

OPPORTUNITIES IN THE INFORMATION TECHNOLOGY (IT) SECTOR IN SOUTH EAST ASIA

PREPARED FOR VEDP

AUGUST 2020

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1.0 INTRODUCTION TO SOUTH EAST ASIA

Table 1: Key statistics

	Indonesia	Malaysia	Philippines	Singapore	Thailand	Vietnam
GDP (USD Billion)	1,119	364	377	372	544	262
GDP Per Capita (USD)	4,136	11,415	3,485	65,233	7,808	2,716
Consumption (USD billion)	746	261	323	172	360	195
Industry (including construction) value added % GDP	38.9	37.4	30.2	24.5	33.4	34.5
Services value added % GDP	44.2	54.2	61.0	70.4	58.6	41.6
Imports of Goods (USD Billion)	171	205	113	359	240	271
Exports of Goods (USD Billion)	167	238	70	390	245	318
Total Population (million)	270.6	31.9	108.1	5.7	69.6	96.5
Urban Population (%)	56	77	47	100	51	37
Median age (years)	29.7	30.3	25.7	42.2	40.1	32.5
Total Area (sq km)	1,811,570	328,550	298,170	709	510,890	310,070
Currency	Indonesian Rupiah (IDR)	Malaysian Ringgit (MYR)	Philippine Peso (PHP)	Singapore Dollars (SGD)	Thai Baht (THB)	Vietnamese Dong (VND)
Average Annual Exchange Rate per US dollar (2019)	14,147.67	4.14	51.80	1.36	31.05	23,050.24
Official Language	Bahasa Indonesia	Malay	Filipino, English	English, Mandarin, Malay, Tamil	Thai	Vietnamese

Source: World Bank, UN Comtrade, Worldometer

Note: All monetary amounts are in current USD.

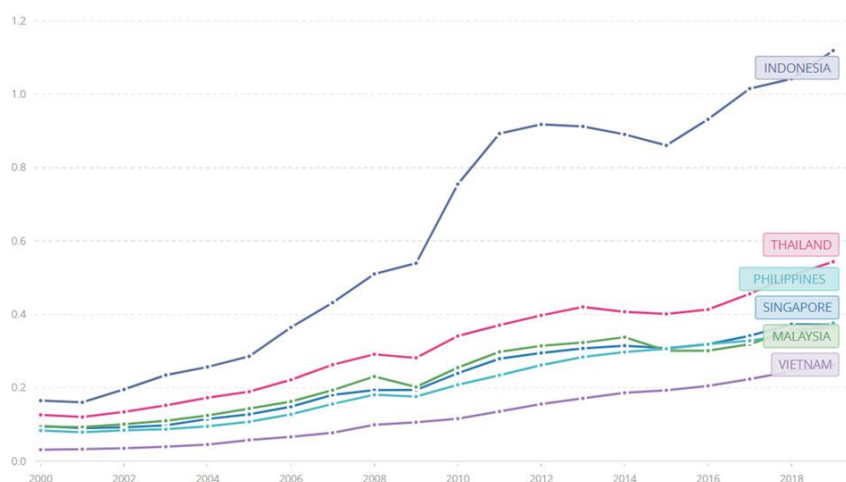


Figure 1: GDP in current USD trillion

Source: World Bank



The six major countries in South East Asia – Indonesia, Malaysia, Philippines, Singapore, Thailand and Vietnam – have a combined population of 582 million and GDP of USD 3 trillion. If it were a single nation, it would be the third most populous country and the fifth largest economy in the world. It would also have the eight largest consumption expenditure globally.

The region is among the fastest growing in the world, with ASEAN (Association of Southeast Asian Nations) having witnessed an average annual GDP growth of 5.3% between 2000 and 2018, supported by an increasingly well-educated workforce, abundant natural resources and favorable geographic location at the heart of the Asia-Pacific region.

The region's population has a median age of around 30 years, providing an ample labor pool to support growth in the coming years. This youthful demographic profile also translates into receptivity to new technologies.

Between 2019 and 2022, 50 million new consumers are expected to join the ranks of the middle class in Indonesia, Malaysia, the Philippines, Thailand and Vietnam by 2022. The middle class will expand to include 350 million people and continue on its upward trajectory, propelled by greater access to the flourishing digital economy and aspirations to better lives for themselves, their families and their communities.

The above makes ASEAN a key export market for the US. In 2019, it was the fourth largest export destination for the US, after Canada, Mexico and China, receiving USD 108 billion worth of exports originating from the US.



2.0 IMPACT OF COVID-19

2.1 COVID-19 Situation

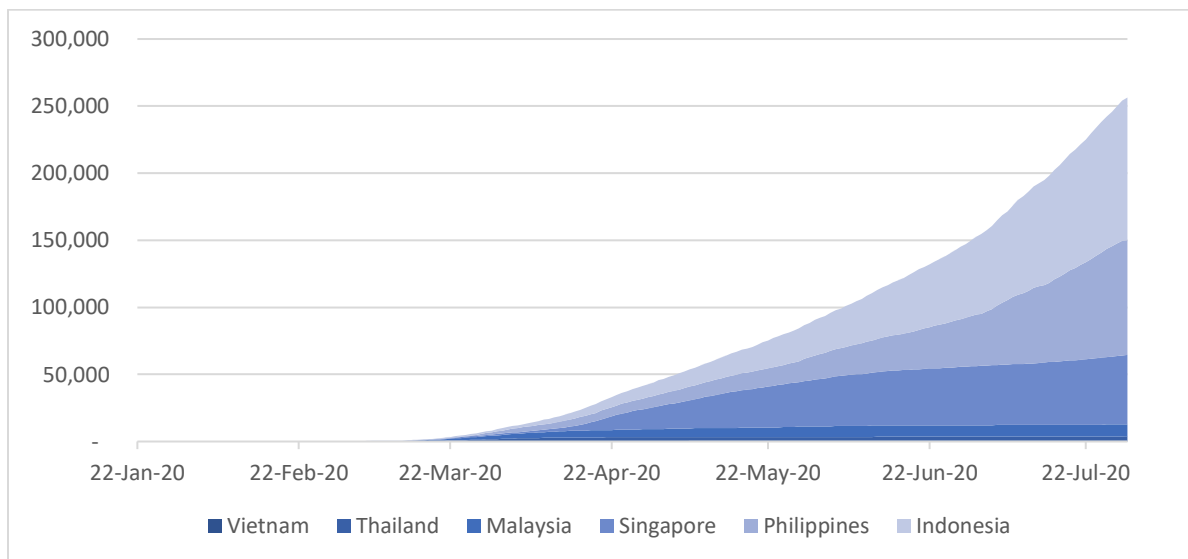


Figure 2: Cumulative confirmed COVID-19 cases from 22 January 2020 to 30 July 2020
 Source: Johns Hopkins University Center for Systems Science and Engineering (via United Nations Office for the Coordination of Humanitarian Affairs)

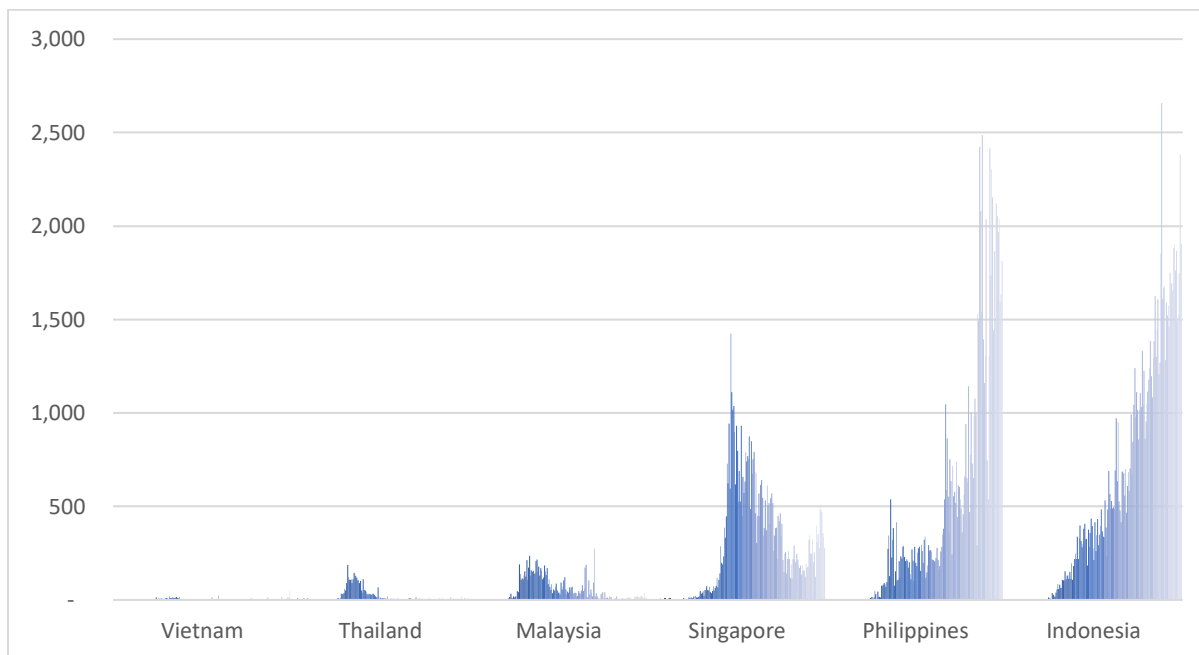


Figure 3: New COVID-19 cases from 23 January 2020 to 30 July 2020
 Source: Johns Hopkins University Center for Systems Science and Engineering (via United Nations Office for the Coordination of Humanitarian Affairs)



Table 2: COVID-19 status in 6 major South East Asian countries (statistics as of 29 July 2020)

Country	Total Cases	Total Deaths	Cases in July 2020	Deaths in July 2020
Indonesia	102,051	4,901	48,041	2,147

Indonesia has the highest number of cases and deaths in South East Asia. Instead of imposing a nationwide lockdown, the central government allowed regional governments to restrict the movement of people and goods in and out of their respective localities. The capital Jakarta introduced Large-scale Social Restrictions, starting on 10 April, and this was followed by many other provinces and cities. On 4 June, Jakarta announced entry into a transitional phase, underpinned by the gradual reopening of several essential services sectors. On 14 July, Jakarta officially extended the transition phase by another 14 days.

Malaysia	8,943	124	309	3
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Malaysia started easing its restrictions in May and from June 10, nearly all social, economic and religious activities restarted, while adhering to safe distancing principles. This current phase supposed to last till end-August and is supposed to be a recovery phase. Local cases started to spike again in the third week of July and on 26 July, the minister in charge of managing the coronavirus outbreak said that the government will reimpose a lockdown if the number of new COVID-19 cases surpasses 100 a day.

Philippines	86,673	1,947	48,218	703
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Quarantine measures to contain the virus vary across the Philippines, with different degrees of restrictions, but the strictest and longest lockdown was in Manila, starting from mid-March. The city began to reopen at the beginning of June with limited public transport and offices permitted to have skeleton staff. Since then lockdowns have been re-imposed on several neighborhoods as cases jumped. Overall, cases have continued to rise throughout the country. On 31 July, the president extended restrictions in Manila until mid-August because of the continued high number of coronavirus cases.

Singapore	51,197	27	7,738	1
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A large number of the cases in Singapore are from foreign worker dormitories. Phase 2 of the country's reopening started from June 19, with the resumption of most activities, subject to safe distancing principles. Singapore expects to enter a new normal in Phase 3 at a currently unspecified date, where all activities would be permitted to resume, with restrictions on gathering sizes and strict safe management measures at businesses involving crowds or close contact. Singapore expects to remain in this state, until an effective vaccine or treatment for COVID-19 is developed.



Country	Total Cases	Total Deaths	Cases in July 2020	Deaths in July 2020
Thailand	3,298	58	135	0

Thailand ended its lockdown period on July 1, allowing all businesses to resume operations. But a state of emergency is in place to maintain control of movements into and outside of the country and for state-run quarantine and tracking. On 31 July, Thailand extended its state of emergency by another month to the end of August 2020, to reduce the risk of a second COVID-19 outbreak, as it opens its doors to select foreigners, including migrant workers from neighboring countries. Medical tourists, foreigners participating in international conferences and trade fairs, foreign film production crews and Thailand Elite cardholders (those with long-term residence visas and multiple-entry residence visas) are among those allowed to enter the country.

Vietnam	446	0	91	0
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Vietnam was the first South East Asian country to lift its lockdown, on 22 April. Through a centralized quarantine program and an aggressive contact-tracing system, Vietnam had managed to keep its coronavirus tally to the lowest in the region and avoid any deaths. However, on 25 July, the first locally transmitted COVID-19 infection in nearly 100 days was reported from the central city of Danang, quickly followed by several others taking the total of new cases to 30, as of 29 July. Around 80,000 tourists were evacuated from the city and all transport to and from the city was suspended. Danang has been locked down and the government has warned that every province and city in the country is at high risk of coronavirus infections.

Total	252,608	7,057	104,532	2,854
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Source: Johns Hopkins University Center for Systems Science and Engineering (JHU CCSE), Center for Strategic & International Studies, multiple media outlets

According to the International Air Transport Association, as of 29 July 2020, with certain exceptions such as relatives of citizens or individuals with long-term residency permits, foreigners are not allowed to enter any of these countries. Thailand has started allowing select foreigners to enter, such as those participating in international conferences and trade fairs and foreign film production crews.



2.2 Economic Impact

Economies in the South East Asian region have suffered due to the global impact of COVID-19, driven by decline in consumption, investment and trade. Movement restrictions imposed by governments to contain the outbreak constricted economic activity in all countries.

Table 3: GDP growth rates

Year	Indonesia	Malaysia	Philippines	Singapore	Thailand	Vietnam
2019	5.0%	4.3%	6.0%	0.7%	2.4%	7.0%
2020f (ADB)	-1.0%	-4.0%	-3.8%	-6.0%	-6.5%	4.1%
2021f (ADB)	5.3%	6.5%	6.5%	3.2%	3.5%	6.8%
2020f (World Bank)	0.0%	-3.1%	-1.9%	NA	-5.0%	2.8%
2021f (World Bank)	4.8%	6.9%	6.2%	NA	4.1%	6.8%
2020f (IMF)	-0.3%	-3.8%	-3.6%	-3.5%	-7.7%	2.7%
2021f (IMF)	6.1%	6.3%	6.8%	3.0%	5.0%	6.5%

Source: ADB, IMF, World Bank

Note:

2019 actuals are from World Bank

f=forecast

The more open trade-dependent economies of Malaysia, Singapore, Thailand, and Vietnam were also hit by slumping global trade and demand. In addition, tourist arrivals plunged in response to stringent travel restrictions and quarantine requirements, hitting the aviation, hospitality, and retail industries. Most countries in the region have relaxed restrictions, at least partially, but business uncertainty and weak consumer confidence may hinder economic recovery.

Moreover, external demand is expected to remain muted for the rest of 2020 due to global economic contraction. However, all of these economies are expected to rebound during 2021, as seen from the projections by the Asian Development Bank (ADB), the World Bank, and the International Monetary Fund (IMF). While the variation in the projections reflects the high level of uncertainty due to the rapidly evolving COVID-19 situation, the common trend in expectations is indicative of the strong macroeconomic fundamentals in the region.

Indonesia

- Indonesia saw growth in Q1 of 2020 drop to 3.0% year on year, its slowest pace since 2001. Domestic consumption growth fell to 2.8% as households reduced discretionary spending, though public consumption picked up gradually. Growth in fixed investment decelerated to 1.7% as investment in buildings and other structures wound down and investment in machinery and equipment contracted. Meanwhile, sustained demand for palm oil and metal ores partly countered contraction in exports of services and oil and gas.



- The government has announced a fiscal stimulus package of USD 48 billion but less than 20% of this had been spent at end-July 2020. A new National COVID-19 Mitigation and Economic Recovery Committee was established on July 21 to resuscitate the economy.
- The country's COVID-19 cases still have not peaked and economic recovery will depend upon success in bringing virus situation under control and effectively roll out existing assistance schemes to help both the public health sector and ordinary Indonesians.
- The country's economic growth in the longer term is contingent on the ability of the government to renew its pre-COVID agenda to build infrastructure, invest in human capital, and pass structural reforms to reduce bureaucratic hurdles and increase private investment. The President has instructed the country's provincial governments to make preparations to grab opportunities from corporate migrations out of China, while the central government has been intensively lobbying US and Japanese decisionmakers to win their backing in making Indonesia a corporate relocation hub. At the end of June, seven foreign companies, including from the United States, Japan, and other countries, committed to transferring production out of China to Indonesia.

Malaysia

- Growth in Malaysia fell to 0.7% y-o-y in Q1 of 2020, compared to 3.6% in the previous quarter. As the COVID-19 pandemic affected global supply chains, exports of goods and services shrank by 7.1%. Investment also declined as public investment fell by 11.3% and private investment by 2.3%. Consumption remained a bright spot in the economy, growing by 6.5% as stronger public consumption offset weaker private consumption. However, domestic consumption is expected to have contracted in Q2, due to movement restrictions. External demand is likely to be similarly weak as trade partners continue to grapple with the effects of COVID-19. With the outlook having deteriorated since ADO 2020, the Malaysian economy is expected to contract by 4.0% in 2020 before recovering to 6.5% growth in 2021.
- Initially government response was hampered by an abrupt change of government in February 2020. But since then, the government appears to have controlled local transmissions. It has also issued four stimulus packages worth a combined USD 68 billion dollars. In addition to wage subsidies and tax deductions, SMEs are receiving grants and soft loans to hire, retrain and upskill the unemployed and the youth. The government is also looking at this crisis as a catalyst for optimizing the usage of new technology, business digitalization and e-commerce platforms.
- The economy is beginning to show signs of recovery. An index of leading economic indicators rose by 0.6% y-o-y in May 2020, after rebounding from a fall of 5.7% in April 2020. The Industrial Production Index (IPI) surged 18.2% in May 2020 as compared with the previous month, though it was still 22.1% lower y-o-y. Improvement in domestic consumption and growth in manufacturing production and sales are expected to support economic recovery going forward.



