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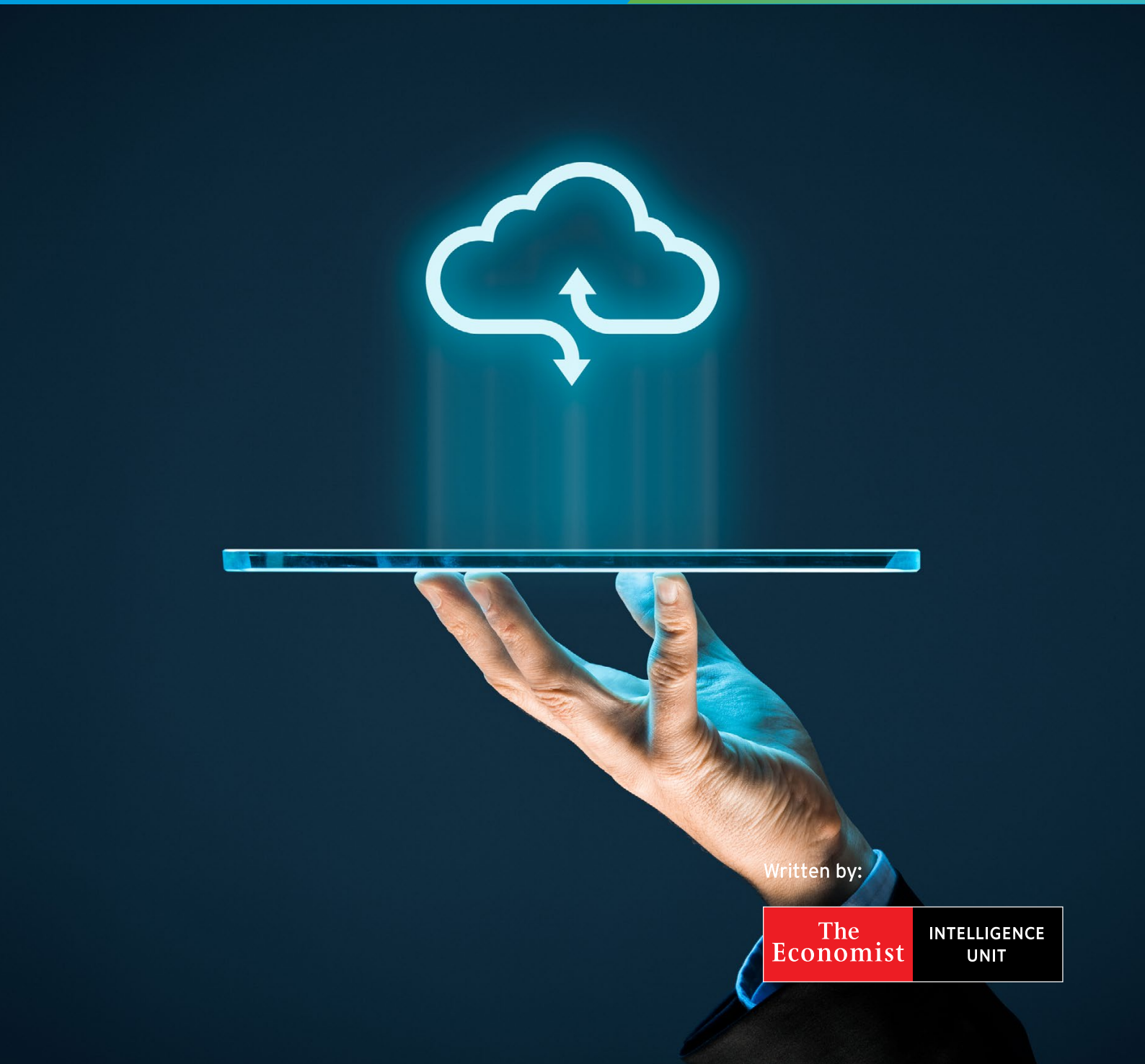
Up in the air

The journey to the cloud in ASEAN



Written by:

The Economist INTELLIGENCE UNIT

Client foreword

VMware, one of the world's leaders in cloud, cyber security and modern apps, commissioned this ***#cloudsmart*** project with The Economist Intelligence Unit, working from our couches and kitchens at home during COVID-19. VMware CEO Pat Gelsinger remarked at VMworld 2020 that "***COVID-19 has accelerated the need for a digital foundation for an unpredictable world.***"

Indeed, more than ever before people across the world have embraced technology to keep our world moving. For example telemedicine, workforces across all range of industries, supply chains and remote classrooms have been rapidly deployed to survive – all supported by technology.

As governments address the economic impact of COVID-19, digitization is even more critical in long term policy strategies with more citizens and industries online. Governments are turning their attention to restarting and revitalizing economies and for many the cloud is a core ingredient in the economic rebuilding plans. Indeed markets like Singapore are openly aiming to be global digital hubs of the region as part of COVID strategies. Cloud is an integral component of any such goal.

Therefore such policy backdrops provide much opportunity for harnessing technology and innovation to the betterment of all people. As such, VMware sees an opportunity for more policy thought leadership on the benefits of cloud and how governments can structure policies to achieve maximum digitization across the Asia Pacific region. Governments understanding and embracing the economic benefits of cloud first policy and current digital disruption caused by COVID are key to a healthy recovery of economies.

Being ***#cloudsmart*** is one step towards achieving this. Including the benefits of cloud and cyber security in digital economy agreements and free trade pacts are strategies Governments should continue to discuss at the policy table right now. We acknowledge that ASEAN, via the ASEAN Comprehensive Recovery Framework, has numerous plans to address the impacts of COVID-19, of which one focus area is "***Accelerating Inclusive Digital Transformation***". We applaud this.

Governments across the region can build on this work in progress and look at the benefits of cloud through the lens of four foundational pillars outlined in the Economist's report, namely: supply (infrastructure), demand (awareness), regulatory policies and cyber-security.

We encourage Governments to consider this unique report by the Economist - reimagine the digital world, rebuild economies and become ***#cloudsmart*** in the interests of all.

Join us on the ever evolving cloud journey.

