simplify

participation in the digital economy, whilst providing more accountability and enabling greater intra-ASEAN e-commerce.

a) Integration of Unbanked SEA Population into Digital Economy

73% of the SEAsian population remains unbanked (section 2.1.1). Tapping this market would bolster the intra-ASEAN digital economy significantly (section 2.2.1), (Fig 3.1).

Singapore should develop

a mobile banking solution (section 2.2.2) that can be testbedded here⁴¹, thereafter rolling it out to other ASEAN economies⁴².

Across the board, local e-payment solution providers⁴³ should develop their mobile e-wallet platforms to simplify fiat-to-digital-currency conversion, perhaps through partnerships with banks for withdrawal/deposit of cash from cashiers at shops⁴⁴ (Fig. 3.2)

Simultaneously, Singapore

⁴⁰ This suggests that introducing mobile banking to the unbanked ASEAN population would gradually integrate them into the digital economy, and could cause them to eventually become reliant on digital services.

⁴¹ Under AFIN, MAS and World Bank's IFC will set up an industry 'sandbox' to offer cloud-based testing to financial players by Q4 2018. Singapore's high digital penetration, advanced digital infrastructure, and availability of skilled workforce for innovation make it an ideal location in ASEAN for testbedding solutions.

⁴² AEC cooperation and regional support will be necessary for implementation.

⁴³ E.g. GrabPay, PayNow

⁴⁴ While Singapore's high banked rate and availability of ATMs islandwide might make this initiative seem redundant, it is necessary to testbed cashier-withdrawal/deposit of fiat-digital processes. This is because access to ATMs in less-developed ASEAN countries is low, and costs of expanding ATM networks high. Conversely, access to retail outlets is more widespread, even across less-developed SEA countries.

needs to enforce policies that allow operator-led mobile banking services to coexist and compete with bank-based solutions⁴⁶, whilst incentivising innovation (see section 3.3).

b) Integrated Digital Payment Systems

However, too many e-payment providers weakens a cohesive digital payments ecosystem⁴⁷.

While integration of e-payment services across Singapore are taking place⁴⁸, DLTs could be harnessed for complete integration of all e-payment platforms⁴⁹, attaining increased scalability, privacy and transaction speeds, whilst decreasing transactional costs⁵⁰. (Fig 3.3)

Simultaneously, to enhance efficiencies in cross-border and inter-bank transactions⁵², Singapore should expand on

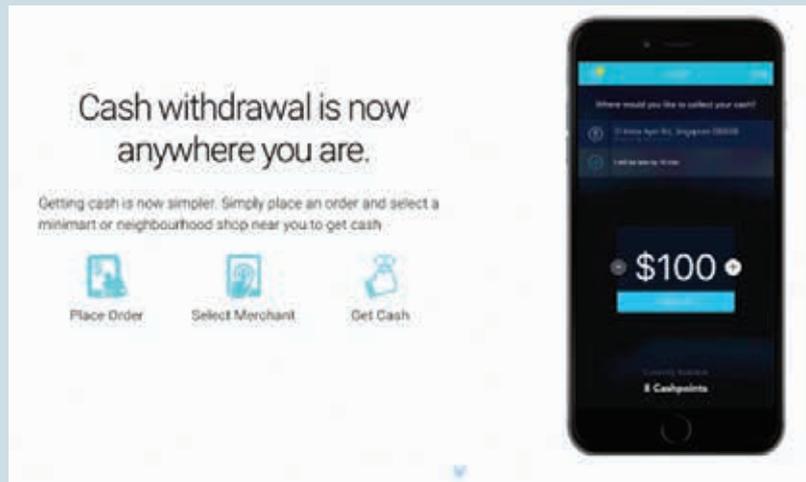


Fig 3.2: A 'socash' Advertisement⁴⁵



Fig 3.3: Potential future e-payments solution 'omisego'⁵¹

⁴⁵ An example of the aforementioned model is *socash*, a Singaporean Fintech startup which has established a 'Cashpoints' network across various retail outlets islandwide with MAS support.

⁴⁶ This addresses the regulatory concerns across ASEAN against the operator-led e-payments growth model, discussed in section 2.3.1. If mutual coexistence and competition are testbedded and shown to enhance innovation, adoption across SEA would rise as well.

⁴⁷ Having many E-payment platforms that have little liquidity between them and charge high transaction costs would disincentive adoption.

⁴⁸ Singtel and Razer (video gaming company) announced plans in May 2018 to link their digital payments systems in SEA, while Singapore's Paynow and Thailand's PromptPay are also discussing linking their e-payment systems.

⁴⁹ Ethereum-based token OmiseGo (Appendix A) is developing a white label Software Development Kit e-wallet that could potentially act as a backend for e-payment providers. It incentivises adoption via significantly higher transaction speeds and smart contracts eliminating most administrative costs. An integration of backend technology with a white label wallet, simply put, means that you could pay someone with GrabPay, and that person could use Paynow to buy a burger in McDonald's, whilst the individual operators' branding remains. More in Appendix A.

⁵⁰ Transactions on DLTs using smart contracts will run on Ethereum's Plasma chain, expected to allow over 1,000,000 transactions per second (tps). By comparison, Visa handles on average 2,000 tps.