Philippines

- The Philippines contracted by 0.2% year on year in Q1 of 2020 as border restrictions slashed tourism receipts and quarantine measures depressed domestic demand. Growth in household consumption, comprising three-fourths of GDP, was flat, and investment slumped by 18.3%, as outlays for machinery and equipment went down. However, government consumption rose by 7.1% y-o-y. Exports and imports fell, as external demand weakened and supply chains were disrupted. On the supply side, all major sectors decelerated. Growth in services slipped from 7.1% in Q1 of 2019 to 1.4% with weakening transport and accommodation, food services, and trade. Industry dropped by 3.0% with lower construction and manufacturing, and agriculture fell by 0.4%.
- Going forward, the contraction in the global economy will continue to impose a drag on external trade, tourism and remittances (9.3% of GDP in 2019). Domestic consumption and business confidence could be boosted by the virus being brought under control.
- The government is relying on big-ticket infrastructure projects to counter the effect of the pandemic. In May, media outlets reported that the government was reviewing infrastructure projects from the 'Build Build Build' infrastructure plan (which entails USD 160 billion to be spent between 2017 and 2022) to identify projects with high and immediate economic impact and prioritize them.
- In June 2020, the House of Representatives passed a USD 26 billion stimulus package to help the economy recover from the coronavirus pandemic in the next four years. It is seeking to offer various forms of assistance to micro, small, and medium enterprises (MSMEs) and other key sectors affected by the COVID-19 crisis, while at the same time rebuilding consumer confidence. It is expected to generate some 1.5 million jobs through infrastructure projects and financial assistance for small businesses between 2020 to 2023. But as of end-July 2020, the bill is still pending in the senate. On 24 June, the administration announced that it was seeking a USD 85.9 billion budget for 2021 to support the economic recovery from the pandemic.

Singapore

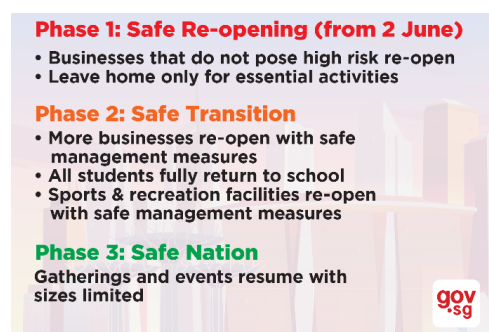


Figure 4: Singapore's three phase reopening plan
Source: Government of Singapore



- In the second quarter of 2020, Singapore's GDP contracted by 12.6% on a y-o-y basis, following a 0.3% y-o-y contraction during the first quarter. The manufacturing sector continued to grow, expanding by 2.2% y-o-y primarily due to a surge in output in the biomedical manufacturing cluster, though it slowed down from 8.2% during the previous quarter. Weak external demand and workplace disruptions during lockdown weighed on output in the chemicals, transport engineering and general manufacturing clusters. Services declined by 13.6%, as tourism and air transport sector came to a standstill and sectors such as food services, retail and business services were affected by the lockdown. Meanwhile, the construction sector contracted by 54.7%.
- For the rest of the year, construction is expected to suffer as it grapples with interrupted supplies of materials and migrant labor. External demand and trade will be affected by supply chain disruption, but the impact may vary by industry. Oil and electronics will continue to drop, but biomedical manufacturing and precision engineering may see positive demand arising from the pandemic in the short term.
- During the first four months of 2020, the country secured USD 9.5 billion in investment commitments for the next few years, from companies such as Micron and Thermo Fisher Scientific, reflecting the sustained confidence of foreign investors in Singapore.
- The government has released four stimulus packages worth a total of USD 66 billion, to support workers and businesses. In June 2020, the government set up an "Emerging Stronger Taskforce" to establish industry coalitions to spark job growth and prototype ideas in areas such as robotics, e-commerce, environmental sustainability, digitalization of supply chains and the built environment.

Thailand

- Thailand's economic contraction in 2020 is projected to be the worst by ADB. One reason for that is the high contribution of tourism to GDP, accounting for more than 20% in 2018 and reliance on exports, with merchandise trade at around 100% and export of goods and services at 59.7% of GDP.
- Thailand's GDP declined by 1.8% y-o-y in Q1 of 2020, as consumption and investment slumped, the public side of both categories shrinking as the budget was delayed. Private investment was hampered by weaker domestic consumption and business sentiment under the COVID-19 pandemic. On the supply side, merchandise exports grew moderately, but were constrained as declines hit exports of rice, rubber, vehicles, and chemical and petrochemical products. Service exports dropped in tandem with a significant fall in tourism receipts.
- The government expects the economy to recover gradually after hitting bottom in the second quarter. Thailand's economy improved during June from the previous month due to the gradual relaxation measures implemented in Thailand and abroad, supporting the resumption of economic activity. The Bank of Thailand (BoT) said the value of merchandise exports excluding gold, private consumption and private investment indicators, and manufacturing production contracted at a lower rate.



- The Thai government has issued two stimulus packages worth USD 70.7 billion. The Thai cabinet has also approved a USD 3.2 billion budget for projects targeted at boosting consumption and tourism and 92 public-private partnership projects worth USD 3.3 trillion are being planned to stimulate the economy. In addition, the government is planning to set up an economic recovery task force led by the prime minister, to allow SMEs (small and medium enterprises) to gain greater access to state procurement projects. State agencies may be required to buy SMEs' products or services for at least 30% of their procurements each year.

Vietnam

- Growth in Vietnam decelerated to 3.8% y-o-y in Q1 of 2020 but recovered partially in May since the lifting of social distancing. Agriculture stagnated under lower external demand for agricultural exports and prolonged drought. Growth in services was halved from 6.5% in 2019 to 3.2% year on year in Q1 of 2020. A strong uptick in domestic tourism in May was not enough to offset a 98% drop in foreign tourists compared to May 2019. The trade surplus in January to May declined significantly as demand from the economy's principal export markets plunged. Growth is forecast to continue to decelerate in 2020 due to sharp fall in external demand. The country is highly reliant on trade, with the highest merchandise trade to GDP ratio in South East Asia at 215% in 2019, and the global slowdown will have an unavoidable impact on exports.
- Notwithstanding the slowdown, Vietnam is expected to outperform its regional peers in 2020, with GDP growth remaining in positive territory. Vietnam relied on early action, targeted testing, extensive contact tracing, effective government communication and widespread public buy-in and compliance to control the outbreak. Being the first country in the region to control the pandemic and reopen the domestic economy has given the country a head start in its economic recovery journey. The government stimulus package is the smallest in the region at USD 3.8 billion of fiscal measures and delayed collection of an estimated USD 7.6 billion in value-added tax, corporate income tax, and land rent, but the economic impact has also been the smallest.



Figure 5: A COVID-19 fight poster in Hanoi, Vietnam
Source: Asia Power Watch (Credit: Reuters / Kham)

- Vietnam’s suspension of non-essential activities lasted only 22 days, significantly shorter than many other countries, easing some of the downward pressure on consumption. Domestic spending has been a key engine of growth for Vietnam, accounting for 71% of GDP in 2019.
- Vietnam is well-positioned to attract companies seeking alternative manufacturing locations. Even before COVID-19, Vietnam was one of the principal beneficiaries of manufacturing facilities relocating out of China, leveraging its strategic location, relatively low labor costs and membership in multiple free trade agreements. In its 2020 ranking of locations for global manufacturing among 48 countries in Europe, the Americas and Asia Pacific, Cushman & Wakefield assessed Vietnam to be the second most cost-competitive manufacturing hub in the world, after China. Once the world economy begins to recover, Vietnam will be able to fully reap the benefits from this shift.



2.3 Key Business Trends

While nearly every sector in the six major South East Asian countries have been adversely affected by the outbreak, the virus is also creating opportunities by realigning supply chains, accelerating digitalization and automation, and driving medical sector innovation.

Corporate executives in the region are also planning their future beyond the crisis and using this as an opportunity to address issues such as technology adoption. According to a survey by consulting firm Ernst & Young that was published in May 2020, companies are taking steps to effect change in their global supply chains (50% of survey respondents), digital transformation (27%), speed of automation (SEA 33%), and management of workforce (48%).

- COVID-19 has spurred academic institutions and research organizations in the region to work together to manufacture medical equipment and kits such as negative pressure units, face shields and masks, as well as robotic transporter units. The demands imposed by the pandemic have also acted as a positive catalyst in the rapid emergence of local technologists in these fields as well as greater collaboration, such as that between medical and engineering schools and between academia and the private sector.
- The pandemic is prompting a rethink among MNCs to make their supply chain more resilient by boosting inventories and enlisting suppliers from countries such as Vietnam, Malaysia, and Thailand. Many companies are also shifting or diversifying their manufacturing operations beyond China, accelerating a trend initiated by the trade tensions between the US and China, benefiting low wage manufacturing destinations such as Vietnam and Indonesia.
- With the rise of digital technology in areas such as communications and conferences, education, financial services, medicine, logistics, lifestyle and retail, businesses providing technologies will benefit.
 - Across South East Asia, governments have committed significant funding to helping businesses complete their digital transformation. Singapore has allocated SGD 500 million (USD 364 million) to support businesses digitalize, while Malaysia has pledged around MYR 700 million (USD 166.7 million) to support digital transformation and automation in small and medium enterprises. The pandemic is forcing businesses to recognize the urgency with which they need to upgrade parts of their workflows
 - As part of a continuing study on the growth of digital consumer behavior, Bain and Facebook analyzed the buying patterns of 8,600 digital consumers in six South East Asian countries between January and June 2020. They found that the region's digital consumers expect to spend more time at home after restrictions are lifted, and they have discovered new apps that they intend to continue using. They are buying more essentials online, delaying splurge spending and are favoring value for money and trusted, established brands. In response, consumer goods companies are responding by swiftly increasing product availability and visibility online, targeting digital engagement across platforms and optimizing pricing and value perception.



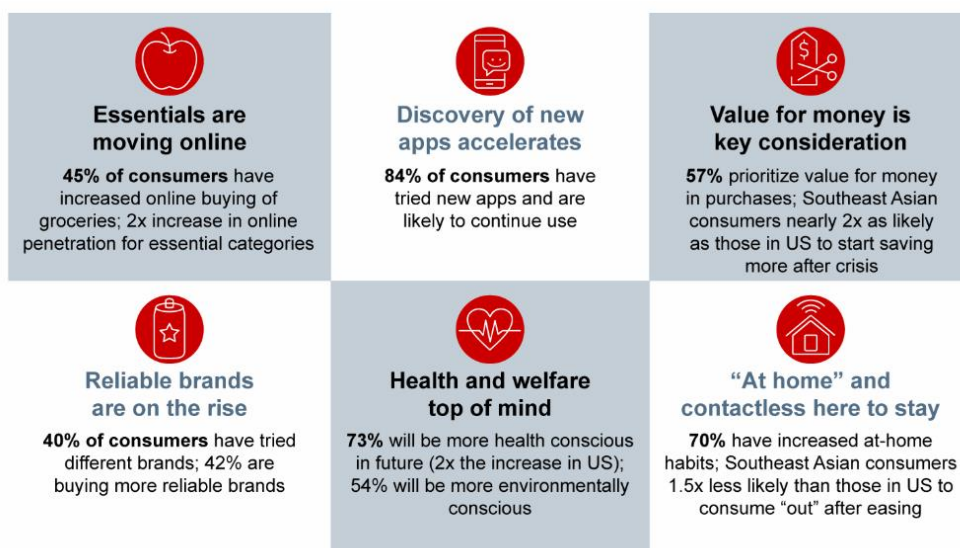


Figure 6: Findings from Bain/Facebook survey of digital consumers in South East Asia, conducted between January and June 2020
Source: Bain & Company











3.0 INDONESIA

3.1 Snapshot of the Indonesian Digital Landscape

- Estimated at USD 40 billion in 2019, Indonesia's Internet economy has more than quadrupled in size since 2015, at an average growth rate of 49% a year. As the largest and fastest growing Internet economy in the region, Indonesia is well on track to cross the USD 130 billion mark by 2025.
- As of January 2020, Indonesia counted 175.4 million internet users with an internet penetration rate of 64%, 160 million social media users, and 338 million mobile connections, equal to 124% of the total population. It was estimated that the average Indonesian spent eight hours a day surfing the net.

Table 4: IT device ownership in Indonesia, 2020

Smartphone 94%	Desktop / laptop 66%	Tablet device 23%	Streaming device 5.7%
			
Games console 16%	Smart home device 7.8%	Smartwatch 13%	VR device 5.1%
			

Source: DataReportal – Global Digital Insights

- An estimated 70% to 80% of internet traffic runs through mobile connections, at costs lower than regional peers, and which are among the lowest in the world. Indonesia is likely to become the country with the third-largest number of smartphone users, at 410 million, by 2025.
- In late 2019, the government announced the completion of the Palapa Ring project – a priority infrastructure project that aims to provide access to 4G internet services across the country. However, significant gaps remain. For instance, as of 2019, only 6.5 million SMEs, or around 10% of the country's total, were using digital technologies.
- The growth of the sector is attracting an increasing number of foreign companies. For example, in May 2020, it was reported that Microsoft was considering building a USD 2.5 billion data center. The announcement followed the decision from Google Cloud to build its first data center in Indonesia. In January of the same year, Amazon's AWS announced that it will build an infrastructure "region" in Jakarta by early 2022. Moreover, in 2019, NTT decided it will invest USD 500 million for its data center in the country.



- The e-Commerce segment is growing strongly in Indonesia, and the outlook remains positive notwithstanding the decision to put a 10% value-added tax digital products and services sold by non-resident internet companies starting from July 2020, in part to boost revenues following the impact of the COVID-19 pandemic. A case in point is offered by local e-commerce start-up Ula – five months after its launch, it announced in June 2020 that it had raised a USD 10.5 million seed round.

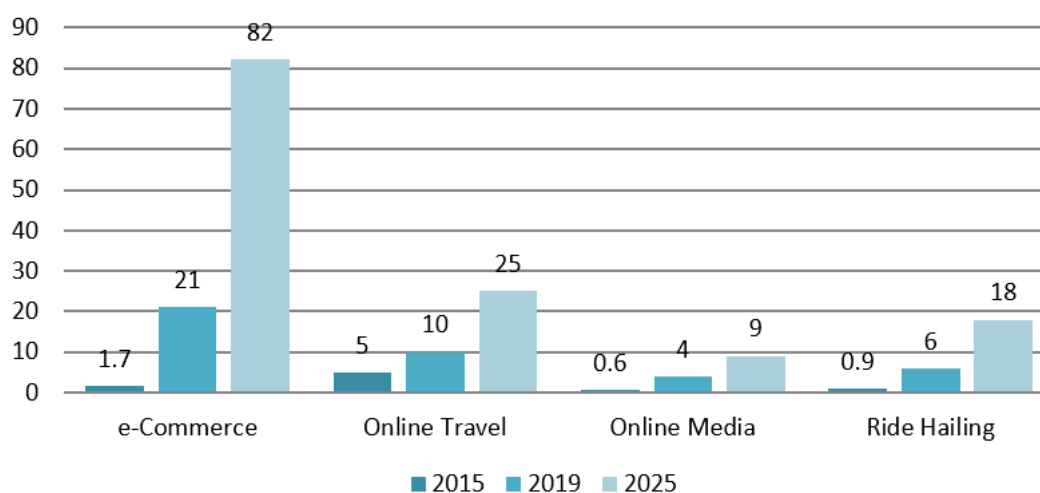


Figure 7: Key segments of Indonesia's internet economy, USD billion

Source: Google; TEMASEK

- Indonesia has the highest number of unicorns in the region, defined as companies whose value is valued above USD 1 billion, which include on-demand transport and logistics service provider Go-Jek, hotel and flight booking platform Traveloka, digital payment service company OVO, and two B2B/B2C online marketplaces, Bukalapak and Tokopedia.
- Although Internet economy players are concentrated in large cities, some of them are investing to develop their businesses beyond metropolitan areas, in search of further growth. For example, Tokopedia has announced its intention to expand to rural areas by signing an MoU to develop “digital villages”, in partnership with the West Java administration.
- One of the positive consequences on the impact of COVID-19 on the sector has been the accelerated growth it has led to in the fintech segment. For instance, it is expected that one of the consequences will be an increased willingness amongst consumers to embrace digital wallets, contactless payments, as well as digital IDs. Importantly, Indonesia already ranks as the second largest market for fintech funding in the region after Singapore.



3.2 Software in Indonesia

OVERVIEW

- The Indonesian software market is characterized by a significant discrepancy between large players who are at the forefront in the adoption of digital solutions and smaller companies which are lagging behind, focusing on simple solutions such as transitioning from paper-based to digital documentation and automation of processes. However, the situation could rapidly evolve as more initiatives are launched.
- The government and private sector actors such as banks and financial startups are making efforts to promote the digitalization of SMEs. In 2019, the Ministry of Industry launched Startup4Industry, a program that gives SMEs easier access to affordable and feasible technological solutions from technology startups. In June 2020 local company Unzyp Software launched an application for digitalizing SMEs in partnership with Microsoft and Tech Data.
- In 2018, the government launched the "Making Indonesia 4.0" program, which provides specific incentives and seeks to increase investment directed to five key areas: IoT, AI, human-machine interface, robot and sensor technology, and 3D printing. An interesting example in this context is the Jakarta Smart City initiative, under which the government partners with local AI firm Nodeflux for data management, computer vision and real-time video analysis solutions.
- An important development took place in November 2019, when Indonesia relaxed its data storage rules, revising the 2012 regulations which required domestic storage of a range of data to allow oversight by the government. With the new regulation, Indonesia allows private sector data, which are considered commercial and non-strategic, to be stored abroad.