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About the research and acknowledgements

Up in the air: The journey to the cloud in ASEAN is a report from The Economist Intelligence Unit, sponsored by VMware, examining the opportunities and challenges presented by cloud services adoption in the public sector in ASEAN countries with a focus on Indonesia, Malaysia, Singapore and Thailand.

Kim Andreasson was the author of the report and Charles Ross was the editor. To better understand the opportunities and challenges presented by cloud computing adoption in the public sector in ASEAN markets, The Economist Intelligence Unit conducted wide-ranging desk research supplemented by six in-depth interviews with senior experts in October 2019. Two additional in-depth interviews and follow-ups were then conducted in June and July 2020 to account for changing circumstances due to the pandemic disruption of covid-19. Our thanks are due to the following interviewees for their time and insights:

- Maciej F Boni, associate professor, Center for Infectious Disease Dynamics, Department of Biology, Pennsylvania State University
- Chan Cheow Hoe, government chief digital technology officer, Singapore
- Nigel Cory, associate director, trade policy, Information Technology and Innovation Foundation
- Deborah Elms, executive director, Asian Trade Centre
- Ashish Lall, former associate professor, Lee Kuan Yew School of Public Policy, National University of Singapore
- Gwanhoo Lee, professor and chair, Department of Information Technology and Analytics, Kogod School of Business, American University
- Lim May-Ann, executive director, Asia Cloud Computing Association
- Don Ta, assistant professor, information systems, Singapore Management University

The Economist Intelligence Unit bears sole responsibility for the editorial content of this report. The findings do not necessarily reflect the views of the sponsor.

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Executive summary

Cloud computing solutions offer cost-savings and improved efficiencies by taking advantage of global economies of scale. Many countries are therefore attempting to create an enabling environment for cloud computing, not only for the private sector itself but also for private sector entities to either take advantage of such offerings or provide them.

At the same time, many countries in the Association of Southeast Asian Nations (ASEAN) inadvertently hinder the potential for cloud computing adoption through a lack of data-privacy regulations and the introduction of data localisation policies that prevent the free flow of data across borders, leaving many businesses in limbo.

This report looks at the opportunities and challenges presented by cloud computing adoption in ASEAN countries through the lens of four foundational pillars: supply (infrastructure), demand (awareness), regulatory policies and cyber-security. Research shows that leading countries, such as Singapore, take a proactive approach towards the regulatory environment and support government adoption through hybrid clouds. This method involves taking advantage of cheaper, global public clouds while also hosting data locally. Other countries in the region, meanwhile, offer major opportunities in terms of scale but also face a number of challenges.

To provide insight into national cloud computing efforts in ASEAN, The Economist Intelligence Unit conducted desk research and eight in-depth interviews. The key findings of the research are as follows:

- **Policies matter:** ASEAN countries are deploying different cloud computing strategies at a national regulatory level. They range from laissez-faire approaches without any policies in some to clear regulations supporting adoption by government and business in others. The latter is particularly true of Singapore, the leading country in the region.
- **Infrastructure shortages can hinder adoption:** Internet access, affordability, speed, bandwidth and data centres are foundational to reaping the benefits of the cloud. Progress in this regard varies widely across ASEAN with Singapore's connectivity reaching nearly 90%of the country whereas in Indonesia that figure is nearly halved. This digital divide offers potential for businesses to capture the cloud opportunity.

- **A lack of digital skills remains an issue:** Even when access is readily available, people must possess the necessary digital skills to navigate the cloud. Again, progress varies across the region with Singapore rated as the top country in an Economist Intelligence Unit index for future skills. The digital skills gap has been accentuated during the covid-19 pandemic: those without them are being left behind.
- **Cyber-security remains the greatest concern:** Some countries in ASEAN have introduced data localisation policies which can limit economies of scale in the name of national security, though data-privacy regulations can be unclear across the region. Both topics carry great importance and one way to mitigate the concern on both sides may be the adoption of hybrid cloud solutions that are cost effective while allowing sensitive data to be stored in private clouds.
- **Turn disruption into an opportunity:** The covid-19 response highlights the importance of technology, particularly in terms of business continuity but also in terms of government response to the pandemic. Cloud computing contributes to more seamless collaboration, including between businesses and medical researchers across the globe.

Introduction

There are many benefits of cloud computing, including decreasing cost of doing business, improved accessibility and collaboration and enhanced security.[1] Cloud computing can provide a common information and communications technology (ICT) infrastructure as well as shared applications and services. This leads to standardisation and improves interoperability across government agencies. Global spending on public cloud services will more than double between 2019 and 2023, according to market research firm IDC.[2] Within the cloud environment, most of this spending will be on Software-as-a-Service (***see box on cloud differences***). In Asia-Pacific, spending on a public cloud is expected to have an economic impact of US$450bn between 2019 and 2023 in an estimate based on six markets including Singapore India, and Australia.[3]

This shift towards cloud computing is partly due to changing organisational buying patterns. By moving to the cloud, there is no need for large capital investments. Previously, information technology (IT) departments had to plan for large spending over a period of time, typically three to five years, whereas the cloud allows them to manage resources more efficiently on an on-demand basis. "The growth in cloud computing adoption was astronomical before covid-19 and the pandemic has now accelerated that trend," says Nigel Cory, associate director of trade policy at the Information Technology and Innovation Foundation (ITIF). "It was primarily driven by big multination corporations before, but now we see cloud adoption increasing rapidly among small- and medium-sized enterprises and across non-tech sectors."

The pandemic has simply resulted in a fundamental shift in business operations for a large number of companies across the world, including the Association of Southeast Asian Nations (ASEAN). Opportunities include agility and flexibility in terms of working from home as well as innovation benefits. According to The Economist Intelligence Unit Global Business Barometer, "greater digital agility" is also the greatest opportunity for post-covid resilience.

There are three benefits of cloud computing during the current pandemic, says Gwanhoo Lee, professor and chair at the Department of Information Technology and Analytics at the Kogod School of Business at American University in Washington, D.C. The first is business continuity as cloud providers have greater expertise than individual organisations. The second is cost. During a pandemic, organisations can scale their needs depending on whether they increase or decrease the number of staff. Third, the cloud enables management to focus on its core business in times of crisis instead of worrying about the technology infrastructure. "During a pandemic, the difference is the magnitude of the benefits," says Mr Lee.