⁵¹ More in Appendix A

⁵² As the digital economy expands within ASEAN, volume of cross-border payments is expected to increase exponentially. Increasing efficiencies of cross-border transactions and simplifying interbank payments are necessary for the rapidly growing digital economy.

MAS' Project Ubin (Fig 3.4), a successful testbed of DLTs, with Singapore's central bank (MAS) as the key regulator⁵³.

c) Streamlining Regional Trade Rules

As our nascent digital economy grows rapidly with the introduction of the unbanked population, greater economic cooperation is also required within AEC to streamline regional trade rules, ensuring

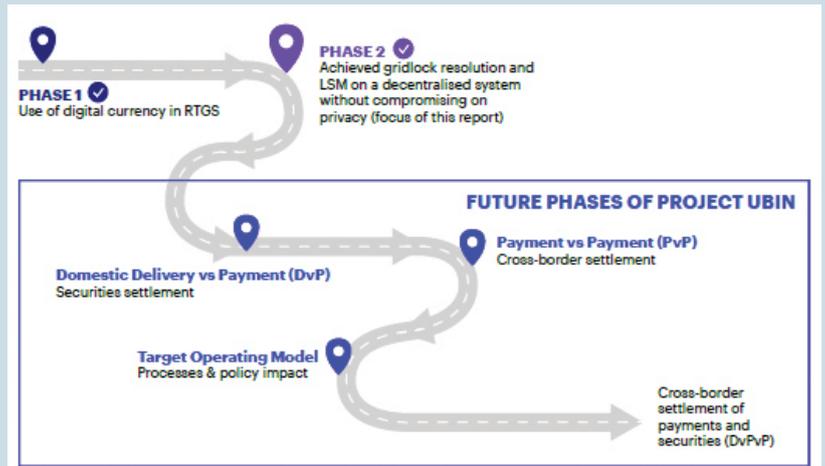


Fig 3.4: Overall Journey of Project Ubin by MAS⁵⁴

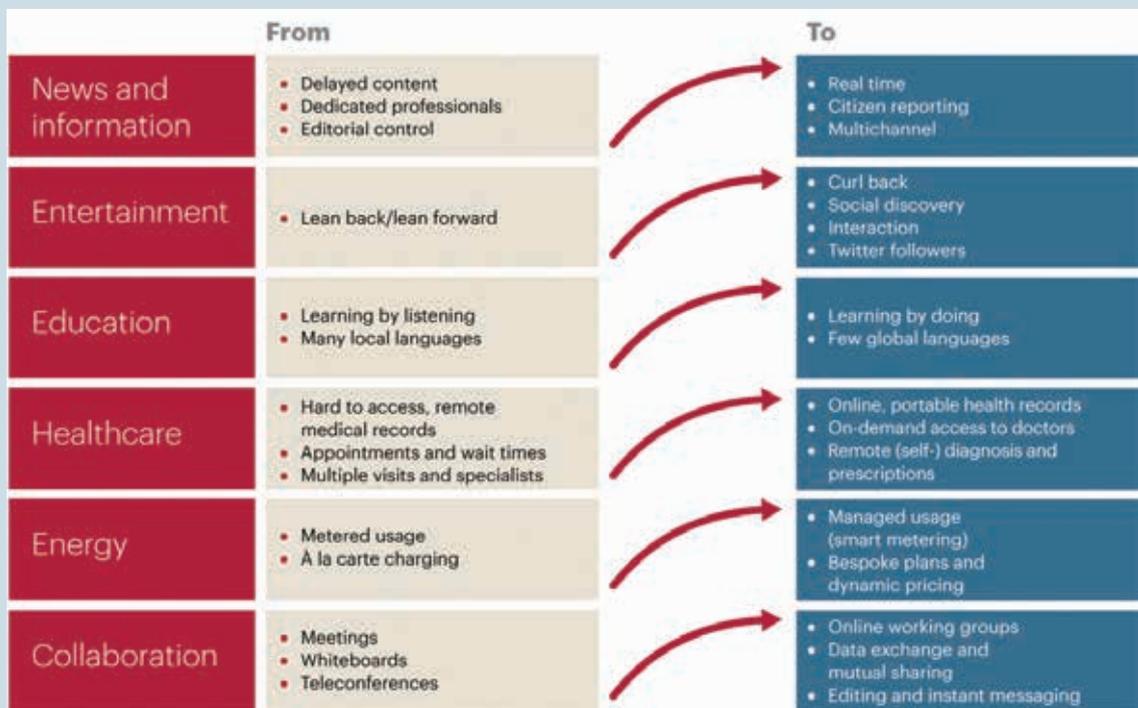


Fig 3.5: Industries Disruption by the Digital Economy⁵⁵

⁵³ While MAS Project Ubin showed that a centralised operator to facilitate cross-border payments would not be required in DLTs (thereby also reducing administrative costs for Singapore), a central bank acting as a regulator still plays a vital role in the critical payment network infrastructure across cities.