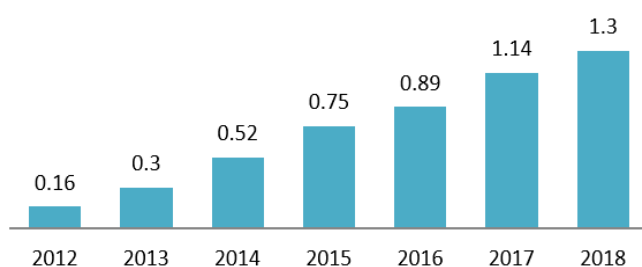


Figure 8: Cloud computing spending in Indonesia, USD billion

Source: Statista

- Interestingly, the COVID-19 pandemic has prompted the digitalization of various administrative processes to spur trade and investment. For example, Indonesia is allowing Australian exporters to use an electronic certificate of origin in order to claim FTA benefits for its exported products. The Investment Coordinating Board also announced plans to develop a web-based OSS (Open Source Software) application that can be managed by central and regional administrations.



OPPORTUNITIES

- Local large corporates have embarked on digital transformation journeys to better serve customers and improve productivity, relying on a mix of on-premise and cloud-based infrastructure and services. Some active players include Astra International, which Invested USD 250 million in Gojek and launched a digital transport platform; Lippo Group, which Invested in a big data and analytics platform from US-based Kinetica and NVIDIA, to develop a 360-degree profile of customer behavior; and Sinar Mas, which uses US-based Domo to capture, analyze and share data across 500,000 hectares of palm oil plantations.
- The banking sector in Indonesia is offering progressively more sophisticated digital banking products and services, and experimenting with big data analytics and artificial intelligence technologies. For instance, Bank Rakyat Indonesia has adopted an enterprise data platform, allowing it to store, consolidate and process information from multiple data streams on a single platform. Bank Mandiri's data warehouse empowered targeted marketing through a variety of communication channels, while Bank Central Asia (BCA), partnered with New York-headquartered Element, Inc. in 2019 to provide its users with a digital authentication solution.
- In view of the strong focus on digital transformation of SMEs, Virginian firms could have opportunities to provide solutions for cloud accounting, SaaS, E-procurement, and digital tax or e-tax payment and compliance systems. Moreover, local SMEs are also underserved by traditional financial institutions, with around 80% not having access to required financing, creating opportunities for digital solutions. For example in May 2020 Swiss e-invoicing software company Billte AG partnered with Indonesian P2P lender Investree to create a new e-invoicing platform called Billtree, which is catered to the needs of SMEs.
- There is growing interest for the usage of blockchain technology. During the Indonesian general elections held in May 2019, Belgian Blockchain-Platform-as-a-Service company, SettleMint, added verified vote count forms from polling stations to a blockchain, providing proof-of-integrity for nearly 13% of 197 million votes cast. In March 2020, Indonesia's Customs and Excise Department under the Ministry of Finance announced the adoption of the blockchain-enabled global trade platform called TradeLens, which was developed by AP Moller - Maersk and IBM.
- A further opportunity area is represented by the growing market for AI solutions, in particular those linked to the booming retail and e-commerce sectors of Indonesia. A case in point is offered by Loop Insights, a Canadian provider of AI solutions to brick and mortar retailers, which in April 2020 announced the formation of a joint venture partnership with local firm Frontier Technology for real-time, data-driven marketing solutions. Frontier expects to gain access to a large network of clients operating in several large-scale industries in Indonesia, including healthcare, convenience and retail chains, restaurant and hospitality chains, and smart city projects.



3.3 Cybersecurity in Indonesia

OVERVIEW

- The Cyber Body and National Encryption Agency of Indonesia (BSSN) recorded 12.9 million cyberattacks in 2018, with indirect losses of up to USD 6.7 million for large companies and USD 33,500 for mid-sized companies. According to the agency the number of cyberattacks in Indonesia grows by an average of 15% every year.
- An important development took place in February 2020 when the government drafted a Data Protection Law. Under the draft, punishment for misuse of data will carry a maximum seven-year jail term or a fine of up to USD 5.1 million. Data trading is forbidden and information cannot be used without the owner's consent.
- The extraordinary growth in digital payments over the past few years has been accompanied by a corresponding growth in fraud. Trust issues for digital payment methods persist among a significant portion of the population.

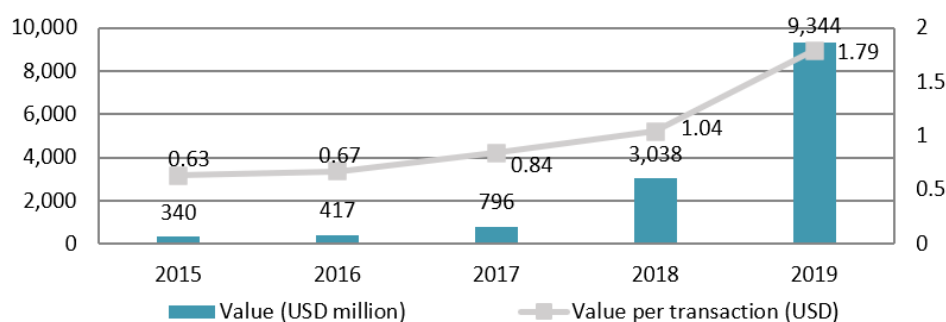


Figure 9: Value of e-money transactions in Indonesia (USD million) and value per transaction (USD)

Source: Bank Indonesia

- Efforts taken by many organizations to ensure business continuity despite remote working during the COVID-19 pandemic have increased their exposure to cyberattacks. In May 2020, the BSSN issued its Guidelines for Protection against Distributed Denial-of-Service ('DDoS') for SMEs, reporting increasing threats on infrastructure and highlighting the need for partnerships with cybersecurity ecosystems such as the Big Data and Artificial Intelligence Association.
- In May 2020, IBM Indonesia reported to have received more requests from the country's financial services industry for its security solutions, including cloud adoption. Already back in 2018 a PwC survey showed that Indonesian banks considered cybersecurity threats as the biggest risk to the industry.
- It is interesting to see that some large players are taking action. For example, in May 2020, Gojek partnered with the Ministry of Communication and Information Technology and the University of Gadjah Mada to create a public awareness campaign on the various types of online fraud.



OPPORTUNITIES

- Indonesian banks are stepping up in the adoption of solution from fraud detection. For example, Bank Rakyat Indonesia has built a real-time fraud detection service which has reportedly reduced fraud by 40%, improved credit scoring capabilities by 8%, and led to the development of a new, digital microfinancing product. In February 2020, Airome Technologies, a Singapore-based developer of cybersecurity solutions for digital banking and e-document management systems, entered into an agreement with iTEKO as a reseller targeting the banking market. Airome Technologies provides a high level of security and an easy way to protect payments, generated via any digital channels, such as internet banking, mobile banking, CNP (card-not-present) operations, and private banking, among others.
- Also worth attention is the fact that Indonesian hospitals lack adequate cybersecurity measures. For instance, the 2017 ransomware WannaCry rendered patients' online information inaccessible in Jakarta's Dharmais and Harapan Kita hospitals. More recently, the BSSN published a white paper on health sector cybersecurity, with guidelines for safeguarding sensitive information on COVID-19 cases at 227 referral hospitals nationwide.
- Similarly, Indonesian governmental bodies are also vulnerable to cyberattacks, and need to strengthen their defenses. In May 2020, it was reported that the data of up to 1.3 million civil servants at the Education and Culture Ministry have been breached by unknown hackers. It has also been reported that the data of the final voters list of the 2014 presidential election has been stolen from the General Elections Commission's website.
- E-commerce platforms have been a key target of cyber threats, with three local e-commerce platforms reportedly experienced data breaches that resulted in the theft of their customers' data in May 2020. For example, it was reported that nearly all Tokopedia's 91 million user accounts were breached and their information sold on the dark net after the company was the target of a cyberattack. Following the attacks, the Communication and Information Minister urged digital companies to improve their cybersecurity measures.
- A further opportunity could materialize if the data protection bill that is currently being debated at the House of Representatives set a minimum-security standard for digital companies, which experts are calling for and the country lacks. A possible requirement might be for digital companies to meet the ISO27001 standard.
- It is also worth pointing out that in November 2018, Indonesia and US reached an agreement to cooperate on cyber security, strengthening the Asian country's capabilities in the areas of transnational cyber and financial crime. The agreement foresees Indonesian police officers undergoing law enforcement-related training programs conducted by their American counterparts.



3.4 Digital Education in Indonesia

OVERVIEW

- The Indonesian digital education market suffers from structural deficiencies such as limited IT infrastructure, but it is growing rapidly thanks to the emergence of new players such as Harukaedu (a platform offering online university degrees), Ruangguru (an interactive e-learning platform for K-12 students) and Cakap (a tutoring platform for language learning).
- An important characteristic is that most Indonesians rely on the limited capacity mobile networks, instead of broadband networks that can easily cater to online learning requirements (a large data exchange especially for video conferencing). In 2019, Indonesia's 4G network covered more than 76% of all villages, while, the penetration of the fixed-line broadband network was still below 10% nationally.
- However, the country is home to South East Asia's largest digital education company, Ruangguru (Teacher's Room), boasting more than 17 million subscribers.

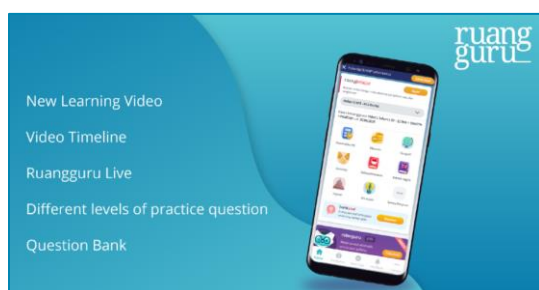


Figure 10: New Features of the Ruangguru's app

Source: Ruangguru

- The COVID-19 outbreak has created a new urgency for Indonesia to adopt digital learning solutions. As of May 2020, over 530,000 schools closed in Indonesia, affecting 68 million students from pre-primary through tertiary levels. Tellingly, on the day of its launch, more than 1.5 million students accessed the free Ruangguru Online School program, which was designed in response to the closure of schools. Ruangguru was first on both Google Play Store and Apple App Store in Indonesia, surpassing downloads of WhatsApp and TikTok.
- Recognizing the opportunity of the market, in March 2020, Huawei made an investment of USD 2 million to provide online learning services for tertiary, secondary, and primary educators and learners in Indonesia.
- It is expected that the digital education trend will continue even after the pandemic. For instance, in May 2020, 11 Indonesian universities, including University of Indonesia and the Sumatra Institute of Technology, agreed to continue online learning after the coronavirus crisis.



OPPORTUNITIES

- Virginian companies are advised to offer solutions that use platforms alternative to computers, due to the relatively low penetration rates. TVs and smartphones by contrast are ubiquitous and are used for educational purposes. For example, the Ministry of Education and Culture launched the Study from Home initiative on national television on April 2020.
- A key recommendation is to work with data providers. An interesting company in this context is Cakap, which developed a solution for service in education, or commonly known Education As A Service. The company has partnered with Telkomsel, a local wireless network provider, to provide data packages that offer free access to various e-learning applications called Ilmupedia Free Access 30G. This package can be used for 30 days with a 30 GB internet quota.
- It should also be highlighted that local players are partnering with foreign companies. For instance, Jakarta-based IndonesiaX, an online education platform that offers online courses from universities, institutions, and practitioners, has partnered up with Singapore-based company Akadasia to jointly build new education technology solutions that enable educators to provide free education access to their students.
- Due to the COVID-19 outbreak, the Indonesian government is collaborating with private sector players such as digital education start-ups and mobile providers to provide online learning portals and free internet. Specifically, the Ministry of Education and Culture has coordinated with EdTech players such as Zenius, UK-based Quipper School and Ruangguru to offer free programs and services, such as live teaching channels, question banks, online practices exams, instruction videos, to help students continue their education from home.
- Apart from digital education solutions for students at schools and universities, an area of opportunity is represented by the market for professional learning and upskilling. In June 2020, Indonesian digital learning company Arkademi announced to have raised an undisclosed amount of funding from US-based VC firm SOSV to scale its operations. The company was established in 2018 and is mobile-focused, providing a massive open online course platform that helps people both learn and teach any certified vocational skill. It offers various learning topics such as digital marketing and entrepreneurship and allows practitioners to upload and share their courses online. It plans to use the fresh funds to further enhance its product, make new hires, and deepen its roots in the Indonesian market.
- Other players are also exploring opportunities in the B2B digital learning services segment. A company that is expanding into this area is HarukaEDU, an Indonesia-based digital education startup. In November 2019, it announced that it had raised Series C funding led by SIG, a US-based global trading firm, and that it will use the fresh funds from the new round to support the expansion into B2B services through its corporate online training platform as well as its lifelong learning platform.











4.0 MALAYSIA

4.1 Snapshot of the Malaysian Digital Landscape

- Since 2015, Malaysia's Internet economy has continued to rise at a steady 21% annualized rate despite economic headwinds. The sector reached an estimated value of USD 11 billion in 2019, and is projected to grow to USD 26 billion by 2025.
- As of January 2020, Malaysia counted 26.7 million internet users with an internet penetration rate of 83%, 26 million social media users, and 40.7 million mobile connections, equal to 127% of the total population. Smartphones are ubiquitous in the country, with an estimated 97% of the population possessing such devices.

Table 5: IT device ownership in Malaysia, 2020

Smartphone 97%	Desktop / laptop 72%	Tablet device 32%	Streaming device 10%
			
Games console 16%	Smart home device 8.2%	Smartwatch 18%	VR device 2.6%
			

Source: DataReportal – Global Digital Insights

- The commercial deployment of 5G is expected to begin by the third quarter of 2020. In January 2020, the Malaysian Communications and Multimedia Commission (MCMC) identified the 700 MHz, 3.5 GHz and 26/28 GHz as the pioneer spectrum bands for the roll-out of 5G. In line with Malaysia's goal to implement 5G infrastructure nationwide by 2023, telecommunication providers such as Nokia and U Mobile are undertaking 5G demonstration projects in the country.
- Malaysia is a popular destination for US ICT companies for their global market expansion. Some leading US players include IBM, HP, Intel, Google, Amazon, Cisco, Microsoft and Oracle. In 2019, Oracle launched a Cloud Solution Hub in Kuala Lumpur to help firms integrating solutions such as Blockchain, Machine Learning, Artificial Intelligence (AI), and Data Analytics.
- However, more recently Chinese companies have made significant inroads. For example, in 2019 Huawei signed an agreement with Malaysian telco, Maxis, to accelerate 5G technology in the country; while China Harbour Engineering Company and SenseTime announced to set up the first artificial intelligence AI park in Malaysia, with a total investment of more than USD 1 billion over the next five years. Alibaba in turn



has partnered with the Malaysian government for the development of the Malaysian Digital Free Trade Zone, the world's first outside of China.

- The datacenter industry has grown rapidly to support around 30 datacenter service companies and nearly 200 specialized firms capable of providing affordable, scalable and high-quality remote data storage and retrieval services. An important development took place in 2019, when NTT decided to construct its fifth data center at the NTT Cyberjaya Campus in Malaysia.
- e-Commerce is a bright spot of the local internet economy, and has tripled in size since 2015, exceeding USD 3 billion in 2019. The sizable online travel sector, spearheaded by budget airlines and budget hotel chains, reached close to USD 5 billion in the same year, representing the most important segment for the country's internet economy.

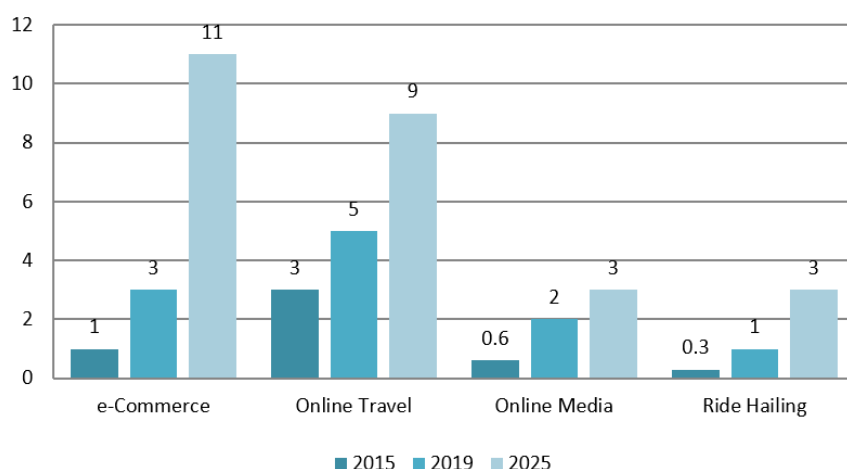


Figure 11: Key segments of Malaysia's internet economy, USD billion
Source: Google; TEMASEK

- Malaysia is a leader in the region for corporate digitalization, and nearly all SMEs in the country have computing capabilities and internet connectivity, in which they use either a smart device or a personal computer. However, SMEs often end up getting trapped with limited business usage of these tools, only using them for social media and personal consumption of digital content.
- Because of the relatively high levels of adoption of digitalization in the country, international analysts such as CPA Australia assess that Malaysian SMEs are well placed to recover quickly from the impact of the COVID-19 pandemic. Moreover, the government is taking some important steps, such as allocating grants of up to USD 2,330 to local entrepreneurs to promote their products on e-commerce platforms as well as USD 4.7 million to Malaysian Digital Economy Corporation (MDEC) for the creation of e-commerce hubs in rural areas.



4.2 Software in Malaysia

OVERVIEW

- The Malaysian software market is one of the most advanced in the region, behind only Singapore. Although there is a sophisticated metropolitan market in and around Kuala Lumpur, the software market is still developing in other regions. However, the impact of the COVID-19 outbreak has accelerated the country's digitalization agenda.
- In 2020 the government launched its SME Digitalization Initiative, under which it provides a 50% grant of up to USD 1,160 per company covering five key areas. This matching grant will be worth USD 115 million over five years. However, it should be noted that in 2020 Malaysia was the second country in the region to introduce a digital service tax to foreign providers.