The region ought to be progressive, but it looks less attractive the deeper you look

DEBORAH ELMS, EXECUTIVE DIRECTOR, ASIAN TRADE CENTRE

At the same time, the cloud brings national security concerns in terms data storage locations and potential loss of control. Hence governments around in the world—including ASEAN—are grappling with both opportunities and challenges in the space. Many are introducing various mechanisms around cloud adoption, ranging from "data sovereignty" to "data localisation" initiatives that seek to promote control and protect national security. The downside is that these schemes can increase the cost of doing business and result in significantly weaker service than that offered by international companies.

"The region ought to be progressive, but it looks less attractive the deeper you look," says Deborah Elms,

[1] https://www.business.qld.gov.au/running-business/it/cloud-computing/benefits
[2] https://www.idc.com/getdoc.jsp?containerId=prUS45340719
[3] https://www.zdnet.com/article/public-cloud-can-add-450b-to-apac-economies-through-to-2023/

executive director of the Asian Trade Centre. On the one hand, some countries have no national policies yet, such as Myanmar, Lao PDR and Cambodia. On the other hand, some countries have strict data localisation regulations that limit the benefits of economies of scale. "This has spooked international companies as they have to set up their own domestic servers, which is contrary to the benefits of international clouds."

Indonesia and Vietnam have both introduced regulations that limit the uptake of international cloud computing to the potential disadvantage of global economies of scale. "Others [in the region] are paying attention" to those initiatives, says Ms Elms. She also points out that it is a timely topic as ASEAN is currently working on regulatory frameworks that cover data flows and classifications—two topics that go hand-in-hand—and may limit the enabling environment for cloud computing in the region, depending on the outcome.[4] "They have to be viewed together," says Ms Elms. "But also note that they can be undercut by domestic policy."

Such country differences have also been highlighted globally during covid-19. "This may not be the first pandemic of the information age, but this is the first global pandemic of the information age," says Ashish Lall, former associate professor at the Lee Kuan Yew School of Public Policy (National University of Singapore). "With the exception of a few countries, everyone used one instrument: lockdown. This meant our reliance on the cloud increased in terms of e-commerce, health, working from home, collaboration and general communication between individuals."

Covid-19 has exposed digital gaps and accelerated digital transformation trends, says Mr Cory, who expects the pandemic to accentuate competitive differentiation between countries and firms. "After 23 years of various emerging disease outbreaks, the role of technology in prevention and response has become increasingly important" adds Maciej F Boni, associate professor at the Center for Infectious Disease Dynamics in the Department of Biology at Pennsylvania State University. "The biggest impact can be found in contact tracing, mobile-phone based human movement analyses, genome sequencing, and big data approaches"

A common denominator is that all those technologies can take advantage of cloud computing to store and analyse such data. "The ability to purchase cloud processing time at a good price is important," adds Mr Boni, although he says the most common use of cloud among researchers relates to collaboration platforms that improve storage capabilities and enable work to transcend time zones in a seamless manner. "There is no way to collaborate with researchers across the world in this way without the cloud."

However, the creation of an enabling environment for cloud computing poses a number of challenges for ASEAN, according to Ms Elms. They include infrastructure supply in terms of connectivity, speed and affordability. "Uptake in ASEAN overall is slowed by fundamental challenges," says Ms Elms. She adds that even when "you have the right conditions, other questions then surface, such as regulatory policy and awareness". ASEAN countries, therefore, must take a holistic approach. This includes a focus on four pillars: supply (infrastructure), demand (awareness), regulatory policies and cyber-security.

[4] https://asean.org/storage/2012/05/6B-ASEAN-Framework-on-Digital-Data-Governance_Endorsed.pdf

Box I: Cloud differences

There are four different types of cloud over which three different kinds of services are offered. Private clouds are located on-premise by the organisation for private use and offer greater control. Government clouds are similar in this regard, the difference being that they apply to the public rather than private sector. By contrast, public clouds (not to be confused with the public sector) take full advantage of global economies of scale. Some argue that there is a loss of control and cyber-security issues with regard to public clouds, but this is not always the case. Then there are hybrid clouds which allow organisations to take advantage of all approaches. They can use cost efficient public clouds for non-sensitive data and elect to use a private or government cloud for sensitive information if they wish to do so. "I have a sense that a lot of organisations are considering a hybrid cloud solution," says Ashish Lall, former associate professor at the Lee Kuan Yew School of Public Policy (National University of Singapore). "The critical point of a hybrid cloud is interoperability because of legacy systems that have to adapt to new solutions." Finally, there are multi-clouds which allow users to access data both on and off-premises.

Whatever the preferred option, there are three types of services delivered over more than four different types of cloud: Software-as-a-Service (SaaS), Platform-as-a-Service (PaaS), Infrastructure-as-a-Service (IaaS) and Disaster Recovery as a Service (DraaS), all of which promise to leverage economies of scale to improve efficiency and reduce costs. SaaS is the use of cloud-based software. PaaS offers a cloud platform to develop services, such as an external customer service interface or internal data analytics. IaaS is the use of cloud-based servers and storage solutions. DraaS enables organisations to gain access to data that is accidentally lost. Combined, these solutions mean that the cloud can offer a complete information technology (IT) environment on demand.

With cloud adoption, organisations no longer need to design and maintain their own customised IT infrastructure. The cloud enables automation, security, optimisation and scalability of existing infrastructure for maximum flexibility. For instance, the 2011 UK "G-cloud" initiative pointed to the flexibility of on-demand cloud solutions enabling the government to pay for software applications on a subscription basis instead of having to pay for bulk licences, some of which may go unused. Second, the consolidation of data across multiple agencies improves storage efficiency by removing the need to maintain several data centres.[5] A key challenge facing governments is the provision of sufficient information and support to smaller government agencies that would enable them to take part in government cloud (G-cloud) initiatives. The UK central government, for instance, spends over ten times more on cloud adoption than local governments according to the most recent data available.[6]

[5] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/266214/government-cloud-strategy_0.pdf
[6] https://www.gov.uk/performance/g-cloud

VMware insight

Hybrid clouds are gaining momentum

Hybrid cloud is becoming a leading cloud solution because it enables enterprises to allocate their data, applications, and other computing resources to either dedicated private cloud or to public cloud infrastructure like Amazon Web Services (AWS). This flexibility helps organisations achieve a wide range of business goals, including increased efficiency and reliability, high availability, security, and cost efficiency.