⁵⁴ More in Appendix B

⁵⁵ Source: A.T. Kearney analysis. Apart from the rapidly growing size of the digital market, many industry sectors could also be disrupted by industry 4.0 and digitisation, and brought into the e-commerce market. AEC regulations need to be strong to ensure fairness and competitiveness across these various 'new' sectors.

fairness and consistency (Fig 3.5).

In particular, Singapore should raise its e-commerce levies to match others in the region⁵⁶ ensuring uniformity and greater incentive for operators' expansion/foray into the digital economy.

In creating a more inclusive and extensive intra-ASEAN digital economy, we utilise fintech adoption and innovation to capture the opportunities of a burgeoning digital market, whilst targeting regional trade regulations limiting regional entrepreneurship.

3.2 Strengthening Digital and Physical Connectivity Infrastructure (Smart Cities)

Secondly, we aim to target inadequate infrastructure (section 2.3.2), to promote greater collaboration within ASEAN for growth and build upon our connectivity successes (Fig 3.6)

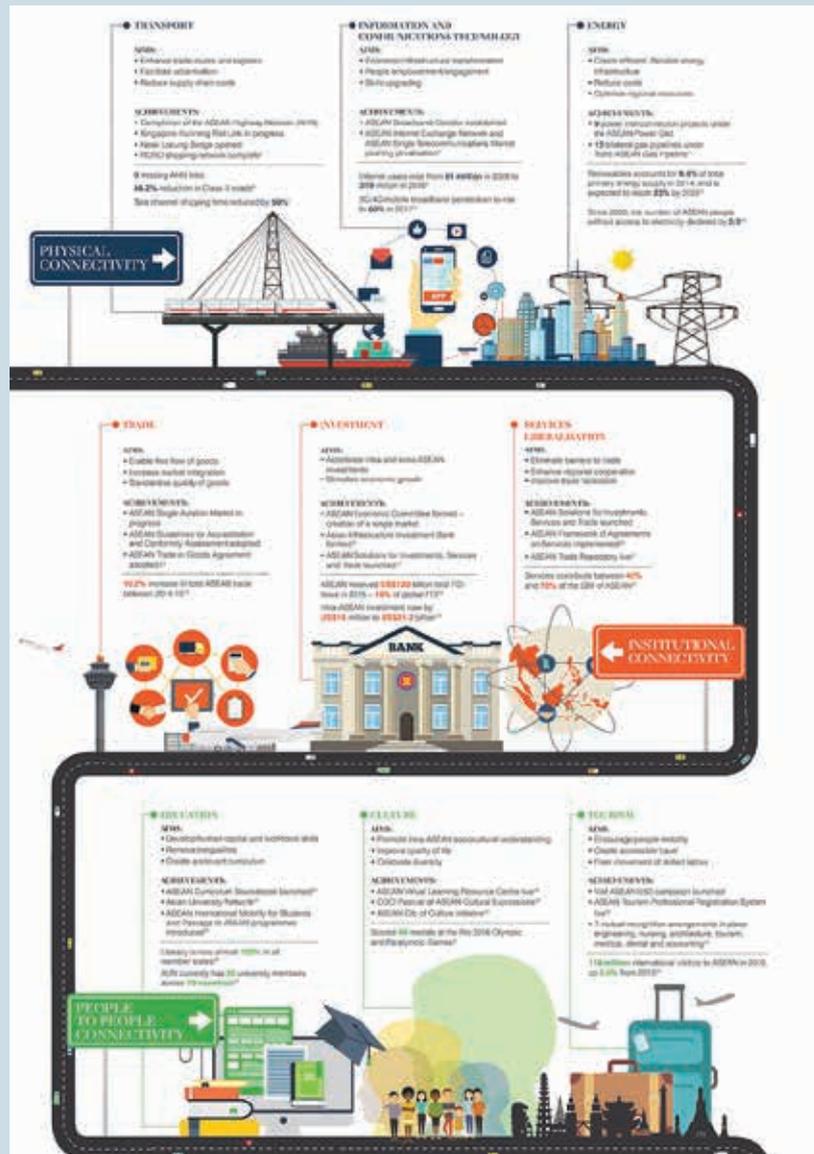


Fig 3.6: ASEAN's Connectivity Successes⁵⁷

⁵⁶ Currently, Singapore charges no GST, or any other form of tax for e-commerce purchases below \$400 (see section 2.3.1).

⁵⁷ Lee Kuan Yew School of Public Policy. (March 2017). ASEAN's Connectivity Success. *LKY School of Public Policy*. Retrieved May 01, 2018, from http://global-is-asian.nus.edu.sg/wp-content/uploads/2017/03/ASEAN-connectivity-infographic_r.jpg

a) Increasing Access to Broadband and Digital Services

Increasing high-speed Internet access (especially in less developed countries), will drive growth⁵⁸. This can be done in two ways:

i) Common Broadband Plan
All ASEAN countries should release a common spectrum with a harmonized broadband plan (Fig. 3.7), allowing the mobile industry to reap economies of scale and consumers to enjoy lower prices. Singapore has already committed to this plan, and should take charge

in persuading others to follow suit.

ii) Ensuring Healthy Operators Economics

Telecom operators in ASEAN have higher capital expenditure than global ones (Fig 3.8). Consolidation⁵⁹ is required for the remaining operators to