Table 6: Key areas of Malaysia's SME Digitalization Grant

Digitalization Grant	Digital marketing/sales	Electric point of sales
Across 5 key digitalization areas		
HR payroll system/CRM	Procurement	ERP/accounting & tax
		

Source: MDEC

- Malaysia is one of the world's most prominent fintech hubs, counting around 200 fintech startups as of April 2019. The government also launched the Malaysia International Islamic Financial Centre Initiative, which allows locally incorporated foreign banks to establish Islamic subsidiaries, as well as web-based fully automated systems for issuing and tendering.
- In June 2020, the Securities Commission of Malaysia announced it had conditionally approved three companies to operate crypto currency exchanges in the country. The three companies are Luno Malaysia, SINEGY Technologies and Tokenize Technology.
- Malaysia is also establishing itself as South East Asia's gaming hub, with local gamers spending USD 673 million on video games alone in 2019. Malaysian companies such as PassionRepublic have produced digital content for Sony, Microsoft Games, Warner Game Brooch and Square Enix.



- An example of how COVID-19 is spurring new solutions is represented by Telekom Malaysia, a telecommunications company, which has developed a one-stop data exchange center aimed at facilitating data sharing for global research efforts on the pandemic.

OPPORTUNITIES

- Malaysian companies are among the most likely in the region to adopt digital solutions. A notable example of a foreign player which has targeted the local market for corporate digital solution is offered by Microsoft, which in January 2020 signed an agreement with telecommunication provider Maxis to offer Microsoft's Modern Workplace solutions, including Microsoft Teams, which gives employees the ability to work from any remote location with a network connection.
- There are opportunities to partner with private-sector players. For instance, thanks to a partnership with home-grown IT specialist iEnterprise Online, California-based Rootstock Software provides Malaysians companies with next-generation Cloud Enterprise Resource Planning solutions.
- The government is promoting the adoption of data analytics solutions among local companies. In this context, MDEC announced a collaboration with SAP in April 2020 in order to accelerate data technology adoption among local enterprises and facilitate industry-academia collaborations.
- The retail industry is an important target. A case in point is offered by the agreement reached in 2019 between Radiant Globaltech Berhad, a local retail technology solutions provider, and 7-Eleven Malaysia, which announced the adoption of the AX Retail B2B portal for its 2,323 outlets nationwide. 7-Eleven also reported that it expects the retail solution technology to be adopted by all of its suppliers in Malaysia.
- A further opportunity area could be represented by contributing to the R&D efforts being undertaken in the country. An interesting case is offered by Skymind Global Ventures, an AI ecosystem builder based in London, which in 2020 announced the launch of a USD 800 million fund partially destined to develop a Cloud and Artificial Intelligence Innovation Hub in Malaysia.
- There are growing opportunities in Malaysia's creative industry. For example, Japanese gaming giant Sony Interactive Entertainment Worldwide Studios recently announced it had chosen Malaysia as the location for its first studio in South East Asia, attracted by the government's incentives for foreign companies operating in this area. Other companies that are entering the local market include game publishers and developers, Double Eleven from the UK, and Larian Studios from Belgium.
- Some ICT solutions are finding applications in traditional sectors. For example, in May 2020 it was reported that the Malaysian Palm Oil Council (MPOC) is working with BloomBloc, a Swiss blockchain developer, to implement blockchain technology for the country's palm oil industry, one of the largest in Malaysia. This project aims to reinforce MPOC's commitment to sustainable, transparent and responsible supply chain, in order to raise the level of trust in its palm oil industry across the global market.



4.3 Cybersecurity in Malaysia

OVERVIEW

- Microsoft and Frost & Sullivan estimate the potential economic loss in Malaysia due to cybersecurity incidents at USD 12.2 billion, more than 4% of the country's GDP. Crucially, cybersecurity attacks have resulted in job losses in 61% of organizations that have experienced an incident.
- The country ranks high in terms of its commitment cybersecurity. Malaysia's cybersecurity is second in the Asia Pacific region, and eighth globally among 175 countries, according to the Global Cybersecurity Index 2018.
- In 2019 there were 10,772 reported cyberattacks in Malaysia. However, as COVID-19 has led people to spend more time online, cyberattacks have surged in 2020. For example, reported cyberattacks in April 2020 were 127% higher than April 2019. A total of 20 different COVID-19 malware were detected in Malaysia by cybersecurity specialists, while Forbes reported that Malaysia is one of the top five countries in the world targeted by cybercriminals during the outbreak.

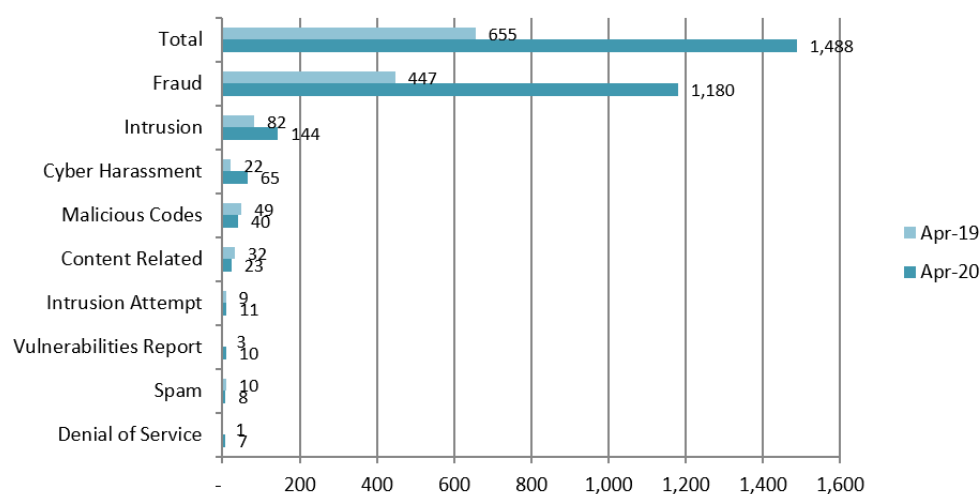


Figure 12: Reported cybersecurity incidents in Malaysia, April 2019 vs April 2020
Source: MyCERT

- The financial sector is a key target of the recent wave of cyberattacks. For example, in February 2020, Indian cybersecurity startup Technisanct discovered that information from more than 35,000 credit cards from Malaysia had been compromised and sold on the dark web.
- Moreover, in the same month, the country's cybersecurity officials revealed that Chinese state-sponsored hacking group targeted the Malaysian government in an apparent data-stealing espionage campaign. Malaysian officials did not explicitly name the hacking group but indirectly pointed to a state-sponsored entity known as APT40 or Leviathan.



OPPORTUNITIES

- It should be highlighted that Malaysia's cybersecurity market is one of the most developed in the region. International companies are choosing the country as their regional hub. For instance, in March 2020, Austrian service provider TÜV Austria opened its Cybersecurity Lab in Malaysia to offer cybersecurity testing and certification services in the Asia-Pacific region, in collaboration with local cybersecurity company LGMS.
- Some cybersecurity players are specifically targeting large companies in Malaysia as potential clients. One of these is US-based EC-Council, which in 2019 acquired DNeX Technology Sdn Bhd, a local company that operates a security operations center for major enterprises in Malaysia.
- Other companies are making inroads in the market by offering blockchain cybersecurity services. An example is represented by Swiss cybersecurity IoT platform WISeKey, which in 2019 announced a partnership with local company Cendee for the establishment of a Blockchain Center of Excellence in Malaysia to support the creation of Trusted Blockchain as a Service Platform. An additional case is offered by Korean FNSV, which in 2020 partnered with TELEKOM Malaysia to distribute its Blockchain Secure Authentication products and solutions.
- One potential entry route is by partnering with the public sector. A key player is CyberSecurity Malaysia, the country's cybersecurity agency. In 2019, it collaborated with international cybersecurity firm Kasperski to set up its first Transparency Center in Asia Pacific. Cyberjaya was picked as the location of the center. In the same year, the agency launched the CyberSecurity Malaysia Collaboration Program (CCP), a public-private partnership that targets Malaysian registered companies that provide cybersecurity products and services. A further initiative took place in March 2020, when the Ministry of Education in collaboration with Cybersecurity Malaysia announced plans to introduce a National Cyber Security Awareness Module at 300 schools nationwide.
- It should also be highlighted that facial recognition solutions are gaining ground in Malaysia. For example, in January 2020, Malaysia Airlines partnered with IT firm SITA to pilot facial recognition technology at the Kuala Lumpur International Airport. The technology provides single-identification verification for passengers at all airport touchpoints such as check-in, security and customs. Moreover, the following month Malaysian firm Datasonic secured a facial recognition e-gate contract for the Malaysia-Singapore border crossing worth USD 1.7 million.
- Malaysia's National Registration Department (JPN) is looking to implement a biometric registration system for all official identifying documents, in an attempt to increase national security. The documents involved in the effort will include citizenship, marriage, birth, and adoption certificates, none of which currently have any biometric identification characteristics. As the Malaysian government has recently been targeted in data-stealing cyberattacks, the biometric system will need strong cybersecurity measures in place.



4.4 Digital Education in Malaysia

OVERVIEW

- Malaysia is witnessing a wave of global technology firms rolling out digital learning platforms to improve the education system amidst the challenges of the COVID-19 pandemic. Importantly, in March 2020, the MDEC called Malaysians to turn to e-Learning platforms and digital alternatives as a way to overcome the challenges during these unprecedented times.
- In March 2020, the government allocated USD 11.7 million to subsidize short courses in digital skills and highly skilled courses for 100,000 Malaysians.
- In May 2020, the Ministry of Education decreed that all university lectures must be conducted purely online, with no face-to-face lessons allowed, until December 31 2020. Schools have been reopening in phases, starting from June 2020.
- An important development took place in June 2020, when it was announced that Google, Microsoft, and Apple collaborated with the MOE to revamp its year-old digital learning platform called Digital Education Learning Initiative Malaysia (DELIMa). The platform offers applications such as Google Classroom, Microsoft 365, and Apple Teacher Learning Center. DELIMa has an average of 1.7 million monthly active users, consisting of 10,000 schools, 370,000 teachers, and 2.5 million students.

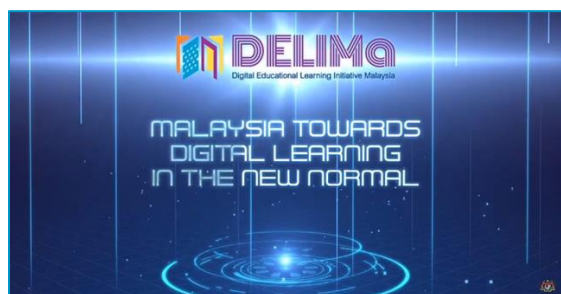


Figure 13: DELIMa's Logo
Source: EduwebTV

- One of the local champions is FutureLab, a startup that provides a software-as-a-service mentorship platform that allows universities, companies, and accelerators to manage, track, and scale their mentoring programs. It was recently selected for an acceleration program by Singapore-based edtech accelerator EduSpaze. Another interesting local start-up is Forward School, which raised USD 500,000 in funding and offers bootcamps for Android and iOS app development, React Native development, data science, and user experience design.
- An interesting initiative took place in May 2020, when Bain & Company started a collaboration with NGO Teach For Malaysia to build a microsite with guides on distance learning for teachers, parents and students.



OPPORTUNITIES

- Most learning centers in Malaysia are using Zoom for distance teaching. However, because of recent security issues many of them are looking for alternatives. For example, local edtech company AOne decided to collaborate with a company in Singapore to launch its online learning software to its existing customers for free, which comes with improved security features and no time limit for video calls. In two weeks the company registered about 600 classes conducted using its software, with some 180 teachers signing on the platform.
- It should also be highlighted that the country has high private tutoring demand but there are not many solutions available on the market. An example of a company capitalizing on this opportunity is Qatari edtech firm Modaris, which entered the Malaysian market offering a solution that uses a data-driven approach to connect students with home tutors.
- Virtual reality educational solutions have been successful in Malaysia, thanks to the high levels of internet penetration and smart device ownership. For instance, Singaporean digital education company Pinheads Interactive penetrated the Malaysian market by offering solutions that gamify the learning process with virtual reality. Another interesting case is represented by the USD 1.5 million investment that Malaysian MyEG Capital directed towards Beijing-based education tech startup that provides a Virtual Reality, AI-powered educational software.
- International companies are also targeting the Malaysian market for digital education solutions related to the businesses and technology segments. A key example is represented by Huawei Malaysia, which in May 2020 launched its ASEAN Academy, a training module that aims to nurture and train 50,000 Malaysians between 2020-2025 to equip them with skills for the country's digital sector. The company will invest USD 700,000 to provide more than 3,000 ICT courses for 100 skilled trainers. Some local companies are collaborating with Huawei for technical support. One of these is Jenexus, which will be assisting Huawei in providing AI technology training in Malaysia and ensure that are on par with global standards.
- Other companies that are entering the market in Malaysia highlight their online-tutoring services, in an effort to make distance learning comparable with the traditional experience. One of these firms is Singapore-based startup KooBits, which in Malaysia offers an online mathematics learning platform, and an AI-enabled online live tutoring service with apps for parents to track learning progress.
- MDEC is open to collaborating with foreign players. For instance, it is partnering with global online learning platform, Coursera, via the 'Let's Learn Digital' under the #mydigitalworkforce initiative, offering a total of 3,800 courses including Professional Training Certificate through applications until the end of 2020. Courses offered include Google IT Automation with Python, SAS Programmer, and Intel Introduction to Deep Learning.











5.0 PHILIPPINES

5.1 Snapshot of the Philippine Digital Landscape

- The Philippines' internet economy has grown remarkably from USD 2 billion in 2015 to USD 7 billion in 2019. Of the six largest South East Asian countries, the Philippines has the most room for growth: the internet economy makes up 2.1% of the country's GDP currently, and is expected to rise to 5.3% by 2025, hitting a value of USD 25 billion.
- As of January 2020, the Philippines recorded 73 million internet users with an internet penetration rate of 67%, and 173.2 million mobile connections. Notably, Filipinos are the heaviest internet users in the world, spending around 10 hours per day online.

Table 7: IT device ownership in Philippines, 2020

Smartphone 93%	Desktop / laptop 67%	Tablet device 40%	Streaming device 7.5%
			
Games console 12%	Smart home device 4.2%	Smartwatch 9.7%	VR device 1.9%
			

Source: DataReportal – Global Digital Insights

- The Philippines is currently in the middle of upgrading its digital infrastructure. Some USD 105 million have been allocated in 2020 to the country's Department of Information and Communications Technology (DICT) to speed up the rollout of interconnectivity and data security programs. This specifically includes installing free Wi-Fi in public places and state universities and colleges, setting up of centralized data centers, servers and storage facilities to interconnect government agencies. Importantly, the country is planning to build and launch two more international submarine cables. The eastern link, which will connect to Singapore and Japan via Indonesia, will be ready by 2022, while the western link will connect to Japan, South Korea, Hong Kong, Vietnam, and Thailand, and will be operational by 2023.
- Private companies have proven to be remarkably active in supporting government-led projects. For instance, Facebook agreed to construct and operate a 240 km submarine cable system, and Singaporean company HyalRoute Group announced an investment of up to USD 2 billion for laying out shared fiber optic cables throughout the country, as part of the government's Free Public Wi-Fi Network project to reach the unserved and underserved areas in the country.



- From having only two telco operators (PLDT and Globe), the country saw two more players joining the field in 2019 – DITO Telecommunity and NOW Telecom. These telco operators are currently racing to rollout 5G services. Globe is partnering with Huawei and PLDT with Nokia. Globe already introduced 5G services to its home subscribers in Metro Manila in July 2019. PLDT’s plans for a commercial rollout of 5G services in the first half of 2020 had to be postponed due to the COVID-19 outbreak, but are expected to be relaunched soon.
- Among the key segments of the internet economy, e-commerce is the fastest growing and the largest. The online media sector is also an area of strength as the Philippines it recorded a 43% increase from 2015 to 2019, with subscription music and video streaming services popular among young Filipinos.

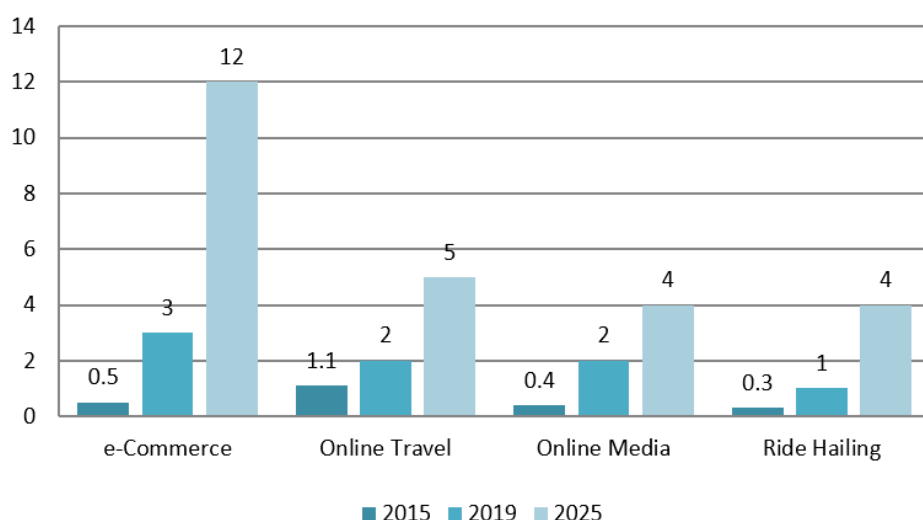


Figure 14: Key segments of the Philippines’ internet economy, USD billion

Source: Google; TEMASEK

- The Business Process Outsourcing (BPO) sector is the major driver of ICT developments in the Philippines, with the country being one of the global leaders in the area. The sector recorded USD 26.3 billion in revenues in 2019 and employs 1.3 million full-time employees. Interestingly, because of the high level of digitalization of the sector, it has proven to be resilient during the COVID-19 outbreak.
- As the pandemic redefines the world’s economy, the government of the Philippines has taken a more decisive approach in supporting the development of the ICT sector. In June 2020, the Philippine government launched the “Digital Cities 2025 program”. Under the program, the government will set up 25 new digital hubs in the country, which will be the focus for new economic development in the next three years. The initiative is geared to sustain the rapid growth of the Information Technology and Business Process Management (IT-BPM) sector and promote countryside development. Various Local Government Units, ICT Councils, and IT-BPM locators will have access to information on strategies and best practices from the private and public sectors to effectively develop and grow the IT-BPM industry in the selected regions.