VMware Cloud on AWS, an integrated cloud offering jointly developed by AWS and VMware, delivers a highly scalable, secure, and innovative service that allows organisations to seamlessly migrate and extend their on-premises VMware vSphere-based environments to the AWS Cloud running on next-generation Amazon Elastic Compute Cloud (Amazon EC2) bare metal infrastructure. VMware Cloud on AWS simplifies and accelerates the migration of mission-critical production workloads to the cloud at scale without conversion or re-architecture. You can leverage your existing VMware investments, increase innovation, achieve operational consistency, and deploy a hybrid cloud environment without complexity. Additionally, your company can maximize its VMware Cloud on AWS investment by leveraging native AWS services.

The state of play: Four pillars to greater cloud adoption

The 2018 Cloud Readiness Index 2018 from the Asia Cloud Computing Association assesses cloud readiness through ten factors across four segments (infrastructure, security, regulation and governance). It shows that Singapore leads in the region among the 14 countries measured, while Malaysia (8th place), Thailand (10th place) and Indonesia (11th place) all lag behind (***see box on Singapore as a regional leader***).[7]

Singapore is one of the earliest to implement a cloud first policy amongst its peers and has taken the very big step of establishing a specific organisation, GovTech, to provision the government," explains Lim May-Ann, executive director of the Asia Cloud Computing Association. "In Indonesia, there is interest in promoting government cloud adoption but the development of its G-cloud and private cloud adoption is currently hindered by its stance of needing data to be localised." She continues to say Malaysia has run a 1GovCloud since 2013 and that a cloud-first policy is apparently forthcoming while Thailand has been very pro-cloud in the government sector for a long time, having run a G-cloud since at least 2013 through the Digital Government Development Agency (DGA).

"At a national level, the components that ASEAN needs to get in place are quite complicated," says Mr Cory. "From infrastructure, regulations and capacity to having people with the right skills."

In the age of pandemic disruption, such components are increasingly important and highlight existing gaps. For example, the medical community is using the cloud (and artificial intelligence or "AI") for genomic sequencing and vaccine development. "The cloud allows for continuity during a pandemic," comments Mr Lall. He believes it is offering significant support to the medical community as it seeks to develop a vaccine, particularly in terms of research sharing and remote collaboration (***see box on the role of technology during covid-19***).

In order to assess the state of play regarding cloud adoption in ASEAN markets, The Economist Intelligence Unit framework for focuses on four pillars: supply (infrastructure), demand (awareness), regulatory policies and cyber-security.

Regulatory policies

"There needs to be a statement from the government at the national level to support greater cloud adoption," says Mr Lall, but this applies internationally as well. For example, local adoption in ASEAN is often hindered by unclear regulations while regional adoption is occasionally challenged by data localisation strategies or a lack of a rule of law, hence ASEAN efforts to standardise regulations on data flows that can enable free data movement. "Covid-19 has revealed how existing regulations can inhibit sectors," says Mr Cory. "This included non-technology sectors, such as healthcare, education and government that are now seeing the greater benefits of digital tools."

In Indonesia, there is interest in promoting government cloud adoption but the development of its G-cloud and private cloud adoption is currently hindered by its current stance of needing data to be localised.

LIM MAY-ANN, EXECUTIVE DIRECTOR OF THE ASIA CLOUD COMPUTING ASSOCIATION.

[7] https://app.box.com/s/7ffvax5le5mydpo2zl50qv6efx0q6zvd

Box II: The role of technology during covid-19

"Few governments in the world were prepared for the covid-19 pandemic and I am sure the same can be said for business," says Ashish Lall, former associate professor at the Lee Kuan Yew School of Public Policy (National University of Singapore). Some were faster to respond than others, however, and technology played an integral role. South Korea, which has been labelled one of the success stories during the pandemic, used technology to combine mobile phone location data and information from credit card transactions to pinpoint areas most in need of testing, tracing and treatment. "The contact tracing system in South Korea would not have been as successful if mobile phone and digital payment adoption rates were lower," says Gwanhoo Lee, professor and chair at the Department of Information Technology and Analytics at the Kogod School of Business at American University in Washington, D.C. "Connectivity and the foundational infrastructure made a big difference," he explains, as the country also benefitted from the adoption of 5G in Seoul which makes location data more precise and reliable.

In Vietnam, another success story during covid-19, the government used technology to screen passenger temperatures at airports and maintained a database to track suspected cases. "It was a complete response, and nothing slipped through the cracks," says Maciej F Boni, associate professor at the Center for Infectious Disease Dynamics in the Department of Biology at Pennsylvania State University. "The excellent data management had its roots in nearly two decades of responding to outbreaks and pandemics using real-time data and analytics; it could not have been done without today's sophisticated and user-friendly data platforms" As a result, Vietnam has able to largely contain the covid-19 pandemic to date.[8]

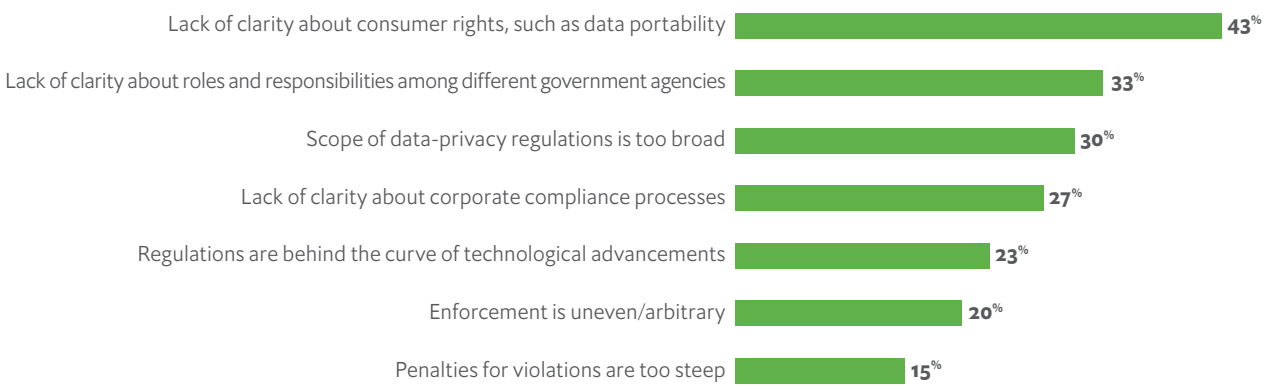
[8] https://www.cambridge.org/core/journals/epidemiology-and-infection/article/factors-associated-with-the-duration-of-hospitalisation-among-covid19-patients-in-vietnam-a-survival-analysis/42A19B1739E1751A952011A76692E4FF