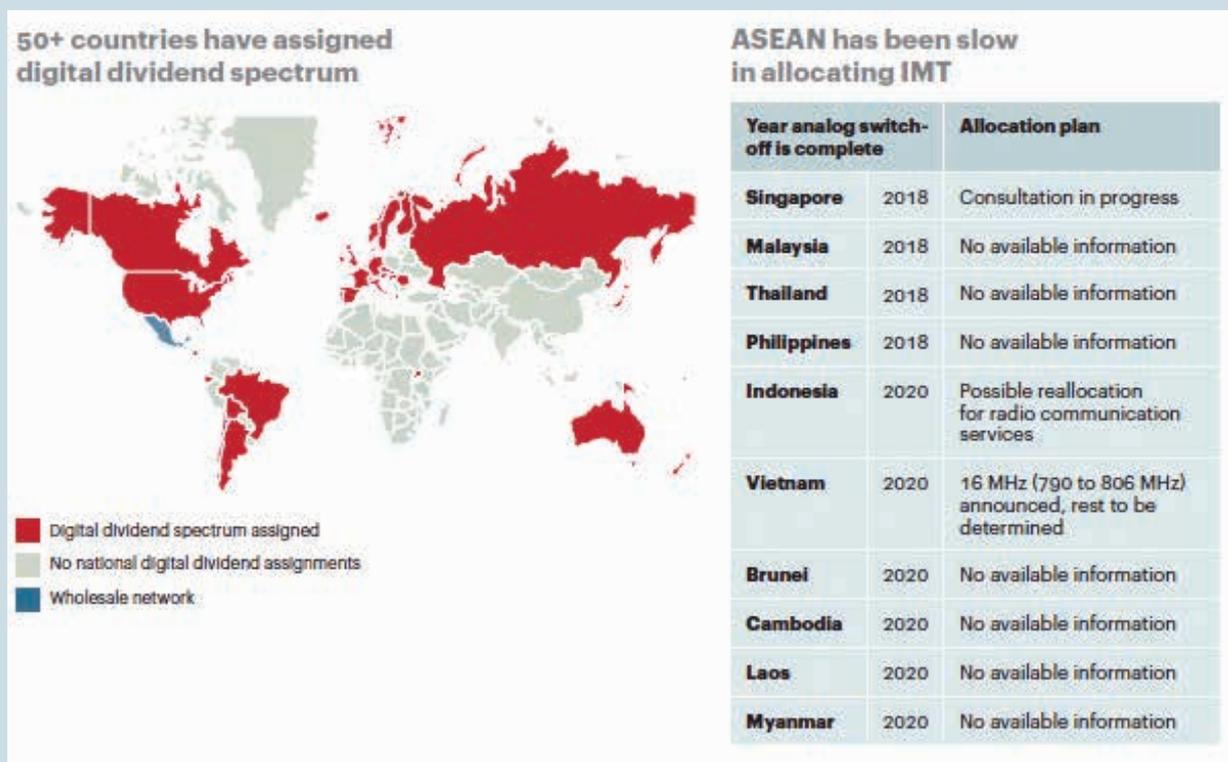


Fig 3.7: Digital Dividend has not been fully allocated to International Mobile Telecommunications

⁵⁸ The immediate impact of an increase in broadband penetration is akin to the impact of any infrastructure project, with a rise in employment and multiplier effect on other industries. Moreover, an increase in broadband access for households and enterprises boosts income and the consumer surplus, further fueling GDP growth. Multiple studies across different geographies in the world have shown that a 10 percentage point increase in broadband penetration increases GDP growth by 0.16 to 0.25 percentage points. In addition, studies have shown that doubling the broadband speed can add 0.3 percentage points to annual GDP growth.

⁵⁹ The existence of three to five operators is said to be the 'magic number' to sustain an efficient mobile market. Source: Chua, S.G., and Dobberstein, N. (February 2016). The ASEAN Digital Revolution. AT Kearney. Retrieved May 5, 2018, from http://www.southeast-asia.atkearney.com/innovation/asean-innovation/asean-digital-revolution/full-report/-/asset_publisher/VHe1Q1yQRpCb/content/the-asean-digital-revolution/10192

standards, and methods to reap economies of scale as the urban centers develop.

c) Enhancing Intra-ASEAN Physical Connectivity

Improving physical connectivity would improve flow of goods and human resources, and benefit intra-ASEAN collaboration⁶⁶.

While key projects are in the works⁶⁷, lack of funding, technical knowledge, outdated transport infrastructure, and disparate access of technology have hindered progress.

Singapore should provide necessary assistance to less-developed ASEAN nations, and

be proactive in pushing ASEAN to operationalise agreements that strengthen air, sea and land links, and have the potential of revolutionising transport integration using technology⁶⁸.

3.3 Fostering Digital Innovation and Entrepreneurship with Regional Ambitions

To foster greater digital innovation and regional entrepreneurship, significant investments into human capital and policies incentivising entrepreneurship are necessary.

a) Skilling Up Workforce, and Streamlining Education

Developing a skilled workforce for innovation starts from schools. Singapore's education system "lags behind in efficacy for learning in the new age"⁶⁹, and should be streamlined to better suit Industry 4.0 needs⁷⁰.