5.2 Software in the Philippines

OVERVIEW

- Software development has become one of the more established segments of the country's ICT industry. Critical factors that are adding momentum to the Philippines's industry are its cost competitiveness, good IT knowledge of its workforce, as well as the high number of native English speakers in the country.
- The BPO industry is one of the biggest users of software solutions in the Philippines. The industry is made up of foreign firms, likely to purchase software solutions from their home countries. The market is registering a particularly strong growth in IA solutions such as RPA. Other key adopters of software solutions include banks wishing to pursue greater efficiency and security, hospitals seeking virtual platforms, and telcos looking into cloud solutions.
- Importantly, in 2019, the country launched its E-Government Masterplan (EGMP) 2022 which sets a blueprint for ICT adoption in the public sector, and plans for integrating interoperable ICT networks in order to improve organizational and inter-governmental coordination.
- Interestingly, the Philippines is considered to be at the forefront for cryptocurrency adoption in the region. The country also created a cryptocurrency and fintech hub called Crypto Valley of Asia in order to attract international blockchain companies.



Figure 15: Cryptocurrencies in South East Asia, May 2020

Source: Desfran

- The government is also encouraging startup development, an objective that the COVID-19 pandemic has further reinforced. In 2019, it promulgated its “Innovative Startup Act,” defining benefits for startups or startup enablers in the country. One of the key features of the law is the creation of a startup venture fund under the Department of Trade and Industry. The government plans to spend USD 61 million to help 1,000 startups by 2022.



- The private sector is also showing dynamism, with Ayala corporation creating a USD 150 fund supporting startups pursuing innovations along key technology areas in data analytics, machine learning, AI, cloud computing, and fintech sectors.

OPPORTUNITIES

- AI solutions are gaining ground in the country. In 2019 the government started crafting a roadmap for the adoption of AI solutions among public entities, and the market is already registering encouraging signs. For example, in 2020, the Manila City government entered into an agreement with Senti Techlabs for the adoption of AI solutions. Senti is considered to be among the leading AI companies in the Philippines and has partnerships with Google and Microsoft. Interestingly, AI solutions have also been used at hospitals in the capital city for the detection of cases of COVID-19.
- The development of the Crypto Valley of Asia represents an important opportunity, as it is the first and only fintech hub in the country. The concept was jointly developed by the government and the private developer Northern Star Gaming. It is located at the Cagayan Special Economic Zone, and provides special incentives to international investors. In 2020, the Philippines confirmed the construction of a new airport in the hub, at an estimated cost of USD 60-80 million.
- Banks are key targets, and are open to collaborating with foreign players. A case in point is represented by Bank of Philippine Islands (BPI), which in March 2020 tapped Swiss leading fintech service provider, Avaloq, to digitalize BPI's customer services in all its units ranging from private banking, investment banking and asset management. The Avaloq Banking Suite allows the bank to bring all areas onto one consolidated platform, allowing for a highly personalized level of service and richer set of products to wealth clients. It is also worth highlighting that digital banking is a nascent area that is gaining attention in the Philippines. In 2020, the country granted the first digital banking license to TONIK Digital Bank, the local subsidiary of Singapore-based fintech start-up, TONIK Financial.
- International companies specializing in blockchain solutions are making considerable inroads in the market. One of these is Chinese firm OneConnect, which in 2019 signed an agreement with Union Bank of the Philippines' fintech subsidiary UBX, in order to build and implement the country's first blockchain platform. The partnership aims to make various loans and financing products available to micro, small and medium enterprises. The platform leverages OneConnect's facial recognition technology, micro-expression interviewing technology, and big data-enabled artificial intelligence for credit assessment, loan disbursement, and anti-fraud checking. This allows UBX provide supply chain financing while enabling paperless contracts, contract judgement, compliance verification and financing risk assessment.
- It should be highlighted that the Philippines is one of the largest recipient of remittances, with international digital players expanding into this segment in the country. For example, in 2019, Japanese company Digital Wallet Corporation (DWC) announced its entry to the Philippines through the acquisition of a licensed remittance and foreign exchange company, Speed Money Transfer Philippines. DWS



developed one of the most popular mobile remittance service in Japan and aims at replicating the service in the Philippines.

5.3 Cybersecurity in the Philippines

OVERVIEW

- Cybersecurity incidents could result to a potential economic loss for the Philippines by as much as USD 3.5 billion, or about 1% of the country's GDP, according to a study commissioned by Microsoft. A remarkable 60% of local businesses are estimated to have inadequate cybersecurity infrastructure.
- The Philippine National Police (PNP) has recorded a consistent increase in cases of cybercrime in the country over the last years. According to Kaspersky Lab's global list, the Philippines is the fifth country with the most online threats worldwide.

Table 8: Cybercrimes investigated in the Philippines

	2016	2017	2018
Online libel	498	646	1,041
Online scam	511	367	1,012
Voyeurism	196	355	415
Identity theft	175	250	395
Threat	208	107	364
Hacking	116	109	184
Vexation	46	81	192
Illegal access	26	38	144
Robbery with intimidation	40	57	97
ATM/credit card fraud	31	56	91

Source: Philippine National Police

- Public bodies are major targets of cyberattacks in the country. For example, the Philippines government suffered a major attack on its Commission on Elections database that compromised the personal information of over 50 million voters.
- The Philippines' Department of Information and Communications Technology (DICT) launched the National Cybersecurity Plan 2022 (NCSP) creating a National Computer Emergency Response Team, and a Security Operations Center. To support NCSP, a USD 10 million Cybersecurity Management System Project was unveiled in early 2019 to serve as the national platform for intelligence sharing, monitoring threats and defending the country's cyber strategy.
- Interestingly, in June 2020, the Department of Information and Communications Technology (DICT) extended some of its cybersecurity services to private companies in response to a call from the Securities and Exchange Commission of the Philippines for firms to strengthen their cybersecurity and data privacy



protection in the middle of increased levels of digital transactions brought by the COVID-19 crisis. The DICT will offer for free digital certificates that will be useful in determining the authenticity in web applications and releasing of documents online.

OPPORTUNITIES

- The market is attracting players specializing in automated security services. One of this is EY, which in 2019 announced the opening of its front-line Cybersecurity Center in Manila. This multi-million facility offers highly automated security services that are supported by intelligent automation. Examples of services offered include triaged incident response services, threat hunting and threat protection powered by security orchestration, automation and response.
- The Philippines is deemed to have a cybersecurity skills shortage. There is thus a growing demand for cybersecurity training facilities. For example, in 2019, Californian firm Palo Alto Networks collaborated with Asia Pacific College (APC) to launch the first cybersecurity academy in the Philippines. In addition, in February 2020, DDLS Pty Ltd, Australia's largest provider of education training programs focusing on corporate IT, process and cybersecurity, opened up its first training facility in the Philippines.
- A further opportunity is represented by collaborations with various government and public entities, which need to rely on foreign providers given the scarcity of cybersecurity specialists in the country. An interesting example is represented by the joint venture formed in 2019 between Integrated Computer Systems (a local integrator) and Israel's Verint System Limited (a provider of surveillance tools to companies and the Israeli government). The joint venture won the USD 10 million contract for the development of the previously-mentioned cybersecurity platform called Cybersecurity Management System.
- Large conglomerates also represent key targets. For instance, in 2019, Aboitiz Equity Ventures (AEV), a Filipino holding company based in Cebu City, announced a partnership with BlueVoyant, an American analytics-driven cybersecurity firm. BlueVoyant became AEV's managed security services provider delivering real-time monitoring and vulnerability detection. Following the deal, BlueVoyant officially opened its new office in Manila to serve as its regional headquarters.
- Cloud security solutions are gaining ground in the local market in the wake of the COVID-19 pandemic. For example, in July 2020, local telco Globe signed a partnership with US-based cloud IT security company Zscaler in an effort to beef up its cybersecurity solutions for its clients. Through this partnership, Zscaler Internet Access (ZIA) and Zscaler Private Access (ZPA) are now part of Globe's growing cybersecurity solutions portfolio. ZIA is a cloud security service that transforms networks by delivering cloud-based internet and web security that scales to all users, regardless of location. Meanwhile, ZPA delivers on Zero Trust Network Access by securing access to private applications without those applications or users ever connecting to the network.



5.4 Digital Education in the Philippines

OVERVIEW

- The local e-learning sector was at a nascent stage before COVID-19, with the local market estimated to be valued at around USD 4 million. However, the outbreak has accelerated the adoption of digital education solutions, with e-learning expected to become a major component of the Philippine education system, in the new normal that has emerged with the pandemic.
- The government announced that schools in the Philippines will fully reopen only when a vaccine for COVID-19 has been found. Consequently, educational authorities are fast tracking the development and usage of e-learning platforms in order to have a distance learning regime for 27 million children in place by August, when the new school year begins.
- Infrastructure is a major challenge for the inclusive coverage of distancing learning nationwide. Only 26% of public schools are able to connect to the internet, while nearly 5,000 public schools in remote areas do not even have access to electricity.
- Consequently, the government is allocating additional resources. It announced that by the end of 2020, it will have 475,650 tablets and 634,877 desktop computers for 21.4 million public school students, and 190,574 laptops for public school teachers. However, it should be highlighted that only 15% of Filipino teachers have so far been trained to deliver alternative modes of education.

Table 9: Examples popular digital education apps in the Philippines

App	Logo	Description
Edukasyon		Platform for higher education opportunities
Learntalk		English leaning with video-calls
PhilSmile		All-in-one school management system for academic institutions
KITE eLearning Solutions		E-learning programs to educational institutions
Study Buddy		Recreational learning centered on official curriculum

Source: WorldRemit



- Usage of edtech platforms, and enquiries related to them, were at an unprecedented high during this pandemic. For example, Edukasyon, which is one of the most used edtech startups in the Philippines averaging over 10 million visitors per year, registered a 25-fold increase during the quarantine period.

OPPORTUNITIES

- Companies that have invested in AI and big data solutions have successfully penetrated the Filipino market. One of these is Singapore-based edtech startup KooBits, which has been able to work with over 130 schools in the Philippines since 2019. Its learning modules are based on the tried and tested concrete-pictorial-abstract approach, a model that ensures students do not simply rote-memorize the steps to solving a problem but are able to visualize and understand the underlying concept. In the wake of the COVID-19 pandemic, it launched two new products in the Philippines: 'Home-Based Learning', an online mathematics learning platform, and 'Live Tutoring', an AI-enabled online live tutoring service – both with accompanying apps for parents to track learning progress.
- A key opportunity is represented by possible partnerships with PLDT. The telecommunication company recently organized a series of online events to discuss how the global pandemic is impacting various industries in the Philippines. During one such education-related event, the company revealed that it is looking into developing new products for improving e-learning solutions in the country, and that it is considering collaborating with providers of learning management systems.
- The Filipino culture prefers face-to-face interaction, which is why the vast majority of education and upskilling in corporations and universities is still done in-person. However, some players are capitalizing on the new opportunities created by the COVID-19 pandemic by offering personalized learning solutions. One of these companies is local digital education specialist CloudSwyft, which provides a cloud-based, technology learning platform built around online courses and technology learning labs that provides instruction in subjects ranging from data science and machine learning to Azure and Power BI.
- Finally, educational institutions and corporate training providers in the Philippines are looking for solutions to optimize their limited resources, creating a need which is being answered by new startups. One of these is Edusuite, an AI-powered startup which predicts administrative needs and makes recommendations to school administrators. It recently secured over USD 235,000 in fresh funding from seasoned investors from the Manila Angel Investors Network (MAIN). One potential entry route is by partnering with Philippine corporate training providers and educational institutes who are looking to leverage digital channels and gamification to deliver more effective training.











6.0 SINGAPORE

6.1 Snapshot of the Singapore Digital Landscape

- Singapore is the established hub for ICT companies in South East Asia. Unicorns like Grab and Sea Group as well as US companies like Microsoft, Oracle, and Amazon Web Services have chosen to be based in Singapore for its world-class infrastructure, supportive business environment and its ability to attract talent.
- In January 2020, Singapore registered 5.1 million internet users, with an internet penetration rate of 88%, 4.6 million social media users and 8.5 million mobile connections, equal to 147% of the total population..

Table 10: IT device ownership in Singapore, 2020

Smartphone 95%	Desktop / laptop 78%	Tablet device 47%	Streaming device 16%
			
Games console 21%	Smart home device 11%	Smartwatch 25%	VR device 4.1%
			

Source: DataReportal – Global Digital Insights

- Singapore is also a global data management hub connected to 15 active submarine cable systems, with a total submarine cable capacity of 114 Tbps and more than 50% of the commercial carrier and carrier neutral data center space in South East Asia. Examples of companies capitalizing on the country's leading position in the region include Visa, whose Singapore transaction processing center serves both its regional and global networks, and LinkedIn, which set up its first international data center in Singapore to handle all its Asia Pacific traffic.
- A key development took place in November 2019, when Singapore launched a National AI Strategy consolidating all current existing initiatives related to AI, with funding of USD 108 million over five years. The government identified five National AI Projects, chosen because of their high social and economic impacts: Intelligent Freight Planning; Seamless and Efficient Municipal Services; Chronic Disease Prediction and Management; Personalized Education through Adaptive Learning and Assessment; and Border Clearance Operations.
- In April 2020, Singapore's Infocomm Media Development Authority named Singtel and the Joint-Venture Consortium (JVCo) formed by StarHub and M1 as the winners of its 5G Call for Proposal. The winners will roll out 5G standalone networks from January 2021. Singapore plans to have 5G coverage for at least half



of the country by the end of 2022 and nationwide coverage by the end of 2025. Crucially, in 2019 the government set aside USD 29.3 million to support 5G research and innovation, and develop the country as a 5G innovation hub.

- With high per capita incomes, the wealthy city-state is ahead on many metrics in the region. For example, average order values in Singapore's e-Commerce sector are three to four times higher than those in the rest of the region. Ride hailing trips and food delivery orders reveal similar patterns. It is this strong spending power that makes Singapore's internet economy, worth USD 12 billion in 2019, comparable in size to its much larger neighbors.

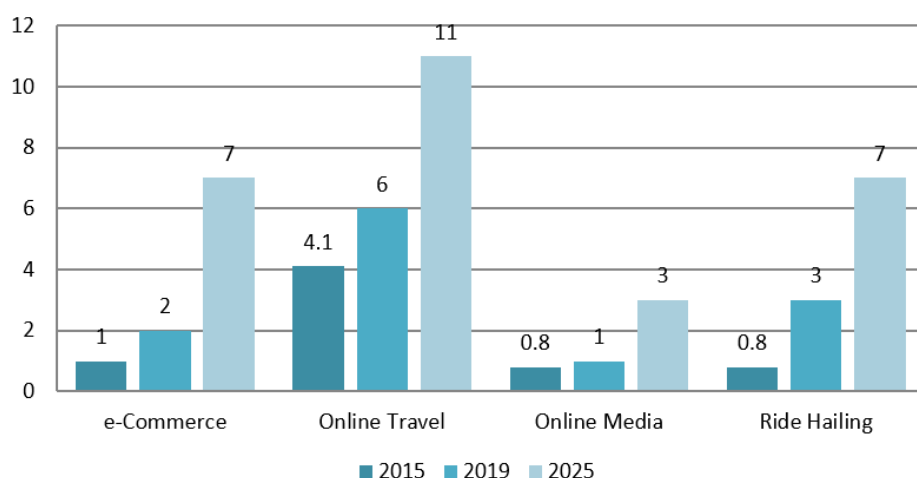


Figure 16: Key segments of Singapore's internet economy, USD billion

Source: Google; TEMASEK

- Singapore's businesses are making a major push towards digitalization this year, prompted by the COVID-19 crisis. More than 3,500 businesses started transformation projects from January to April 2020, a 20% increase from the previous year. About 600 retailers and 10,000 food and beverage establishments have also signed up to join digital platforms such as Amazon, Lazada, Shopee and Qoo10, helped by an e-commerce booster package that was launched by the government in April 2020 to help businesses sell online.
- In June 2020, it was announced that Singapore will spend an estimated USD 2.5 billion on ICT procurement to boost the economy and support businesses recovering from the COVID-19 outbreak, a 30% increase compared to the previous year. SMEs will be eligible to participate in 80% of these potential procurement opportunities. Expenditure will focus areas such as development of new technology tools to respond to COVID-19, development of citizen- and business-centric digital services, ICT systems on cloud, and government ICT infrastructure.



6.2 Software in Singapore

OVERVIEW

- Singapore remains a leading market for IT software. The country is a particularly attractive target for companies producing enterprise software such as enterprise resource planning. Moreover, the country is a major location for data centers, hosting three data centers from Google alone.
- Singapore ranked 2nd overall and 1st in the region in the 2020 Cloud Readiness Index from the Asia Cloud Computing Association, only behind Hong Kong and head of Australia and Japan.