Domestically, Mr Lall cites the UK's National Health Service (NHS) as a good example of large-scale cloud migration being supported by comprehensive guidelines.[9] "Having rules in place is crucial. This is not so much about the cloud but about people," he says. "There need to be guidelines on information governance." This is perhaps particularly important in the healthcare sector given the sensitive nature of its personal data. The introduction of the General Data Protection Regulation (GDPR) in May 2018 placed limits on the transfer of personal data, especially outside the EU, and provides a regional example of standardisation. Recent survey research from The Economist Intelligence Unit shows that data privacy is a top concern across the world, and no less so in South-east Asia (***see figure 1***). "The value of information increases if it's shared, and in healthcare it's more important," says Mr Lall. "You need a national framework or national policy before you then drill down into individual sectors."

Supply

There appears to be a correlation between the state of ICT infrastructure and cloud readiness. In digital circles this has been labelled the "access divide" in terms of availability, affordability, speed and bandwidth of internet connections (***see figure 2***). Research shows that access rates vary by as much as 88% in Singapore and up to 40% in Indonesia.[10] Similarly, the speed of those connections are 100 times greater in Singapore than in Indonesia, meaning that certain cloud services may be difficult or nearly impossible to work with in the latter. The establishment of viable infrastructure is essential before we can expect to see greater cloud uptake in many ASEAN markets. "Digital divides, such as the urban-rural divide in terms of speed and bandwidth, can be foundational barriers to cloud adoption," says Mr Lall. "Covid-19 highlights the digital divide," adds Mr Cory, who says that countries with better cloud infrastructure and digital skills have visibly fared better during the pandemic.

Figure 1: Data-privacy barriers
Biggest data-privacy barriers faced by organisation with regard to regulations (% respondents in Southeast Asia)



Source: The Economist Intelligence Unit

[9] https://digital.nhs.uk/data-and-information/looking-after-information/data-security-and-information-governance/nhs-and-social-care-data-off-shoring-and-the-use-of-public-cloud-services
[10] https://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx

Figure 2: Infrastructure and cloud readiness

	Selected markets in ASEAN			
	Singapore	Malaysia	Thailand	Indonesia
The number of Individuals using the internet varies considerably[11] (%)	88.17	81.2	56.82	39.79
The technological readiness of markets ranges from the global leader in Singapore to #67 in Indonesia (rank of 82 economies)[12]	1	27	49	67
Speed of Internet (kb/s per user) [13]	616.53	27.17	54.79	6.23
Cloud readiness of markets (rank of Asian economies)	1	8	10	11

Source: ITU, The Economist Intelligence Unit, World Bank

Figure 3: Worldwide Educating for the Future Index, 2019

Country	Ranking (out of 50)	Overall score (out of 100)
Singapore	4	79.7
Indonesia	28	57.9
Thailand	38	51.8

Source: The Economist Intelligence Unit (https://educatingforthefuture.economist.com/)

Demand

The ability to use cloud computing (assuming infrastructure access is available) also varies greatly in ASEAN. Our research shows that while literacy rates are high, many countries in the region are falling behind in the development of new skills.[14] In the Worldwide Educating for the Future Index 2019, which measures such progress, Singapore is again the regional leader while others lag behind (**see figure 3**). As such, its workforce is generally better equipped with the digital skills to actually use the cloud computing services on offer. "Training and skills are critical to cloud adoption," says Mr Lall. According to Don Ta, assistant professor of information systems at the Singapore Management University, "the quality of locally trained manpower in IT and other related engineering disciplines (top ranking universities and rising research prowess), as well as the ability to attract skilled people from abroad" have been central to Singapore's success.

[11] https://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx
[12] EIU technological Readiness Index
[13] https://tcdata360.worldbank.org/indicators/entrp.inet.bandwidth?indicator=3405&viz=line_chart&years=2012,2016
[14] https://educatingforthefuture.economist.com/EIUYidanPrizeEducatingFortheFuture2018WP.pdf

"One major challenge will be getting enough skilled professionals who specialise in cloud computing," says Chan Cheow Hoe, Singapore's government chief digital technology officer. "The importance of cloud computing is already acknowledged by the presence of leading cloud service providers in Singapore and by the introduction of cloud computing into existing tech curricula by our schools and tertiary institutions to build up local talent pool." The digital skills challenge has been highlighted during the covid-19 pandemic as many people have had to adjust to working from home and using e-learning tools. "Many teachers don't know how to use technology and the student experience has not been good in many cases," says Mr Lall.

Stimulating broader uptake of cloud computing in isolation is therefore a difficult proposition for a government as future adoption relies on both digital skills and awareness. Governments can, however, set the tone by promoting education, adopting new practices and encouraging businesses to become part of their G-cloud initiatives. For instance, the UK government's Cloud Strategy of 2011 established the goal of cloud usage across government and actively encouraged British companies—particularly small and medium-sized enterprises—to offer their services to the initiative. Similarly, Australia has provided information and guidance to companies on the opportunities to sell cloud services to the government in the hope of increasing business competition in this area. In Indonesia, the government is operating digital talent programmes that include cloud technology and educational collaboration with cloud providers.[15] "After being forced to use technology during the pandemic, perhaps educational institutions know what can and cannot be done online," Mr Lall says. Some positives may yet be drawn from this pandemic.