Higher education in STEM-related fields should be further promoted: by increasing the availability of tertiary education placements⁷¹ and marketing STEM careers as an attractive choice⁷².

Ensuring globally competitive salaries for STEM careers in Singapore⁷³ is also

⁶⁶ In particular, it would incentivise and speed up Singapore's human resource movement to less-developed SEA countries and forge greater bonds and collaboration with them, thereby allowing initiatives such as ASCN to be pushed out more quickly as well.

⁶⁷ ASEAN Highway Network, Singapore-Kunming Rail Link, Maritime Transport and Inland Waterways, Trans-ASEAN Gas Pipeline, ASEAN Power Grid, ASEAN Broadband Corridor, and perhaps the most well known recently, the Singapore-KL High Speed Rail.

⁶⁸ Singapore should provide guidance on these agreements. For example, Singapore could share how it incorporates technology into its transport systems: airport terminals, shipping ports and land transport.

⁶⁹ Singapore's education system is "centred on a top-down culture of a one-size-fits-all curriculum, age-based cohorts, and streaming based on standardised exams" and "lags behind in efficacy of learning for the new age", according to former MP and current Chairman and CEO of Singapore Education Academy R Sinnakaruppan.

⁷⁰ Curriculums should aim to focus on developing analytical and problem-solving capabilities rather than rote learning, and STEM related fundamentals, such as introduction to basic programming, could be introduced from Primary education as a compulsory subject.

⁷¹ NUS, NTU and SMU have increased the total number of places in their computing and information systems courses by 22%, 15% and 400% respectively from 2016 to 2018. However, number of applicants for the places have, on average, increased even more. Hence, continually increasing the number of placements, alongside providing further specialisations to target more niche fields in the digital economy, are necessary going forward.

⁷² Attractive starting salaries and career progression could be marketed further to attract greater talent. Offering scholarships to talented Singaporeans, as well as 'scouting' for talents regionally to bring into Singapore, would be beneficial in the long run as well.

⁷³ Average software engineer salary in Singapore, at US\$35,000 (S\$49,000), is below the global average of US\$49,000, according to a 2018 report by US organisation Startup Genome Project.

necessary to pre-empt brain drain⁷⁴.

While Singapore plans to create 4,000 new Fintech jobs annually⁷⁵, continual customization⁷⁶ in workforce skills and retraining programmes such as *SkillsFuture* (Fig 3.10) are vital.

b) Enhancing Local Entrepreneurship

Singapore has one of the best startup ecosystems globally⁷⁷, a skilled workforce and existence of local entrepreneurs with regional ambitions (Fig 3.11).



Fig 3.10: SkillsFuture programme aimed at helping Singaporeans acquire skills relevant to demands in the economy



Fig 3.11: Singapore is the most successful startup ecosystem in SEA; it has the highest number of startups valued over US\$100m

⁷⁴ While Singapore is 2nd and 4th globally for having the best ecosystems for start-ups, we are only 10th place in talent quality, with many top local talents working in Silicon Valley.

⁷⁵ Singapore's Industry Transformation Map (ITM) for financial services indicates plans to create 4,000 Fintech jobs annually until 2020.

⁷⁶ Necessary skills for FinTech jobs could change rapidly given how disruptive the industry is. To ensure the workforce is well-equipped with necessary skills, retraining programmes must continually evolve with the necessary skills provisions. Enhancing an already tried and tested programme such as *SkillsFuture* — 126,000 Singaporeans picked up new skills in 2016 as a result of the S\$500 credit provided by *SkillsFuture* — would also likely produce good results.

⁷⁷ Singapore is ranked 2nd and 4th globally for having the best ecosystems for start-ups, according to a 2018 report by US organisation Startup Genome Project.

To help local enterprises expand regionally, we should address inefficient regulations and provide greater financial incentives for innovation and expansion.

i) Addressing Regulatory Inhibitions

Barriers to key stakeholders in the digital economy⁷⁸ present across ASEAN inhibit regional expansion.

Singapore could develop a startup model with greater bank-style flexibility and ease of enrollment⁷⁹, and push it out to ASEAN through the AEC.

ii) Providing Business Incentive

SPRING Singapore's current grants⁸⁰ could be enhanced and customized to further lower operational barriers to entry for Fintech startups, while streamlining incentives in R&D for enterprises developing Fintech and IoT technologies could further innovation⁸¹.

Additionally, Singapore could propose a regional fund set-up through AEC for Fintech funding, create regional co-working hubs⁸² promoting collaboration, and push out regionally the model of state-

supported Fintech growth (which clearly works — Fig 3.10).

c) Protecting and Promoting Innovation

To encourage greater innovation and patentship, Singapore should continue strengthening intellectual property (IP) rights locally and seek collaboration with the AEC to enforce stricter IP laws regionally⁸³.

Establishing Singapore as a regional testbed for innovation⁸⁴ would also entrench Singapore's position as the central FinTech innovation hub of SEA⁸⁵.

⁷⁸ The three key stakeholders in the digital economy are payment service providers, users and merchants.