Table 11: 2020 Cloud Readiness Index

Country	International connectivity	Broadband quality	Power grid	Data center risk	Cybersecurity	Privacy	Regulatory environment	IPR protection	Business sophistication	Freedom of Information	Total score, 2020
1. Honk Kong	9.3	9.1	4.8	8	8.7	8.3	9.8	8.4	8.4	7	81.9
2. Singapore	6.5	9.9	6.1	8.8	9	9.2	9.8	9	8.5	4.9	81.5
3. New Zealand	4.2	6.4	6.7	7.8	7.9	8.3	9.7	8.6	8.7	8.9	77.1
4. Taiwan	6.8	6.6	5.1	7.3	8.7	8.3	9.8	7.1	8.1	7.5	75.2
5. South Korea	2.6	8.2	4.3	7	8.7	9.4	9.9	6.6	8.4	7.5	72.7

Source: Asia Cloud Computing Association

- Thanks to its attractiveness Singapore has become a global hub for digital startups, accounting for more than 93% of the investment directed to all startups in the country, estimated at USD 9.6 billion from January to September 2019.
- Cloud computing is a key focus for Singaporean enterprises but the public sector is itself an important source of cloud services demand. For example, the government has initiated a cloud strategy called G-Cloud, a next generation government infrastructure that aims to maximize cost savings for local businesses and public entities.
- Singapore is the leader of the big data industry in South East Asia. The country is host to high-impact projects such as Facebook's USD 1 billion data center and Chinese e-commerce giant Alibaba's first joint research institute outside of China.
- Singapore has established itself as a leading fintech center, and its payments infrastructure is considered to be one of the best and strongest in the world.
- A crucial development took place in May 2020, when the government allocated more than USD 360 million to support corporate digitalization amid the COVID-19 pandemic. A key area for support is e-payments, whose adoption has risen sharply, with 50,000 more businesses adopting PayNow Corporate (a funds



transfer service that enables businesses to receive government payouts, collect and make payments in Singapore dollars instantly) since April 2020. The budget supports firms that have not begun using such tools.

OPPORTUNITIES

- A key opportunity is to capitalize on the upcoming 5G networks. Interestingly, in May 2020 the Infocomm Media Development Authority (IMDA), IBM, M1, and Samsung, announced Singapore's first 5G Industry 4.0 trial, with a focus on areas such as IoT and AI. IMDA and the National Research Foundation earlier set aside USD 28 million to support 5G trials in sectors such as maritime, aviation, smart estates, consumer applications, Industry 4.0 and government applications.
- Singapore has a vibrant research environment. A key example is offered by the three-year collaboration in quantum computing research and training announced in April 2020 by IBM and the National University of Singapore (NUS). The partnership will be led by the Quantum Engineering Program, a USD 25 million initiative managed by NUS that helps translate research in quantum science and technologies into commercial products.
- Foreign companies are making successful inroads in Singapore's fintech market. One of these is London-based fintech-as-service player Rapyd, which recently entered into partnerships with key players in Singapore's payments ecosystem to provide a single platform enabling businesses to go cashless. The platform enables consumers and businesses to easily make payments electronically, convert cash to electronic payment methods, or receive funds instantly.
- Digital banking is set to boom in Singapore, with almost a third of Singaporean adults expected to have an account by 2025 as the COVID-19 pandemic acts as a catalyst for the development of the market. Crucially, in June 2020, Singapore shortlisted 14 applicants, for up to five digital bank licenses in the city-state's biggest banking liberalization in two decades. Singapore aims to issue up to two retail bank licenses and three wholesale bank licenses by the end of 2020.
- A further opportunity area is represented by the move towards digitalization that insurance players are undertaking in Singapore. Leading players such as AIA and AXA have embarked of their digital transformation journey, while insurtech startups are mushrooming and expanding. For instance, in May 2020, Singapore-based Igloo (formerly known as Axinan) raised USD 8.2 million to broaden its foothold in half a dozen South East Asian markets and Australia. In July 2020, Hong Kong-based AMTD Digital acquired a controlling stake in PolicyPal, aiming at using the digital insurance broker's license granted by Singapore to develop and expand in South East Asia.
- It should not be forgotten that other industries that are not exclusively digital can present considerable opportunities. A key example is given by Singapore's world class aviation sector, which in February 2020 witnessed the opening of a 10,000 sq ft Innovation Hub from Collins Aerospace Systems, which focuses



on standardized advanced digital technology solutions across the company's MRO network. The Innovation Hub leverages automation, sensing, and machine learning technology to address customer pain points such as inventory management and spare parts availability.

6.3 Cybersecurity in Singapore

OVERVIEW

- As a highly connected nation, cybersecurity is a key concern for Singapore. Importantly, global organizations and multinational corporations, such as Boeing and INTERPOL, have established cybersecurity centers in Singapore in recent years, thus lending credence to the country's vision of becoming Asia's leading security solutions hub.
- Singapore faces the highest cybersecurity risk in Asia-Pacific due to its high internet adoption rate, but it is also the most prepared to deal with it in terms of policies and organizational readiness. For instance, in 2020, Singapore announced that a cyber-security label on smart home appliances will be rolled out to help buyers better judge how exposed they are to cyber risks.



Figure 17: Cyber Smart Index, 2020

Source: Deloitte

- In 2020, government announced that it will set aside USD 720 million over the next three years to build up its cyber and data security capabilities, focusing on advanced technologies such as artificial intelligence and IoT.
- An interesting development took place in 2019, when the ASEAN-Singapore Cybersecurity Centre of Excellence (ASCCE) was set up in the country, with plans to spend USD 22 million over five years to offer policy and technical cybersecurity programs for ASEAN countries. It will also collaborate with other international partners including Australia, Canada, the European Union, and the US.



- Notwithstanding the excellence of Singapore's cybersecurity infrastructure, it has suffered from major cyberattacks. In 2018 the largest data breach in the nation's history, targeted SingHealth, Singapore's largest healthcare group, with data from 1.5 million customers compromised.
- As more Singaporeans switch to remote working in the wake of the COVID-19 pandemic, there are concerns on the increasing levels of cybersecurity threats, as an estimated 70% of remote workers use their personal devices for work, and these devices often do not conform to their organization's security requirements.

OPPORTUNITIES

- An important opportunity is represented by the need to ensure cybersecurity for Singapore's upcoming 5G networks. To protect against 5G network cyber threats and vulnerability, the IMDA has put in place comprehensive security and resilience requirements for the 5G network operators. Moreover, in partnership with network operators, IMDA has announced a 5G Security Testbed Program for technology exploration.
- International cybersecurity companies are also capitalizing on Singapore's excellence in R&D. For example, in 2019 American tech giant Cisco set-up an innovation hub in the country with a Cybersecurity Centre of Excellence in partnership with Singapore's Economic Development Board, in order to boost its Asia-Pacific threat intelligence research and response capabilities related to the IoT industry.
- It should also be highlighted that Singaporean players are collaborating with American companies in the area of cybersecurity. A key example is offered by California-based cybersecurity firm FireEye, which in 2019 announced an expansion of its strategic partnership with the Cyber Security Agency of Singapore in the areas of cybersecurity capability development, research and development. Previously, FireEye entered a similar partnership with Singapore's Nanyang Technological University.
- Other foreign cybersecurity players have selected Singapore as the headquarters for their operation in the region. One of these is Israeli firm Sygnia, which in May 2020 opened its Asia-Pacific center in the county after having been acquired in 2018 by Temasek, one of Singapore's sovereign wealth vehicles.
- The example of another Israeli company illustrates the possibility for the co-development of new cybersecurity solutions with Singaporean agencies. In 2020, Israel Aerospace ELTA's Custodio Technologies announced the start of a collaboration with Singapore's Defense Science and Technology Agency (DSTA) to develop technology to detect cybercrimes. The 2-year project aims to research, design, develop and deploy a smart platform for the analysis, learning and investigation of digital crimes, helping investigators overcome the challenges of modern cybercrime investigation and digital evidence analysis.








- Players that are already established in Singapore are using the country as a launch-pad to the region, capitalizing on the city-state's investment ecosystem. One of the latest is cybersecurity company Horangi, which in March 2020 raised USD 20 million for expansion into South East Asia.
- The education sector has been one of the most targeted by hackers in the wake of the COVID-19 pandemic as hundreds of thousands of students and teachers had to access online resources daily for remote learning during the lockdown. Education institutions faced 16 times more attacks than other often-targeted organizations in the healthcare and retail sectors.

6.4 Digital Education in Singapore

OVERVIEW

- Singapore tops the global ranks for students' preparation. With a strong focus on academics combined with a high purchasing power, it is not surprising to see multiple edtech companies consistently emerging in the city state, a trend that the COVID-19 pandemic has further accelerated.
- In 2019 seed capital firm Spaze Ventures launched EduSpaze, which it said is Singapore's first edtech accelerator supported by Enterprise Singapore. It provides up to USD 360,000 to help startups go to market. In 2020 it revealed nine early-stage companies that formed its first cohort of startups, which came from Singapore, Malaysia and Australia.

Table 12: Examples startups selected by EduSpaze

App	Logo	Description
VERE360		VR content for social issues, education and training
Yumcha Studios		It creates cartoons, bilingual books and digital language-learning experiences
ACKTEC		Innovation for Immersive Learning (Interactive Animations, AR/VR and IoT)
Makers Empire		3D technology to teach STEM, Design Thinking and Project-Base Learning
Practicle		AI-powered online adaptive Math practice platform for P1-P6 children

Source: EduSpaze



- Singapore has recently launched its National Digital Literacy Program. The initiative, rolled out in June 2020, mandates for all Secondary 1 students to have a personal learning device prescribed by the school by 2024 and for all secondary students by 2028, paid with public funds.
- Importantly, in June 2020 the Education Minister announced that Singapore will make home-based learning part and parcel of the local curriculum, and the country may soon start experimenting with once a fortnight home-based learning in primary and secondary schools.
- One of the most successful edtech startups in Singapore is XSEED. Adopted by thousands of schools in the city-state, the XSEED method combines teacher training and integrated curriculum, besides replacing the conventional teaching approach by inquiry-based approach, thereby making students more interested in the content.

OPPORTUNITIES

- Personalized learning and gamification have been successful in the market. For instance, Singaporean startup Knowledge Platform has designed games and various other activities embedding them with social networking features that allow users to interact with one another and join forces to achieve shared success. This startup uses data analysis to track the progress of learners and inform them of gaps and improvement areas.
- Other companies have specifically target local students looking to enter US educational institutions. Singaporean company Cialfo's online platform aggregates information such as application deadlines and requirements, essay prompts and acceptance rates, and also allows for the timely submission of application documents and quick communication on the status of applications. In 2019 it raised USD 3 million in funding to expand into the US market.
- It is also worth highlighting the possibility of developing digital solutions designed by American schools and universities, to be offered to Singaporean players. For example, the already-mentioned Singaporean firm XSEED uses its digital platform to teach a '5-step experiential learning method' curriculum designed by professors from Harvard and MIT.
- The most established companies are also expanding into the booming regional market after having test-bedded their solutions in Singapore. One of these is Hong Kong-based Snapask, which in 2020 decided to expand to Vietnam after having entered the Singaporean market. It recently raised USD 35 million from Asia Partners for its expansion plans.
- There is also demand for professional upskilling.
 - For example, in May 2020, Singapore launched a new online portal to help investment management professionals working in Singapore to acquire new skills. The online portal iLearn centralizes curated training programs for these professionals and is accredited by the Institute of



- Banking and Finance as well as fulfills the Monetary Authority of Singapore's regulatory requirements.
- Similarly, in June 2020, Danish supplier of nautical charts Weilbach received approval from the Maritime and Port Authority of Singapore to supply its e-Learning solution on handling dangerous goods for shipment by sea (the IMDG Code) to shore-side staff. Weilback's e-Learning courses offers a cost-effective way for staff to learn about the safe transport of goods without having to attend classroom sessions.
 - ICT professionals are a key target for professional upskilling, as it is often reported that Singapore lacks qualified specialists in this field. A company trying to capture this opportunity is Huawei, which in June 2020 launched a new Virtual AI Academy with more than 140 free online courses to accelerate training of Singapore ICT professionals and digitalization for SMEs.
 - There is a potential to collaborate with Singapore's public entities, which are very open to working with foreign companies. A case in point is offered by the Government Technology Agency of Singapore, which in June 2020 signed a three-year Memorandum of Intent with Pennsylvania software developer Qlik, aimed at deepening public sector officers' expertise and capabilities in the field of data science.











7.0 THAILAND

7.1 Snapshot of the Thai Digital Landscape

- The Thai internet economy has grown at a 29% annualized rate from 2015 to 2019, reaching a value of USD 16 billion, representing the second-largest market in South East Asia. It is expected that this value will increase to USD 50 billion by 2025.
- As of January 2020, there were 52 million internet users in Thailand. The country has an internet penetration rate and a social media penetration rate of 75%. The number of mobile connections is 93.4 million, equivalent to 134% of the total population. It is estimated that the average Thai spends nine hours a day connected to the internet.

Table 13: IT device ownership in Thailand, 2020

Smartphone 94%	Desktop / laptop 50%	Tablet device 33%	Streaming device 8.3%
			
Games console 12%	Smart home device 3.7%	Smartwatch 15%	VR device 2.1%
			

Source: DataReportal – Global Digital Insights

- The ICT industry has developed on the back of the country's excellence for electronic manufacturing. For example, Thailand is the largest exporter of computers in the region.
- According to a 2018 study by United Overseas Bank, EY and Dun & Bradstreet, Thailand's SMEs are the most active in South East Asia in terms of investment in technology. 73% of Thai SMEs put technology as their top priority, above investments such as machinery or factory equipment. Thai SME's top choices include software for mobile applications and digital marketing.
- Unlike most other ASEAN countries, Thais are generally well banked with good access to personal accounts. Remarkably, Thailand tops the global ranking for internet banking access. Thailand is set to kick off cross-border digital payments in South East Asia, with payments between Thailand and Singapore and Cambodia expected to begin by mid-2020. Moreover, in June 2020, the Bank of Thailand launched a digital currency pilot project.
- Thailand has not imposed yet a digital tax on the earnings of foreign companies. However, in June 2020, it drafted a bill that requires foreign digital service providers to pay a 7% VAT.



- Thailand's online travel sector ranks among the biggest in the region, valued at USD 7 billion in 2019 and growing at a brisk 17% annualized growth rate. Online media has also been expanding rapidly at 39% CAGR since 2015, buoyed by high levels of engagement on social media and video platforms among the Thais.

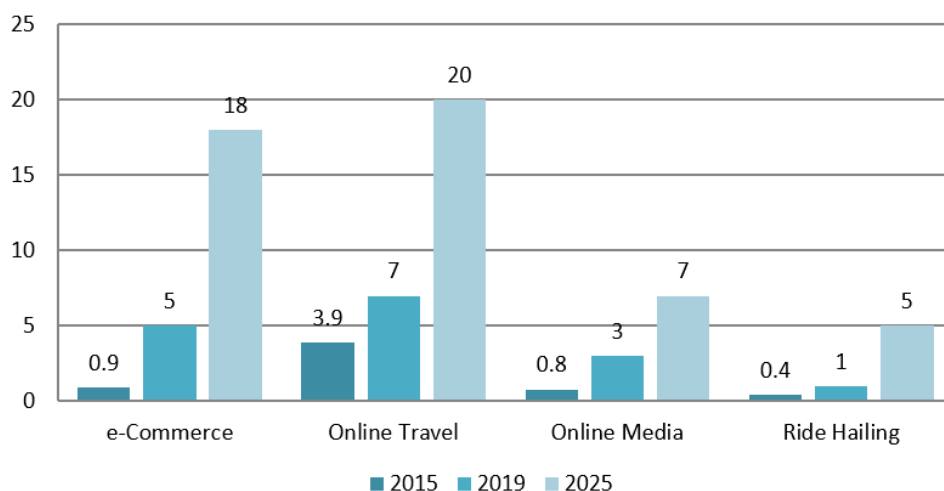


Figure 18: Key segments of Thailand's internet economy, USD billion

Source: Google; TEMASEK

- A key initiative in Thailand is the Digital Park Thailand, a flagship project with an investment of USD 160 million, which seeks to attract more than 100,000 digital ecosystem developers in areas such as edutainment, drones, robots, and e-sports. When completed in 2021, it will have an area of 160,000 m², hosting an IoT Institute and offering incentives to international investors.
- A key player in the sector is the Digital Council of Thailand (DCT). In October 2019, DCT announced that it is working with the Federation of Thai Industries to turn the country into a digital innovation hub in ASEAN through the development of data centers and AI capability.
- The COVID-19 pandemic has prompted Thailand's major telecom operators to speed up deployment of 5G technologies, making Thailand the first country in ASEAN to have commercial 5G services.
- The availability of 5G services combined with the effects of COVID-19 is predicted to act as a boost for the country's thriving e-commerce industry. Alibaba, which set up its distribution center in the free-trade zone of the Eastern Economic Corridor, where products can be kept without paying import tax, is expected to be one of the key winners.






7.2 Software in Thailand

OVERVIEW

- The Thai software industry enjoys extensive government support, launching initiatives ranging from the establishment of 100 Smart Cities nationwide to the transition from 4G to 5G technology.
- Under the Thailand 4.0 initiative, aimed at modernizing the country's manufacturing capabilities, the government plans to raise the contribution of SMEs to the economy through digitalization. An example of one such initiative is the three-month program launched by United Overseas Bank (Thai) aimed at developing long-term digital transformation strategies for selected SMEs.
- On the public sector side an important development took place in May 2020, when the government approved USD 146 in funding to finance the deployment of a cloud service for use by government agencies.
- Thailand has a rapidly developing fintech market, with around 140 companies in 2019, including Omise, a payment solutions and real-time fraud detection provider; Jitta, an investing solution; MoneyTable, a platform that simplifies financial analysis; and FlowAccount, a cloud-based bilingual accounting platform for SMEs.

Table 14: % of internet users in Thailand using fintech solutions, 2020

Mobile banking apps 65%	Mobile payments 69%	Cryptocurrencies 12%
		

Source: DataReportal – Global Digital Insights

- In accordance with the Thailand 4.0 initiative, the country aims to have 100 smart cities by 2022, with innovative solutions for issues ranging from improved water efficiency to improved connectivity. In January 2020, 27 Thai smart cities joined the global City Possible program by Mastercard.
- In 2019, the country opened its True Digital Park, the largest digital innovation hub in South East Asia, which is focused on building a complete startup ecosystem with a co-working and office zone, and an innovation and creator space. It aims to provide an affordable area for over 600 startups to develop and attract venture capital funding and angel investors, and hopes to incubate a unicorn. Its innovation and creator space is where big companies will operate or open development labs: Google, Amazon Web Services, Huawei, Ricoh, and Krungthai Bank, among others.
- Interestingly, in 2019, Thailand's government-owned agency that owns and operates government data centers and cloud services, CAT Telecom, announced it will be involved in big data analytics developments for Thailand's industrial clusters.