Cyber-security

"The main challenge is clearly security," comments Mr Ta. "It is hard to address this fundamental trade-off between cost and security as it is behind the key selling point of cloud computing as well as its main weakness." Many previous studies have confirmed this notion as users often unknowingly compromise systems. But some countries still look towards "data location"—meaning the data has to be stored in the country where it is used—to improve cyber-security in the name of national security (***see box on data localisation***). "From a cyber-security perspective, where data is stored does not matter," says Mr Cory. "What matters are the technical and administrative steps that companies follow to ensure that data is stored and transferred securely. For firms, what matters is if their cloud providers are committed to best-in-class cyber-security measures. On this, it's incredibly hard for firms that store data on-premise to match the cyber-security protection of regional or global cloud providers."

Cyber-security, however, is a far more complex issue. There are few and limited international agreements on the topic. Meanwhile, the sophistication of attackers appears to be ever-increasing: users can unwittingly have their accounts compromised, and this can have a negative impact on entire organisations. Major cyber-attacks have become almost daily front-page stories and unless governments offer better support—both regulatory and in terms of training and re-training staff—such occurrences could result in a widespread lack of trust in cloud computing.

The challenge is also growing during the pandemic. Both Interpol, the international criminal police organisation, and the American Federal Bureau of Investigation (FBI), have reported an increase in cyber-security incidents. "A lot of malicious domains are hosted in the public cloud," says Mr Lall.

[15] https://digitalent.kominfo.go.id/

Figure 4: International Telecommunication Union (ITU) Global Cyber-security Index 2018

Country	Regional ranking	Global ranking
Singapore	1	6
Malaysia	2	8
Thailand	7	35
Indonesia	9	41

Source: https://www.itu.int/en/ITU-D/Cybersecurity/Pages/global-cybersecurity-index.aspx

The cyber-security environment is likely to further increase in complexity as users—perhaps particularly those in ASEAN—rely more heavily on mobile devices. The forthcoming introduction of 5G mobile networks will only enhance both opportunities and challenges in this regard. Again, there is a mixed picture in ASEAN. According to the Global Cyber-security Index 2018 from the International Telecommunication Union (ITU) which measures the commitment of governments with regard to cyber-security, both Singapore and Malaysia fare well globally while Thailand and Indonesia lag behind (***see figure 4***). A recent report from Deloitte, a multi-national professional services company, found that nations with higher exposure to cyber risks tend to be more prepared and that developed economies are the most exposed.[16]

[16] https://www2.deloitte.com/au/en/pages/economics/articles/cyber-smart-enabling-apac-businesses.html

Box III: Singapore as a regional leader

Singapore ranks number one in the 2018 Cloud Readiness Index from the Asia Cloud Computing Association. One reason for this high score is the mandate from senior officials to proactively develop an enabling environment for cloud adoption. "The government has been investing heavily into infrastructure and encouraging top cloud players to set up data centres," explains Don Ta, assistant professor of information systems at the Singapore Management University. "The proximity of cloud services and support help drive adoption," he says, which is an important aspect for local usage.

"As Singapore's Smart Nation initiative gathers pace, cloud services will enable both public and private sectors to access a whole suite of innovative Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS) and, more importantly, Software-as-a-Service (SaaS) solutions that will provide organisations with the agility and speed to scale up digital transformation," says Chan Cheow Hoe, Singapore's government chief digital technology officer. "The larger ecosystem of APIs (Cloud Application Programming Interfaces) and services allows us to build innovative applications and scale quickly across the entire government."

The Singaporean government officially adopted a commercial cloud-first policy in June 2018 with the aim to migrate the majority of Government information and communications technology (ICT) systems to the commercial cloud over the next five years.[14] "Singapore's openness to data use and the free flow of data supports high adoption and use," says Nigel Cory, associate director of trade policy at the Information Technology and Innovation Foundation (ITIF). "This is in contrast to the varying levels of adoption and restrictions in other ASEAN markets where you have policy-making barriers, often as a tool for digital protectionism, which raises cost and complexity for cloud."

For example, the Singaporean government moved from a G-cloud policy for internal services to a hybrid approach to take advantage of economies of scale and the flexibility offered by commercial providers for a number of services.[18] The Singaporean Infocomm Media Development Authority (IMDA) has also launched the GoCloud programme to help ICT small and medium-sized enterprises (SMEs) to train their workforce in order to stimulate greater cloud adoption across the various sectors in the city-state.[16] "The government has been playing a leading role with various efforts to push for cloud adoption in both public and private sectors," says Mr Ta.

"In the private sector, the government has rolled out industry digitalisation plans to transform and digitalise businesses, especially SMEs which employ 70% of the workforce and contribute to half of Singapore's GDP," says Mr Chan. "Within the public sector, the Singapore government—led by the Government Technology Agency (GovTech)—will also undertake a bold and ambitious plan to move the majority of our eligible government systems into the cloud by 2023."

[17] https://www.csc.gov.sg/articles/digital-government-smart-nation-pursuing-singapore's-tech-imperative
[18] https://govinsider.asia/innovation/how-the-singapore-government-can-move-to-the-cloud/
[19] https://www2.imda.gov.sg/programme-listing/gocloud

Next steps: The road ahead

ASEAN countries in the process of developing enabling could environments face different obstacles, but many are also shared. This is particularly the case with regard to regulatory frameworks that cover data flows and classifications. Yet despite commonalities in this area, many regulations are not legally binding as domestic policies can trump regional agreements. Moving forward, however, there are three inter-related challenges with which governments across ASEAN will have to grapple: the future role of data, privacy and risk.

Data as the new oil, or not

"The statement that data is the new oil made governments believe it should own data," says Ms Elms. "Governments are therefore increasingly convinced that there is money to be made by cracking down on cross-border data." The introduction of data localisation from a national security point of view can have merits, but the assumption that money can be made is a fallacy as it often increases the cost of doing business. Unfortunately, this misconception can make it more difficult and costly to operate across ASEAN, not only for business but also for governments looking to take advantage of economies of scale regarding public clouds.