⁷⁹ A more open, transparent system that enables greater liquidity with banks and start-ups for loans and investments, and simplifying and speeding up enrollment processes — namely the know your customer (KYC), anti-money laundering (AML) norms, would allow mobile financial services enterprises to develop faster and more extensively.

⁸⁰ The Standards, Productivity and Innovation Board (SPRING) consolidates all startup assistance schemes under an umbrella program 'Startup SG', which provides government-aided equity financing, cash grants, business incubators, debt financing, and tax incentive schemes.

⁸¹ Currently, for startups classified as "deep tech", Singapore provides 70% of the funding in the initial round investment of S\$500K. Thereafter, it will invest S\$1 for every S\$1 invested by private investors up to an investment cap of S\$4 million. However, typically, the technology a deep tech startup is developing is the result of years of research and lab testing and as such, requires a longer period to reach market viability. Increasing the scope of 'deep tech', pre-empting future disruptive technologies, and identifying the startups with potential fast would lower operational barriers to entry for these startups.

⁸² Shared regional co-working spaces, enabled by physical and digital connectivity infrastructure in the SEA region of smart cities, could bring together talented individuals to pioneer new ideas, fostering innovation, and positive externalities from their interactions — i.e. greater innovation than the discrete goals set out when establishing the hub. Examples of international co-working hubs for Fintech include Neutrino, a shared blockchain co-working space founded by Thailand e-payments provider Omise located in Japan, and could perhaps also loosely include Google offices which promote their international workers mingling with one another traveling around their many offices worldwide.

⁸³ Strong IP regulations would allow small-scale enterprises and developers — with no capital for costly copyright infringement lawsuits — to continue developing products without fear of their ideas or designs being poached.

⁸⁴ Under AFIN, MAS and World Bank's IFC will set up an industry 'sandbox' to offer cloud-based testing to financial players by Q4 2018. Singapore's high digital penetration, advanced digital infrastructure, and availability of skilled workforce for innovation make it an ideal location in ASEAN for testbedding solutions.

⁸⁵ Having the rest of ASEAN's Fintech firms to testbed ideas in Singapore could lead to greater collaboration with local Singaporean firms, thereby improving economies of scales and bolstering of local innovation.

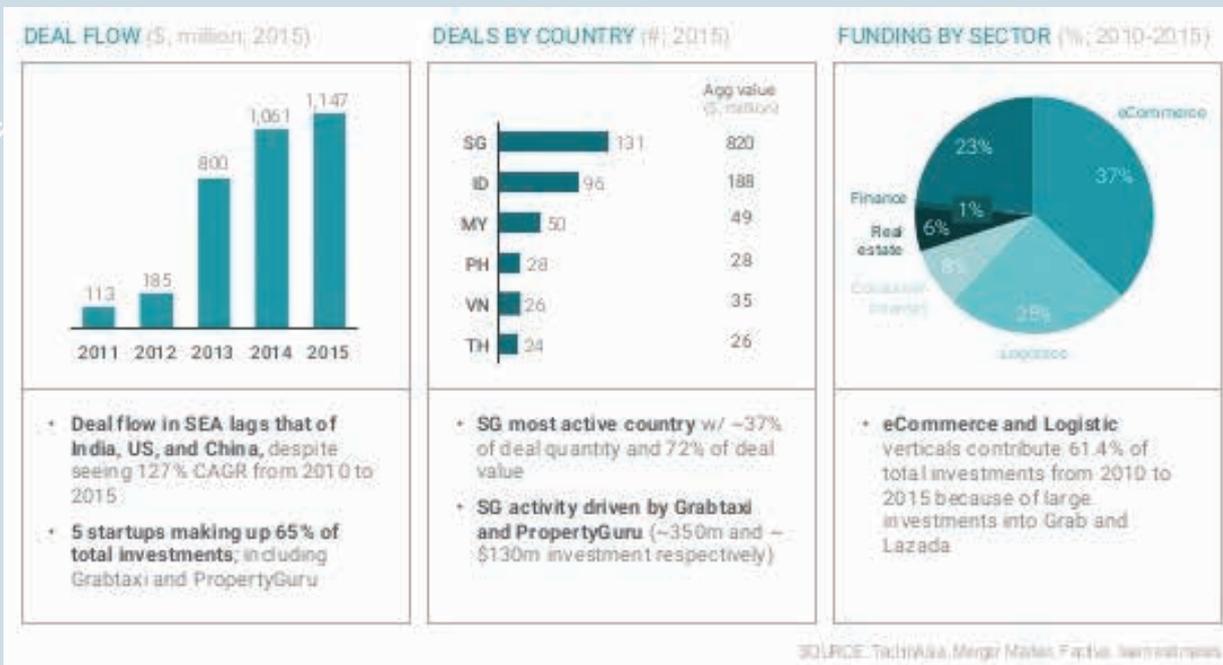


Fig 3.12: Growing deal flow in SEA, however, activity is concentrated to Singapore, and majority of funding are allocated to only a few prominent start-ups

3.4 Enhancing Trust, Awareness and Reliability of Digital Platforms

Lastly, to address the lack of consumer trust and awareness, and increased incidence of cybersecurity attacks (section 2.3.3), we propose:

a) Improving Digital Literacy⁸⁶ in ASEAN

As a global digital leader (Fig. 3.13), Singapore can replicate its current three-pronged approach⁸⁷ across ASEAN to address the lack of digital literacy (section 2.3.3), with a focus on three core groups — students, workforce, senior citizens⁸⁸.