OPPORTUNITIES

- Blockchain solutions are making significant inroads in Thailand. For example, in May 2020, Thailand announced that it was collaborating with Power Ledger, an Australian blockchain startup, to boost peer-to-peer trading of renewable energy. In parallel, Siam Commercial Bank (SCB), one of Thailand's largest banks by assets, revealed the formation of a partnership with US-based Ripple, an enterprise specializing in blockchain solutions for global payments. In January 2020, Lightnet, a Bangkok-based startup using blockchain technology for the Asian remittance market, raised USD 31.2 million in funding.
- Thai banks are exploring facial recognition solutions. Importantly, platforms for opening bank accounts using electronic Know-Your-Customer (e-KYC) from TMB Bank and Kasikornbank (KBank), which are using facial recognition technology to verify customers' identity, recently graduated from the Thai central bank's regulatory sandbox. In the next phase, customers will be able to use cross-bank identity verification through a National Digital ID platform to open deposit accounts.
- An area of opportunity is represented by smart solutions, both for Thailand's growing network of Smart Cities and the upgrade of its industrial clusters. For example, in 2020, Singaporean AI and IoT company Envision was chosen to develop the first smart grid for Thai state-owned oil and gas company, PTT Public Company (PTT). The project will be developed in Thailand's Eastern Economic Corridor, the largest special economic zone in the country.
- Thailand has one of the most dynamic food and farming industries in the region, and local players are looking into digital solutions in order to stay competitive. For example, in 2020, US-based Infor, a global leader in industry-specific business cloud software, signed a contract to support Thai food giant Pataya Food Group's expansion into global export markets. Moreover, AI and Robotics Ventures, a subsidiary of PTT, is reported to be diversifying into agriculture by developing AI and data analytics systems for local farming.
- Another key area of opportunity is offered by the country's growing ecosystem of food delivery apps. GrabFood, Get, Line Man and Foodpanda are the established players, but new entrants are also finding a market. For instance, in June 2020, Siam Commercial Bank unveiled its food delivery platform called Robinhood, as the market skyrocketed as a consequence of the COVID-19 pandemic. Robinhood is waiving the gross profit fees collected from food merchants as part of its strategy to draw eateries and customers onto the platform.
- Importantly, the COVID-19 outbreak has created a market for new solutions. This is illustrated by the success of Bangkok-based fintech startup Synqa Holdings, which is looking to capture a slice of growing demand for cashless transactions in Asia by taking advantage of USD 80 million it raised in June 2020. In the same month, the Royal Thai Police proposed the creation of an online app to track the movement of tourist infected by the virus.



7.3 Cybersecurity in Thailand

OVERVIEW

- Thailand's high levels of internet penetration and early adoption mobile banking, e-commerce and digital government services make the country a key target of cyberattacks. Tellingly, a 2019 study from Cisco found 35% of companies in Thailand saw a financial impact of USD 1 million or more from their most significant breach, compared with 30% globally.
- Thailand is facing a shortage of cyber-security experts amid the country's drive for digital transformation, according to the chairman of the Thailand Banking Sector-Computer Emergency Response Team (TB-CERT).
- In effect, Thai banks have proven to be particularly vulnerable targets as they have heavily promoted the use of online and mobile banking services. Krung Thai Bank reported that the personal data of 117,000 customers applying for personal, housing and other loans online, were hacked. In turn Kasikorn Bank reported that corporate data of about 3,000 customers using the bank's online letter of guarantee service, was compromised.
- Thailand is considered to be the world's leading hotspot for cryptocurrency mining malware, followed by Vietnam and Egypt.

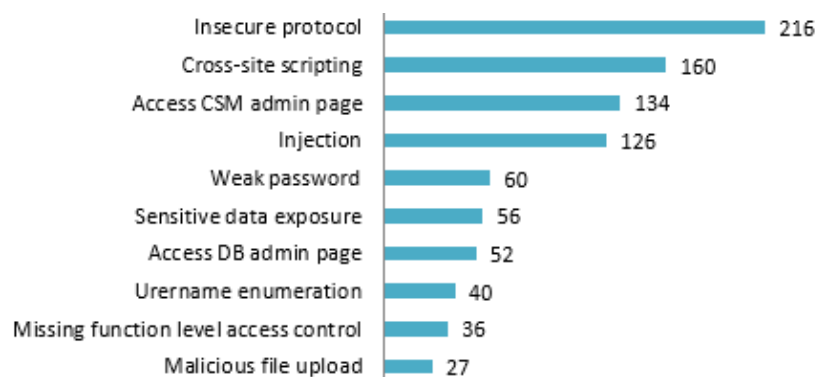


Figure 19: Top 10 cybersecurity vulnerabilities among Thai companies

Source: ACinfotec's survey of 250 companies, 2019

- In the latest Global Cybersecurity Index, Thailand's ranks slipped from 22nd to 35th position, prompting the government to pass a new cybersecurity law in 2019, which allows the government to track, monitor, and access digital data if it deems that the cyber threat is damaging to the critical digital infrastructure of the Kingdom.
- An interesting recent initiative is represented by the opening of a new cybersecurity center named ASEAN-Japan Cybersecurity Capacity Building Center (AJCCBC) to help solve human resource requirements for cybersecurity, particularly the governmental agencies.



OPPORTUNITIES

- The government has initiated a digital ID project to support service provision in both the public and private sectors. Led by the Electronic Transactions Development Agency (ETDA), the National Digital ID Platform provides an intermediary and open infrastructure for identity verification. The system, designed to digitally identify and authenticate customer, needs strong cybersecurity measures.
- Although it is reported that hospital systems are under stress by a growing number of cyber incidents in the context of the COVID-19 outbreak, no major attacks has been registered so far. Thai hospitals have been investing heavily in cybersecurity measures. For instance, in December 2019, Bumrungrad International Hospital announced a new USD 3.5 million cybersecurity operations center in collaboration with IBM, to protect the data of 1.1 million patients.
- A further area of opportunity is represented by collaboration with public institutions, especially for capacity building programs. A good example of a company capturing this opportunity is Estonian company Guardtime, which in January 2019 partnered with the Defense Technology Institute (DTI) of Thailand to strengthen research in national cyber security in multiple areas, including blockchain cyber security solutions, and launched a cyber security training and exercise program.
- The government has identified cloud solutions as a security measure to protect sensitive data. For instance, in 2020, it launched the Government Data Center and Cloud (GDCC) service, to be used as a central cloud system to ensure the safety of government data, and serve as a backup in the event of disasters.
- Cybersecurity solutions for the Thai army are a key opportunity area, as the military is actively seeking collaborations with foreign partners. In this context, it is worth highlighting how in 2020 Israel and Thailand held their first joint cyber exercise as part of part of a program that has been in place since 2018, dealing with a variety of digital threats, from hacking to cyber terrorism.
- Some players are offering cybersecurity solutions targeting companies that are spurred by COVID-19 to transition online. For instance, in April 2020, Thailand's largest mobile phone operator AIS collaborated with US cybersecurity specialist Trustwave to launch its new Cyber Security Operation Center (CSOC) which monitors customers' cybersecurity and develops solutions for companies such as enterprise mobility management, network firewall, IT log management, and vulnerability assessment and penetration testing to identify vulnerabilities and weaknesses in the corporate network.
- Finally, given the high levels of cryptocurrency mining malware, solutions for the safe trading of crypto money could represent a further opportunity. A recent development was in March 2020, when Huobi Thailand launched a platform for Baht to crypto trading.








7.4 Digital Education in Thailand

OVERVIEW

- After closures to contain the spread of the COVID-19 pandemic, schools in Thailand have reopened in July 2020 amid uncertainties, with the Ministry of Education emphasizing that students will move to online and on-air classes in case of new outbreaks. In any case, digital education solutions are seen as part of the new normal, with areas deemed to be at risk of infections relying on distance learning.
- One of the most interesting actors in the market is Bangkok-based Disrupt Technology Venture, which launched “StormBreaker Venture”, branded as the first Edtech Accelerator in South East Asia. The company has set an ambitious goal of providing digital education solutions to one million Thais, as well as breed the first Thai Ed-Tech unicorn by 2023. Partners of the accelerator include Microsoft, the Thailand Development Research Institute, start-up incubator True Digital Park, and media company Tech in Asia.

Table 15: Examples of start-ups from StormBreaker Venture

App	Logo	Description
OpenDurian		Online learning platform for students and first jobbers
Vonder		Micro learning and games that make learning fun for everyone
Voxy		Personalized English learning solutions for professionals
Conicle		Cutting-edge cloud based LMS platforms for corporations
FoxFox		Quiz-format game for coding skills assessment

Source: StormBreaker Venture

- Given the limited access to high quality wi-fi in some rural communities, government efforts to switch to remote schooling in the context of the COVID-19 outbreak have focused on digital, cable and satellite television.
- There are 17 Thai television channels under the nationwide distance learning programs, each devoted to a specific standard – from kindergarten to high school. Two other separate channels are reserved for vocational programs.



- The National Innovation Agency (NIA) is worked together with startups and innovation companies to develop new digital education solutions to facilitate distance learning.

OPPORTUNITIES

- It is interesting to note how telecommunication companies are partnering with foreign players to develop digital education solutions. For example, in 2020 CAT Telecom, the state-owned company that runs Thailand's international telecommunications infrastructure, entered the online interactive learning business by launching a platform called Aculearn Online by CAT, developed in collaboration with Singapore-based digital learning provider Aculearn Online and Advanced Digital Synergy, a Bangkok-based communication tech provider.
- Thailand has a need for more digital solutions for language learning. In effects, Thai schoolchildren score low in English proficiency, behind all their regional peers with the exception of just Cambodia and Myanmar. Some startups are trying to capitalize on this opportunity, including local company Taamkru, offering gamified lesson plans for English on its app-based learning platform.
- New opportunities are also arising thanks to the new 5G infrastructure. A startup that wants to leverage on the country's early adoption of 5G networks is Globish Academia (Thailand), which in May 2020 announced the start of trials for AI and augmented reality adoption for its live English classroom platform.
- Interestingly, the Thai government is pushing for coding to be adopted by schools as a third language, with some primary schools already making it part of their programs. An example of a startup focusing on digital learning solutions for coding is Quest, which in June 2020 raised six-digit seed funding with Reapra, a Singapore-based VC firm. Quest is also one of the startups that is receiving funding from the Digital Economy Promotion Agency of Thailand. Other examples include US companies Edmodo and Coding Galaxy, which in May 2020 announced to have been selected by the Thai Ministry of Education to begin a trial as the online learning platform and coding learning solution for 10,000 K-12 schools.
- A further area of opportunity is represented by the corporate sector. One of the most successful start-up in this segment is Conicle, which apart from being backed by StormBreaker Venture, received USD 900,000 in funding from various investors in 2020 to support its learning management system, which acts as an executive assistant and HR in developing the internal workforce. A key strength of Conicle is its blended-learning approach with data-driven personalization. Conicle claims to have over 500,000 registered users from more than 30 organizations, including AIA, PTT Group, Makro, and Honda.
- A noteworthy collaboration between the private and public sectors in the context of the COVID-19 outbreak is between Microsoft and the Ministry of Higher Education, Science, Research and Innovation, which in March 2020 launched a program to advance outside-the-classroom education through interactive virtual classrooms on the Microsoft Teams platform for 150 universities, covering over 60,000 educators and over two million students across the country.











8.0 VIETNAM

8.1 Snapshot of the Vietnamese Digital Landscape

- Vietnam's Internet economy is booming, reaching a value of USD 12 billion in 2019 on a 38% annualized growth rate since 2015. With its internet economy accounting for over 5% of the country's GDP in 2019, Vietnam is emerging as the most digitalized economy in the region.
- As of January 2020, Vietnam had 68 million internet users with an internet penetration rate of 70%, 65 million social media users, and 145 million mobile connections, equal to 150% of the total population.

Table 16: IT device ownership in Vietnam, 2020

Smartphone 93%	Desktop / laptop 65%	Tablet device 32%	Streaming device 9.6%
			
Games console 6.9%	Smart home device 13%	Smartwatch 18%	VR device 3.1%
			

Source: DataReportal – Global Digital Insights

- Vietnam aims to achieve a smartphone penetration rate of 100% to facilitate the deployment of e-government initiatives. Vietnamese companies have started producing their own version of smartphones, mostly cheaper Android models. Local conglomerate Vingroup is now selling a smartphone called Vsmart for about USD 100, registering high volumes of sales despite the complicated situation of the COVID-19 epidemic.
- Vietnam is third most-funded internet economy in the region after Indonesia and Singapore. From 2015 to 2019, Vietnam's Internet economy attracted close to USD 1 billion in funding. It is expected that by 2025, the country's internet economy will be valued at USD 43 billion.
- E-commerce is a key driver behind the impressive growth of the sector. Major players in Vietnam's e-commerce market are Lazada, Shopee, Tiki, Thegioididong, and Sendo. While Lazada and Shopee are international corporations operating in multiple markets, Sendo, Tiki, and Thegioididong are only available for consumers within Vietnam. Of these, Tiki is the fastest-growing retail company in the country. It has successfully transformed its business model from a B2C platform to a Business-to-Business-to-Consumer (B2B2C) platform.



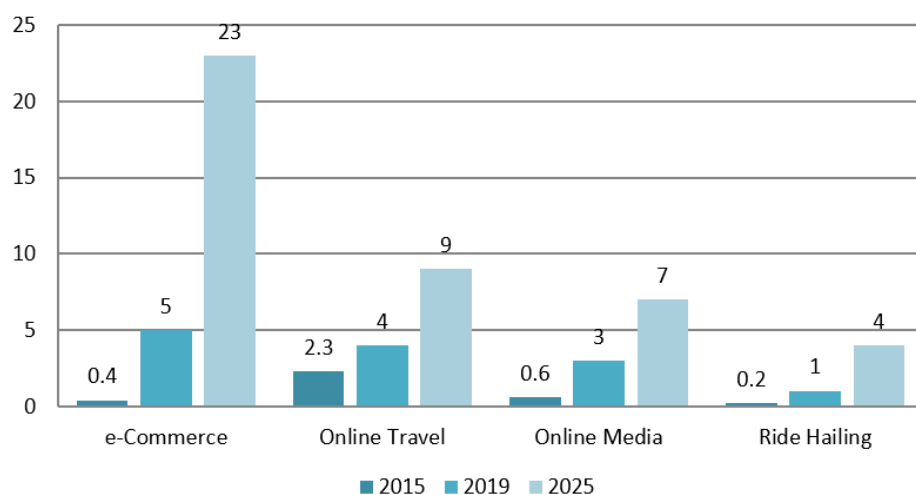


Figure 20: Key segments of Vietnam's internet economy, USD billion

Source: Google; TEMASEK

- Vietnam aims to establish a network of smart cities centered around Hanoi, Ho Chi Minh City, Da Nang and Can Tho City. The first pilot phase is planned to be completed by 2025, focusing on developing reference frameworks and national standards, with priority given to urban management, lighting, traffic, water supply and drainage, waste collection and disposal, power grid, and ICT infrastructure.
- Vietnam is implementing various programs to foster the start-up and innovation ecosystem. Key actors in this context include the National Agency for Technology, Entrepreneurship and Commercialization Development, the National Technology Innovation Fund, the Hoalac Hitech Service Center and the Saigon Silicon City Center. Importantly, in 2019 Vietnam launched the National Innovation Center, promoting the development of start-ups across four areas: content technologies, network security, smart city technologies and smart manufacturing technologies.
- Vietnam is one of the first countries in the world to trial 5G networks, with a commercial launch expected by the end of 2020. The introduction of 5G brings new opportunities for the digital economy. The Vietnamese government has granted the first license to test 5G networks to Viettel, the country's largest mobile carrier, which has over 60 million subscribers.
- The COVID-19 pandemic is pushing digital transformation in Vietnam. Banks slashed online transaction fees to encourage cashless payment, while online shopping and food delivery services jumped in demand. Retailers reported that orders by phone and apps increased tenfold compared to normal days, while digital education surged amid school closures.



8.2 Software in Vietnam

OVERVIEW

- The software market in Vietnam is characterized as being of low value in per capita terms, but the country is experiencing strong growth in this segment as private companies and the public sector are investing in expanding and modernizing their operations. A crucial enabler of this growth is the increasing number of Vietnamese people going online and demanding digital content, e-commerce services, and mobile banking.
- Vietnam is emerging as hub for start-up financing on par with Singapore, attracting 18% of all funding directed to South East Asia. An important development took place in February 2020, when Grab, South East Asia's leading ride hailing firm, announced the launch of Grab Ventures Ignite, an accelerator program for early-stage startups.

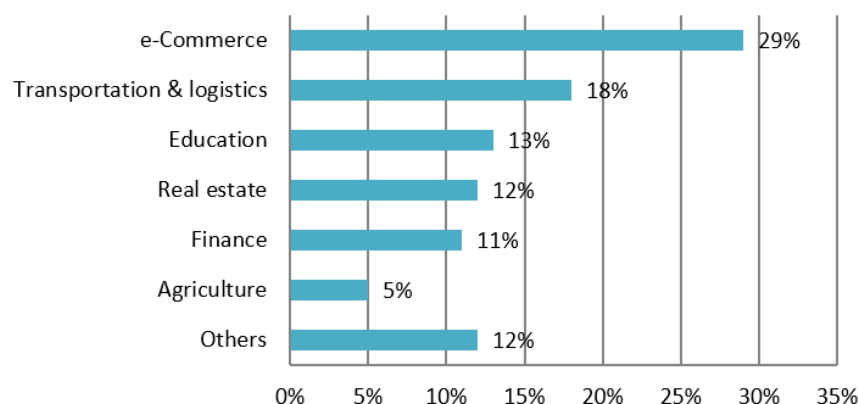


Figure 21: Applications of AI companies in Vietnam

Source: rubikAI

- In effect, attracting investment is a key goal of the country. In 2020, the Vietnamese government approved the Da Nang Information Technology Park (DITP) as a centralized information technology (CIT) zone, granting preferential policies and regulations to attract domestic and foreign investors in IT. The DIPT, which is the second CIT zone after Da Nang's Software Park, focuses on software products, digital content, IT services and hardware products and services.
- It is also interesting to note that local companies are launching new social media platforms. In 2019, Vietnam Communications Corporation (VC Corp) launched social networking platform called Lotus, while Gapo was developed by Hanoi-based Gapo Technology JSC.
- Large application packages for enterprise software still have relatively low adoption rates in Vietnam, with American brands struggling to compete with cheaper local and Chinese rivals. However, the situation is rapidly changing, with more companies willing to invest in more sophisticated solutions as COVID-19 spurs them to move their operations online.