"The cost to businesses of hosting data domestically and using local cloud providers can be large," comments Ms Elms. "It can be a damaging cost to companies, especially small ones. And if you're small in a small country then it can be really bad because you can end up with slow and expensive domestic clouds—or worse, having to have your own servers again." Slow Internet connections and limited bandwidth are often overlooked issues as economic arguments usually take centre stage. In fact, organisations are often initially focused on identifying hard costs which are easier to quantify but provide a limited perspective. As businesses mature in their economic analysis and cloud adoption journey their financial maturity will also increase as they gain greater understanding of the value of agility and other soft costs. "People tend to put it in dollar terms but the issue is also in non-dollar terms, such as the efficiency of cloud computing that only becomes evident over a period of time," adds Mr Lall.

> The statement that data is the new oil made governments believe it should own data
>
> **DEBORAH ELMS**, EXECUTIVE DIRECTOR, ASIAN TRADE CENTRE

A wild east

As the EU has forged ahead with strict data-privacy regulation that directly affects certain cloud computing initiatives, Asia generally—and ASEAN specifically—lacks a culture of such efforts. Despite our survey showing that respondents care about clarity in this area (***see figure 1***), the reality of the situation on the ground often anecdotally implies that they don't. "Unlike Europe, or even the US, where there are discussions, norms and protests regarding personal data privacy, people in Asia don't seem to care," says Ms Elms.

As a result, companies in ASEAN are much more lax about their data practices. In an ironic twist, this could be a short-term benefit for organisations in ASEAN as illustrated by companies that take advantage of personal information to provide better services. "You can do whatever you want," says Ms Elms. "It's a data wild west in Asia." There are, however, two long-term issues with such short-termism, according to Ms Elms. First, few firms seem to take advantage of this opportunity in the

first place because data is not valued to the same extent as elsewhere. Second, international investors and other actors are concerned about funding such endeavours. "The covid-19 pandemic also shows it is time for countries to look at the enabling legislation, such as data protection and cyber-security legislations," adds Mr Lall.

Risk

The role of cyber-security is increasingly important when it comes to cloud adoption: some believe the cloud requires a risky relinquishment of control, but most view it as a safe option as cloud companies have greater resources to protect data. "Organisations have different risk appetites and different capacities," explains Ms Lim. "Therefore many organisations choose to use risk management frameworks to assess the risk." Such evaluation can take into account the value of the data that an organisation holds, which in turn can be used to determine the type of cloud approach to take in terms of when to use a public versus a private cloud, for instance.

There are many different approaches towards risk management. Sometimes the national governments or individual agencies have their own assessments. Sometimes the industry sectoral body suggests or requires a risk management assessment, for instance central banks that aim to stabilise the financial sector.[20] An example of this is The Monetary Authority of Singapore's June 2013 publication of its Guidelines on Risk Management Practices—Technology Risk.

During pandemics such as covid-19, there is also a risk that the surge in cloud demand is so unanticipated that is reasonable to expect outages or capacity constraints, says Mr Lall. For example, partly due to the pandemic, Microsoft cloud demand increased by 775% in certain areas while Google has experienced outages.[21] However, Mr Lall believes cloud service providers could ensure continuity of their services provided they are able to align investment with demand. "Over the long term, whether we expect to see more investment in cloud infrastructure depends upon whether companies anticipate the increased demand to be permanent." Large volumes of data allow people to make a lot of conclusions through big data and data mining, although sifting through such large amounts of information can also be a challenge. "We have large volumes of data," says Mr Boni. "The main challenge at the moment is in improving the quality of data."

[20] http://www.bnm.gov.my/index.php?ch=57&pg=543&ac=816&bb=file
[21] Microsoft: https://azure.microsoft.com/en-us/blog/update-2-on-microsoft-cloud-services-continuity/
Google: https://status.cloud.google.com/incident/zall/20002

Figure 5: Varying approaches to data localisation in ASEAN

Laos	No data localisation laws
Vietnam	All companies providing Internet services maintain at least one server within the country
Myanmar	No data localisation laws
Cambodia	No data localisation laws
Malaysia	Personal Data Protection Act requires citizens' data to be stored on local servers
Singapore	No data localisation laws
Philippines	No data localisation laws
Brunei	Companies may lawfully store data collected within Brunei on servers within the country
Thailand	No data localisation laws
Indonesia	Regulation No. 82: Information and Electronic Transaction Law mandates companies that provide internet services directly to the consumer must locate their data centres within Indonesia

Source: The Economist Intelligence Unit and The ASEAN Post[22]

[22] https://theaseanpost.com/article/data-localisation-southeast-asia

Box IV: Data localisation

"I think covid-19 makes cloud all the more critical," says Deborah Elms, executive director of the Asian Trade Centre. "But if we are collecting health data, some governments will be more eager than ever to have such information housed at home." Nigel Cory, associate director of trade policy at the Information Technology and Innovation Foundation (ITIF), agrees: "We have not seen this happen as of yet but policy-makers can use the pandemic as an excuse [for data localisation]."

The arguments for—and against—keeping data within a country essentially boils down to a debate between cost effectiveness (global economies of scale) and national security. Proponents argue that cloud computing may actually be more secure. "It's like a traditional bank safety deposit box and the same mindset needs to be adopted for the cloud: that you outsource the risk," says Ashish Lall, former associate professor at the Lee Kuan Yew School of Public Policy (National University of Singapore).

"There are three main motivations for data localisation," explains Mr Cory. "Such policy is driven by misguided concerns about data privacy and protection, digital protectionism and concerns over government access to data." However, he cautions that data localisation is a hugely costly strategy. "Except for government access to data, the location of data is irrelevant to those other concerns," he says. "Most problematic is if a country uses national security concerns to force firms to store a broad range of largely commercial data locally. This will undermine the broad use of data, adoption of cloud computing and other digital technologies. Doing so will undermine the potential use of the vast amount of data that is not really related to national security."

Indonesia is one country that has adopted stringent regulations to limit cross-border data flows. "I'm not sure why they [Indonesia] think the data is safer because it is hosted there," says Mr Lall. "I keep important data in several places with at least two different cloud providers. To me, backup and duplication makes more sense [in case of loss of data with one provider]."

Those against such arguments still view international public clouds as losing control in terms of data sovereignty, a case that is also valid: no government would voluntarily store their deepest secrets solely with other countries. "But when one country starts [using public clouds], then others copy," says Mr Lall (***see figure 5***).