DIGITAL NATION SCORECARD

Measure of success: The race for digital leadership in Asia-Pacific is still open

Rank	Overall ranking	Financial capital	Digital products	Human capital	Digital community
1	Singapore	Australia	South Korea	Singapore	Japan
2	Australia	Singapore	Japan	Malaysia	Singapore
3	South Korea	Japan	Taiwan	New Zealand	Australia
4	Japan	Taiwan	Australia	India	India
5	New Zealand	Malaysia	New Zealand	Taiwan	South Korea
6	Taiwan	New Zealand	Singapore	Australia	New Zealand
7	Malaysia	India	Malaysia	South Korea	Taiwan
8	India	Indonesia	Vietnam	Indonesia	Indonesia
9	Indonesia	Thailand	India	Japan	Malaysia
10	Thailand	South Korea	Indonesia	Thailand	Thailand
11	Vietnam	Vietnam	Thailand	Vietnam	Vietnam

Source: AlphaBeta

BANGKOK POST GRAPHICS

Fig 3.13: Ranking of Countries' Digital Development in Asia-Pacific⁸⁹

⁸⁶ Digital literacy refers to the lack of the skill set to use internet services and content, combined with a lack of confidence in internet security and privacy.

⁸⁷ Singapore's 3-pronged approach: 1. Improving access to technology for people with disabilities (Enable IT programme), 2. Developing holistic outreach and education programmes (S.U.R.E campaign and Cyber Security Awareness Campaign), 3. Encouraging curiosity and innovation among citizens and companies (Digital Maker Programme).

⁸⁸ Students should gain a basic understanding of the potential applications of the Internet, workers (both white and blue-collar) should be equipped with the knowledge to leverage ICT to adapt to the changing nature of their jobs, while senior citizens would be trained to keep their digital skills up-to-date so that they would not be left behind as technology progresses.

⁸⁹ Singapore scored the highest overall in a recent digital nation index by AlphaBeta, an economic modelling and forecast business advisory firm.

This would grow usage of digital platforms regionally⁹⁰.

b) Providing Digital Identification and Certification

A Digital ID for every citizen⁹¹ could facilitate cross-border identification⁹², provide access to government online services, and enable widespread digital uptake.

As ASEAN grows into a borderless digital community, digital IDs would also preempt security and data privacy breaches, and improve accountability and trust in the digital ecosystem.⁹³

c) Cybersecurity

Singapore, globally-best in cybersecurity⁹⁴, should lead ASEAN in developing a set

of personal data protection principles⁹⁵, and expand its licensing framework for cybersecurity vendors to other ASEAN countries.

Thereafter, Singapore can work towards proposing an overarching cybersecurity bill for all sectors⁹⁶, which could facilitate investigations of cyber-security threats.

Singapore should also further extend its efforts to create information sharing avenues (similar to STIX and TAXII)⁹⁷ to solve cybersecurity problems.

Conclusion: The New ASEAN Economy

Building a more connected, intra-ASEAN digital economy is difficult, and will take significant time.

While Singapore is primed to take charge, commitment by all member states of ASEAN, in spite of cultural, political or socio-economical differences, is necessary.

The AEC will need to continually recognise and reaffirm the importance of disruptive change, and set greater economic integration with emerging technologies as a top priority.

Together, ASEAN can implement the aforementioned policies effectively, and achieve sustainable, inclusive, and future-proofed growth, in a more competitive and enriching new ASEAN Economy.

⁹⁰ Adequate digital literacy would stamp out irrational fear of digital platforms (e.g. using e-payments on mobile devices), build awareness, and allow consumers to be integrated in the digital economy. As discussed in section 3.1, once consumers are integrated, continually increasing usage and reliance on digital services would follow.

⁹¹ Digital ID could be tied to National ID in ASEAN states where a national ID is mandated, as well as a mobile number. For states with many unbanked people also without national IDs, preliminary digital IDs tied to their mobile numbers (perhaps with at least 2-factor authentication) could be implemented.

⁹² Similar to European Economic Area's adoption of national ID cards which allowed people to move freely across borders.

⁹³ Servicer providers and online retailers would now know who is retailing/procuring services from them, and vice versa. If implemented strictly, incidences of online scams would diminish. Additionally, financial services firms which require KYC/AML norms would benefit from faster processing as such as well.

⁹⁴ A survey by the UN International Telecommunication Union (ITU) rated Singapore as top in the world in overall cybersecurity approach based on its legal, technical and organisational institutions, educational and research capabilities and cooperation in information-sharing networks.

⁹⁵ ASEAN could implement rules drawing on lessons from the APEC Cross Border Privacy Rules (CBPR), a system developed by APEC economies to build consumer, business and regulator trust in cross border flows of personal information.

⁹⁶ An overarching bill that applies to all ASEAN economies would facilitate investigations of cyber security threats and ensure uniformity in penalties offenders would receive.