OPPORTUNITIES

- Vietnamese banks are focusing on the enhancement of their online and mobile banking platforms. Most local banks have started implementing digital core banking systems and some have authorized payments via QR codes on mobile device applications, payments through social networks, and cash withdrawals from ATM without cards. Interestingly, in May 2020, the country's central bank announced a pilot project for deploying telephone subscription accounts to make small payments.
- A key area of opportunity is represented by logistic software. Although current IT adoption rates in the sector are very low, with the majority of logistics enterprises that have yet to adopt ERP systems, transport management systems, bar code systems and warehouse management software, the market is expected to grow rapidly as a consequence of the boom in e-commerce and recently-implemented trade agreements such as EVFTA and the CPTPP. Additionally, the government of Vietnam has recently unveiled a new plan to transform the country into a regional logistics hub by 2025, aiming to make the country one of the world's leading logistics services providers. An interesting example of the dynamism of the market is offered by Logivan, a Vietnamese platform that connects truckers with shipping companies. In 2019, it secured USD 5.5 million to invest in data analytics and integration and application of AI in clarifying documents, meeting user demand and providing more accurate forecasts of orders.
- Vietnam is also emerging as a center for R&D activities. In March 2020 it was reported that Samsung started on construction of its USD 220 million R&D center in Hanoi, which will be completed by end of 2022. It will be the company's largest in South East Asia and will enhance research capabilities in areas such as AI, IoT, big data and 5G. Similarly, in June 2020, Californian giant Qualcomm opened its regional R&D facility in Hanoi, which aims to develop wireless technologies (4G, 5G) IoT solutions, and provide testing services to local companies like VinSmart, BKAV and Viettel.
- In the research field, it is also worth highlighting that Vietnamese companies are entering partnerships with foreign institutions. A case in point is represented by FPT, the largest IT service company in the country. In June 2020, it signed a strategic partnership agreement with Quebec-based research center Mila in an attempt to enhance its AI capabilities. It is the first company in South East Asia to enter the Mila partner network, joining industry giants such as Google, Microsoft, and Facebook.
- Virginian companies could also consider the opportunity to offer smart city services, in particular in target cities such Hanoi and Ho Chi Minh City. Interestingly, local companies are partnering with foreign players in this area. For instance, in 2020, Japan's Mitsubishi Corp and Nomura Real Estate Development announced a partnership with Vingroup on a smart urban development project in Ho Chi Minh City, investing USD 908 million into the project. The project, named Grand Park and expected to be completed in 2023, will involve nearly 50,000 residences as well as schools, hospitals and commercial centers.



8.3 Cybersecurity in Vietnam

OVERVIEW

- According to consulting firm Kearney (formerly A.T. Kearney), Vietnam, together with Indonesia and Malaysia, is one of the key global hotspots for malware attacks. In effect, Vietnam's public and private sector cyber security capabilities are still relatively weak, and the country suffers from a shortage of skilled cyber security personnel.
- Over the last few years the government has stepped up cybersecurity defenses. As a result, cyberattacks dropped 51% in the first four months of 2020. The International Telecommunication Union placed Vietnam in the group of countries with high commitment on cybersecurity, which jumped 50 places in its 2018 Global Cybersecurity Index, compared to its 2017 ranking.

Table 17: Global Cybersecurity Index, ASEAN countries

Country	Score	Rank - Asia Pacific	Rank - Global
Singapore	0.898	1	6
Malaysia	0.893	2	8
Thailand	0.796	7	35
Indonesia	0.776	9	41
Vietnam	0.693	11	50
Philippines	0.643	12	58

Source: International Telecommunication Union

- In 2019, the country set up the Vietnam Cybersecurity Emergency Response Teams/Coordination Center (VNCERT/CC), located in Hanoi with two branches in Ho Chi Minh City and Da Nang. The center is charged with responding to security incidents and checking information security nationwide while preventing spam emails and messages, among others.
- In the same year, Vietnam's new cybersecurity law took effect, requiring all foreign providers of internet-related services to open representative offices and data centers in the country, where information of Vietnam-based users must be stored in order for foreign companies to continue offering their services to local users.
- In April 2020, US cybersecurity firm FireEye released a report detailing how Vietnamese government-linked hackers had attempted to break into Chinese state organizations at the center of Beijing's effort to contain the COVID-19 outbreak.
- In June 2020, an Israeli cybersecurity firm called Check Point Research reported a ransomware attack targeting government systems in Vietnam. According to the firm, the cyber espionage operation has been going on under the radar for years and is connected to Naikon Advanced Persistent Threat (APT) group,



which cybersecurity firms like Kaspersky, ThreatConnect and Defense Group exposed in 2015 as having links to China.

OPPORTUNITIES

- VNCERT/CC is collaborating with foreign players. For example, in June 2020, in the wake of increased cyberattacks in the region as more people switch to work online as a consequence of the COVID-19 pandemic, the center organized a cyberattack drill hosting tech experts of the 10 ASEAN member countries and Japan. The exercise focused on solutions and information-sharing mechanisms to deal with fake websites, and it saw the participation of more than 200 Vietnamese IT experts.
- Fake websites are one of the most crucial cybersecurity issues in Vietnam, and the country needs to adopt more sophisticated measures. For instance, in June 2020, Vietnamese cybersecurity corporation Bkav uncovered spyware being disseminated via a fake website of the Ministry of Public Security, with the aim to secretly gather victims' sensitive data. Bkav estimated there had been over 300 victims of the spyware, which is named VN84App.
- Domestic cybersecurity companies are growing and strengthening their capabilities. A case in point is offered by Viettel Cyber Security (VCS), a subsidiary of Viettel Group, which in 2020 launched a Managed Security Operation Center (SOC) service on a global scale. The new SOC service is capable of detecting, analyzing, responding, preventing and investigating traceability of information security incidents and ensuring security for IT systems. VCS claims that it has been acknowledged by Google, Facebook and Microsoft for detecting vulnerabilities of companies in the country.
- The country needs solutions for more secure video-conference platforms. In this regard it is interesting to note that in April 2020, VNCERT/CC advised state agencies, lenders, and firms against using the popular video conferencing platform Zoom for their online meetings after it was alleged that the personal particulars of more than 500,000 Zoom accounts have been leaked in the country. Zoom boomed in popularity amid the COVID-19 pandemic. Details leaked include the victim's email address, password, personal meeting URL, and host key, a six-digit pin assigned to a user hosting a Zoom meeting.
- Another entry option is to collaborate with Vietnamese companies focusing on R&D efforts. For example, in 2020, Thu Do Multimedia JSC became the first technology company in South East Asia to have developed a solution to protect digital content copyright. After developing the software, it collaborated with American firm Cartesian to meet international security standards. The product combines DRM (Digital Right Management) and Finger Print Online (a solution for detecting re-streaming video sources).
- Finally, it is important to note that the new cybersecurity law requires multinational tech companies such as Facebook and Google to store data on Vietnamese citizens on data centers that must be located in the country's territory. Such companies represent key targets as they need to demonstrate that the data in their servers is safely stored and protected.








8.4 Digital Education in Vietnam

OVERVIEW

- Digital education ranks among the most profitable areas for Vietnamese start-ups, together with fintech, e-commerce, and logistics. Crucially, as part of Vietnam's fight against COVID-19, 22 million students in Vietnam began learning from home in early January while the nation went into lockdown, leading to a boom in the digital education market.
- In March 2020, leading technology firms like VNPT, FPT, and Viettel reported a significant growth in user numbers for their e-learning platforms. For instance, VNPT E-Learning by VNPT witnessed a fourfold increase in visitors to reach 5 million, with the peak of 100,000 visitors simultaneously in one hour. ViettelStudy by Viettel gained 41 million visits in a month.
- Vietnamese schools and institutions suffer from a lack of adequate digital infrastructure and resources. In order to overcome this problem, Viettel, VNPT, Vietnamobile and Mobifone agreed to provide free mobile data for students, teachers and parents when using e-learning methods identified by the government.
- Vietnam currently has about 90 digital education startups. The sector, although booming in the wake of the COVID-19 pandemic, is still in its early stages of development, but it should be noted that education represents a very consistent part of a family's budget, around 40%, with parents keen on investing in their children's education.

Table 18: Leading digital education start-ups in Vietnam

App	Logo	Description
Edmicro	 Edmicro	Personalized and micro-learning using artificial intelligence
Everest Education		Courses for math, English, test preparation, computer programming, etc.
Topica		English speech tutoring course with virtual reality
ELSA Speak		Artificial intelligence solution for English pronunciation
Tesse		Live interactive classes with instantaneous feedback

Source: Orissa International



- Apart from companies from Japan, Korea, the UK, Australia and the US, digital education firms from neighboring countries are also attracted to the fast-growing Vietnamese market. For example, Indonesian Ruangguru recently announced its intention to expand to Vietnam.

OPPORTUNITIES

- An opportunity for digital education companies is to partner with Anglophone institutions in Vietnam in order to complement their offer. An example of a company penetrating the Vietnamese market through this route is Manabie International, a digital learning startup from Japan. After entering Singapore, it raised USD 4.8 million in 2020 to expand to Vietnam, where it teamed up with Japanese schools in the country. In April 2020, it counted more than 100,000 users from Vietnam logging into its platform.
- English is one of the most popular subjects taught online in Vietnam. One of the key companies capitalizing on this demand is Vietnamese startup Yola, which in 2019 received an investment worth USD 10 million from Kaizen Private Equity. The company claims to have trained more than 30,000 students that have been admitted to over 200 top universities in the US, Australia and the UK. A further example is given by ELSA Speak, which stands for English Learning Speech Assistant, a mobile phone application that utilizes artificial intelligence to help Vietnamese with English pronunciation.
- Another area that is in demand in the Vietnamese market is test preparation. Apart from Everest Education, another example of a digital education company offering such service is Rockit Online, an online tutoring specialist that provides test preparation courses for IELTS, TOEFL, and TOEIC. It connects middle and high school students with teachers which are employed by Rockit itself (around 50).
- Augmented reality solutions are growing in demand, with local digital education companies starting to develop such technologies. A case in point is offered by Vietnam's Topica Edtech Group, which claims to have developed the world's first online English speech tutoring course that uses augmented reality to enhance its lessons. The company's platform, called Kidtopi, targets Vietnamese young learners by allowing them to learn English one-on-one with teachers from US and Canadian elementary schools.
- A crucial strategy is to offer solutions that are customizable, a characteristic common to the most successful companies in the market. Some players are also investing in AI to ensure a high level of personalization. For instance, Vietnam's tech giant FPT launched the VioEdu online e-learning system, which is the nation's first smart education assistant using AI. The system also allows parents to closely monitor students' training process through detailed statistical reports.
- Finally, it should be highlighted that online learning platforms for professionals are also finding a market in Vietnam. For example, in 2019, Vietnam-based edtech startup Dream Viet Education sold its online learning platforms Kyna.vn and KynaBiz.vn to HR services firm Navigos Group. The two platforms are digital learning solutions for professionals in the business sector, and offer courses on technical skills and foreign languages.



APPENDIX: EXPORTS FROM VIRGINIA

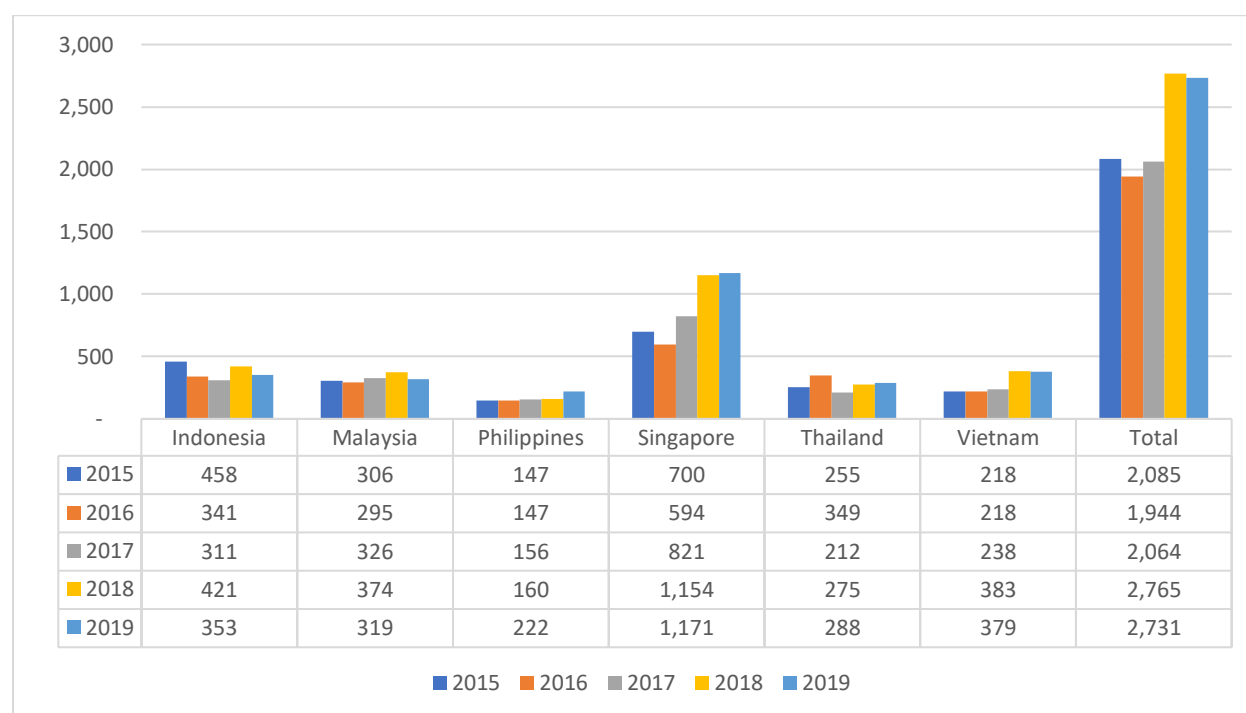


Figure 22: Exports from Virginia (USD million)

Source: United States Census Bureau

Table 19: Top 10 export items from Virginia to the six major South East Asian markets – Indonesia, Malaysia, Philippines, Singapore, Thailand and Vietnam

Item (2-digit HS code and description)	Total export value from 2015 to May 2020 (USD million)
85 Electric Machinery Etc.; Sound Equip; Tv Equip; Pts	233.0
12 Oil Seeds Etc.; Misc. Grain, Seed, Fruit, Plant Etc.	80.8
55 Manmade Staple Fibers, Incl Yarns & Woven Fabrics	27.3
23 Food Industry Residues & Waste; Prep Animal Feed	15.3
39 Plastics and Articles Thereof	17.8
84 Nuclear Reactors, Boilers, Machinery Etc.; Parts	23.1
88 Aircraft, Spacecraft, And Parts Thereof	29.5
44 Wood and Articles of Wood; Wood Charcoal	25.0
48 Paper & Paperboard & Articles (inc Papr Pulp Artl)	11.2
47 Wood Pulp Etc.; Recovd (waste & Scrap) ppr & pprbd	12.3

Source: United States Census Bureau



Table 20: Top 5 export items by total export value from 2015 to May 2020

Indonesia	Malaysia
55 Manmade Staple Fibers, Incl Yarns & Woven Fabrics	85 Electric Machinery Etc.; Sound Equip; Tv Equip; Pts
23 Food Industry Residues & Waste; Prep Animal Feed	12 Oil Seeds Etc.; Misc. Grain, Seed, Fruit, Plant Etc.
47 Wood Pulp Etc.; Recovered (waste & Scrap) ppr & pprbd	84 Nuclear Reactors, Boilers, Machinery Etc.; Parts
12 Oil Seeds Etc.; Misc. Grain, Seed, Fruit, Plant Etc.	76 Aluminum and Articles Thereof
39 Plastics and Articles Thereof	39 Plastics and Articles Thereof
Philippines	Singapore
23 Food Industry Residues & Waste; Prep Animal Feed	85 Electric Machinery Etc.; Sound Equip; Tv Equip; Pts
48 Paper & Paperboard & Articles (inc Papr Pulp Artl)	88 Aircraft, Spacecraft, And Parts Thereof
84 Nuclear Reactors, Boilers, Machinery Etc.; Parts	84 Nuclear Reactors, Boilers, Machinery Etc.; Parts
85 Electric Machinery Etc.; Sound Equip; Tv Equip; Pts	39 Plastics and Articles Thereof
02 Meat and Edible Meat Offal	90 Optic, Photo Etc., Medic or Surgical Instruments Etc.
Thailand	Vietnam
12 Oil Seeds Etc.; Misc. Grain, Seed, Fruit, Plant Etc.	44 Wood and Articles of Wood; Wood Charcoal
39 Plastics and Articles Thereof	56 Wadding, Felt Etc.; Sp Yarn; Twine, Ropes Etc.
88 Aircraft, Spacecraft, And Parts Thereof	02 Meat and Edible Meat Offal
84 Nuclear Reactors, Boilers, Machinery Etc.; Parts	52 Cotton, Including Yarn and Woven Fabric Thereof
23 Food Industry Residues & Waste; Prep Animal Feed	84 Nuclear Reactors, Boilers, Machinery Etc.; Parts

Source: United States Census Bureau