"Even pre-pandemic there was an expansion of cloud infrastructure," Mr Lall observes. "This was driven by two factors. Some companies were investing because they wanted to match the geographic footprint of competitors and partly the geographic footprint was expanded to meet requirements of data localisation laws."

Besides the polar opposites of for and against, there is also a compromise approach. A hybrid cloud solution can be used to take advantage of global economies of scale while using a private (domestic) cloud for any data considered sensitive. Ultimately the onus lies with individual organisations to conduct a thorough risk assessment and map that to existing rules and regulations to determine the best approach. "In terms of which type of cloud to use, this will depend on data policies," says Mr Cory. "A hybrid cloud makes up a large market share in ASEAN and many providers speak of it as a potential solution given the circumstances in the region."

VMware insight

Making IT Life Simpler with Seamless Inter-Operability Across Clouds

CloudsCognizant wanted to use the power of both private and public clouds through an end-to-end platform, which would deliver a secure, inter-operable and highly reliable hybrid cloud infrastructure. Cognizant sought a single tool that would automate resource allocation based on user requests and set up infrastructure that would integrate the private and public clouds into a hybrid cloud environment. With VMware vRealize Suite, IT infrastructure managers gained full control and visibility into both private and public cloud environments from a single window. This not only eased the resource management burden for IT administrators but also ensured optimal resource utilization within the hybrid cloud infrastructure.

VMware insight

Virtualizing Business-Critical Applications Enhances Efficiency and Performance

Telekom Malaysia Berhad (TM) is taking the next leap in virtualization with VMware's software-defined data center (SDDC) solutions and services. It migrated its business-critical SAP system seamlessly from legacy systems to a cloud environment, providing flexibility, agility, scalability and a standardized operating environment across departments to foster greater innovation and growth. To TM's customers, the benefits are clear: their connectivity needs will be fulfilled more effectively and efficiently, resulting in an enhanced service experience.

Conclusion and six steps towards greater cloud uptake

"Five years from now we will probably have the same conversation," says Mr Lall. He points to mobile payments as an example. "I have been reading for so many years that this is the year for mobile payments, but they are still not ubiquitous." He points to Sweden as a success story of having achieved a nearly cashless society.[23] "But some people with disabilities or disadvantaged groups cannot easily access electronic means and people prefer a diversity of payment instruments—and it boils down to people."

This mimics attitudes regarding the cloud environment: some are sceptical, others positive. The winners are likely to be those who embrace adoption while taking the necessary precautions to approach it in the right manner. This requires planning and an understanding of the benefits and challenges. Doing it right, however, can yield great organisational benefits and save time, money and effort. "Cloud provides scalability and adaptability," says Mr Cory.

At a national level this starts with having a clear regulatory environment and one that is open to taking advantage of global economies of scale while guarding national interests. The two concepts are not mutually exclusive as there are solutions that can address both in an integrated manner. "The pandemic has revealed the strong or weak foundations of digital development in countries," says Mr Cory. "It will be interesting to see whether countries take the opportunity to be digitally capable and adaptable post-pandemic." ITIF are encouraging countries to make digital tools the core of their response to covid-19 in terms of cloud, healthcare and adoption of mobile payments, amongst other areas.[24] "Covid-19 has forced us to jump on and experiment with the cloud", says Mr Lall. "Some users may come to the conclusion that this is actually a good thing, so they may permanently change the way they do things." In fact, almost all sectors have realised the benefits of the cloud during the pandemic as physical meetings have been substituted by video-conference calls and remote working.

Governments can set the tone by supporting the business community in both its use and provision of cloud services. "Various factors, such as rules and regulations, technological advances and business challenges, have been quite favourable for cloud computing adoption and will continue to be so in the foreseeable future," explains Mr Ta. "Singapore has the right environment to enable the continual growth of cloud computing," says Mr Chan. "With large amounts of increasingly complex data collected through the adoption of IoT and AI technologies, cloud computing will only continue to grow in Singapore." Both Singapore and Malaysia have named "digital" part of their covid-19 economic stimulus packages. The Philippines has also announced a "Cloud First Policy", in part due to the "new normal" of the covid-19 pandemic.[25]

In the diverse region of ASEAN, challenges vary greatly between countries and they have approached the development of cloud policy in different ways. Yet there are also many commonalities across the region. "ASEAN is quite unique," says Mr Cory. "Few regions have established regional associations that can work towards a common framework." The regulatory, supply, demand and cyber-security pillars are equally important to all countries in the region. How to deal with them requires local context, however. But one thing is certain: those who can figure out the right balance—as Sweden is doing with digital payments—serve to greatly benefit in the future. "Our ability to use the cloud and technology in general depends on our prior investments in digital infrastructure and digital skills," says Mr Lall. "Some countries are ready, others are not. The covid-19 pandemic has shown that this is a time for people and organisations to really get creative about how they are going to incorporate cloud and other ICTs into their daily routines."

[22] https://www.weforum.org/agenda/2018/11/sweden-cashless-society-is-no-longer-a-utopia/
[23] https://itif.org/publications/2020/04/06/digital-policy-physical-distancing-28-stimulus-proposals-will-pay-long-term
[24] https://dict.gov.ph/dict-releases-amended-cloud-first-policy-for-govt-transition-to-new-normal/#:~:text=As%20amended%2C%20the%20Cloud%20First,private%20entities%20rendering%20services%20to

Six steps towards greater cloud uptake in ASEAN

1. **Understand the economic benefits:** Moving to the cloud maximises cost savings while taking advantage of international good practice.
2. **Ensure there is a national policy:** Regulations are fundamental to enabling a cloud environment, both in government and among businesses.
3. **Promote infrastructure development:** Speed, bandwidth and affordability are all essential components of greater cloud uptake, especially in rural areas.
4. **Enhance awareness and digital skills:** Without the requisite information at all layers there will be a lack of adoption due to a lack of demand and usage.
5. **Support cyber-security:** The use of cloud computing can enhance cyber-security but the necessary national pillars to protect information must also be in place, including data-privacy regulations.
6. **Turn disruption into an opportunity:** The covid-19 pandemic has raised awareness of the benefits of digital tools, including the cloud. This is an opportunity to re-assess digital transformation progress and future digital needs within organisations.

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