⁹⁷ Information-sharing forums and processes will bring genuine benefits for both governments and businesses — not just across national sectors but across borders. Established international standards such as STIX (Structured Threat Information eXpression) and TAXII (Trusted Automated eXchange of Indicator Information) are community-driven, free-of-charge, and their technical specifications are designed to enable automated information sharing for cyber security situational awareness, real-time network defence and sophisticated threat analysis.



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Appendix A: What is OmiseGo?

OmiseGO is a subsidiary of Omise, a leading online payment gateway service provider operating in Southeast Asia. The OmiseGO blockchain team has been involved in the Ethereum community from its very beginning—starting in 2015, Omise Blockchain Lab began research work focusing primarily on scalability. By the end of 2016, research had expanded into proof-of-stake (PoS) consensus design and in 2017, OmiseGO was created to achieve two goals:

1. Create the OMG Money Gateway as a scaling solution for Ethereum focused on enabling payments, trades, and other financial transactions in both crypto and fiat. OMG is a fully public, currency agnostic decentralized exchange (DEX) network which will be secured by Ethereum and built to scale infinitely using the Plasma architecture. The OMG Network will be able to interact with Bitcoin (or Bitcoin-like blockchains) and other blockchain platforms through clearing-

houses in state channels or smart contracts, as well as with digital at platforms and economies through collateralized at tokens. This, in combination with virtually unlimited scalability, will enable the OMG Network to serve essentially all global transactions simultaneously.

2. Develop the OMG open-source, white label digital wallet Software Development Kit (SDK). The SDK will be free for anyone to use and will make it easy for those who need online asset exchange as part of their business to connect seamlessly to the OMG Network. The SDK allows wallet providers the ability to enhance, add, and customize payment solutions for many use cases.

OMG is the answer to a fundamental coordination problem amongst payment processors, gateways and financial institutions. By enabling decentralized exchange at high volume and low cost, OMG provides a next-generation value transfer service operating across

currencies and asset types, and across national borders and corporate ledgers.

Through the OMG network, anyone will be able to conduct real-time, peer-to-peer financial transactions, including but not limited to payments, remittances, payroll deposit, B2B commerce, supply-chain finance, loyalty program activity, asset management, and other on-demand services in a completely decentralized and inexpensive way, and including highly performant and fully decentralized trading.

OMG offers mainstream end-customers an introduction to the many benefits of blockchain technology — the wallet SDK will make it easy to create dapps that let the end user take advantage of Ethereum's immense potential without having to leave their comfort zone.

Omise will use the OMG network as the platform for their own payments processing needs, but neither Omise nor OmiseGO will own or control the network.

Reference

Omisego. OmiseGO Official Guide. *Omisego*. Retrieved May 9, 2018, from <https://cdn.omise.co/omg/officialguide.pdf>

Appendix B: MAS Project Ubin Phase 2 Executive Summary

Ubin Phase 2 is a collaborative project led by The Monetary Authority of Singapore (MAS) and The Association of Banks in Singapore (ABS).

It is managed and delivered by Accenture, with participation from 11 financial institutions. The 13 week project explores the use of Distributed Ledger Technology (DLT) for specific Real Time Gross Settlement (RTGS) functionalities.

Particularly, it focuses on the feasibility of decentralising Liquidity Saving Mechanisms (LSM), while maintaining privacy of banking transactions.

Leveraging the capabilities of the Accenture Liquid Studio and its Liquid Delivery Methodology with Microsoft Azure as the cloud platform, three prototypes were developed by three workstreams on three different DLT platforms: Corda, Hyperledger Fabric and Quorum. The prototypes successfully demonstrate several points. Firstly, that key functions of a RTGS system such as fund transfer, queuing mechanism and gridlock resolution can be achieved

through different techniques and solution designs. Secondly, decentralising the key functions of a RTGS system may not only mitigate the inherent risks of a centralised system, such as single point of failure, but may also affirm the promised benefits of DLT, for example cryptographic security and immutability.

Given that privacy is paramount in an interbank payment system, this project validates that privacy of RTGS transactions may be ensured by all workstreams with their distinct methods. Specifically, Corda with its Unspent Transaction Output (UTXO) model and confidential identities, Hyperledger Fabric leveraging its Channels design, and Quorum using Constellation and zero knowledge proofs (ZKP).

Other observations and findings from this project include the scalability and resilience of the three designs. Significantly, this project concludes that all three workstream designs have successfully demonstrated the feasibility of removing a central infrastructure operator in a DLT based RTGS system. Therefore, with the feasibility of DLT in a

RTGS system, the role of MAS as an infrastructure operator in facilitating interbank payments needs to be re-evaluated.

Ubin Phase 2 not only successfully demonstrates that RTGS functions may be decentralised without compromising privacy, but also marks the success and significance of an industry-wide collaboration in laying the foundation for future innovation.

Reference

Mohanty, S., and Ong-Ang, A. B. (November 2017). Project Ubin Phase 2: Re-Imagining Interbank Real-Time Gross Settlement System Using Distributed Ledger Technologies. *Monetary Authority of Singapore*. Retrieved May 2, 2018, from <http://www.mas.gov.sg/Singapore-Financial-Centre/Smart-Financial-Centre/Project-Ubin.aspx>