

# SOUTHEAST ASIA'S CLOUDSTORY:

Impact, inclusivity, and growth



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A person is seen from behind, harvesting tea in a lush green field. The person is wearing a blue long-sleeved shirt and dark pants. A large, round, woven basket is on their back. The background shows rolling hills and a network of white lines with circular nodes overlaid on the scene, suggesting a connection between nature and technology.

## **SOUTHEAST ASIA'S CLOUDSTORY: Impact, inclusivity, and growth**

The Covid-19 pandemic has accelerated digital transformation and the emergence of enablers such as cloud technology around the globe. This technological transformation has the potential to significantly improve lives — by increasing productivity, unlocking new business opportunities and lift communities.

How has cloud technology contributed to the UN Sustainable Development Goals in Southeast Asia, and where do further opportunities lie? What are the roles of the public and private sectors, and what are potential pitfalls?

This white paper explores how cloud technology has benefited society, as well as the elements needed to ensure greater digital inclusivity and sustainable growth in the longer term.



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# EXECUTIVE SUMMARY

Cloud technology has played a crucial role in modernising and empowering communities across Southeast Asia — from boosting financial inclusion in lower-income communities, to revolutionising farming methods and improving public safety. Most notably, cloud technology has been instrumental in aiding progress towards the United Nations Sustainable Development Goals, particularly Goal 8 (Decent Work and Economic Growth) and Goal 11 (Sustainable Cities and Communities)<sup>1</sup>.

Infrastructure on the cloud has provided the backbone for several technologies which have significantly benefited the region. These developments may have emerged over time without the support of this infrastructure, but cloud's capabilities has enabled a greater pace of change and greater benefits to the community. Smartphone apps have enhanced livelihoods and increased the prosperity of citizens across many sectors, including agriculture, finance, retail, healthcare, non-profit and government. These include smartphone marketplace apps such as Tanihub (<https://tanihub.com>) in Indonesia, which connects farmers directly with the country's leading retailers such as Hero, Giant and Lotte Mart. Cloud-powered fintech players such as Filipino apps Cropital and FarmOn have also disrupted the market and improved financial inclusion

by providing lending services to the previously unserved and unbanked communities.

While this white paper outlines the ways in which cloud infrastructure has made a significant positive impact in many parts of society, it also acknowledges its challenges — most notably, on data security. Despite cloud infrastructure's robust security systems, incidences of hacking and data breaches continue to dissuade organisations from migrating their IT systems to the cloud, particularly if it is the public cloud. Experts interviewed outlined further challenges faced by the industry, including its infrastructure being an unwitting vehicle for illegal activities such as scams, fraud, and sexual exploitation. Conversely, cloud technology has also played a key role in the fight against such activities, empowering organisations such as Spotlight, a data analytics tool which can detect and flag up suspicious online ads to help frontline officers protect children from sexual exploitation. Nevertheless, such concerns continue to inhibit the full potential of cloud technology and the benefits it can offer to the region.

Furthermore, findings from the white paper reveal how the digital divide persists across every market in Southeast Asia and has been exacerbated by the COVID-19

pandemic. This continues to pose a challenge for the increased uptake of cloud technology and for it to contribute to wider economic inclusivity. To fully leverage its potential, three challenges must be addressed. First, a solid, country-wide infrastructure must be established to enable community-wide digital connectivity. Second, all citizens will need to be enabled to have access to digital services and equipment. Third, relevant training and education on digital technologies needs to be provided to the masses. Collaboration between the private and public sectors is key to building a stronger, cloud-enabled future in the region. If this can be achieved, cloud computing will help drive core parts of the region's economy and have a great positive impact on liveability, inclusivity and sustainable growth in the long term.

“Southeast Asia's Cloudstory: Impact, inclusivity, and growth” is a white paper written and produced by Eco-Business Research, the research arm of Eco-Business, and supported by AWS Institute and Intel. Eco-Business is the leading media and business intelligence company serving Asia Pacific's sustainable development community. Our platforms include the award-winning Eco-Business.com site, custom publications, research and high-impact bespoke events catered to deepen discussions on sustainability.





# CLOUD'S STORY IN SOUTHEAST ASIA

Cloud technology — the delivery of on-demand computing services, including servers, storage, data, networking, software, and analytics, through a network of remote servers — is one of the most disruptive digital forces in Southeast Asia today. It is being embraced rapidly across the region by private and public sectors. According to a report by GlobalData, the Asia Pacific cloud market is projected to grow by 117 per cent between 2019 and 2024<sup>2</sup>.

Adroit Market Research, a business intelligence company, also forecasts

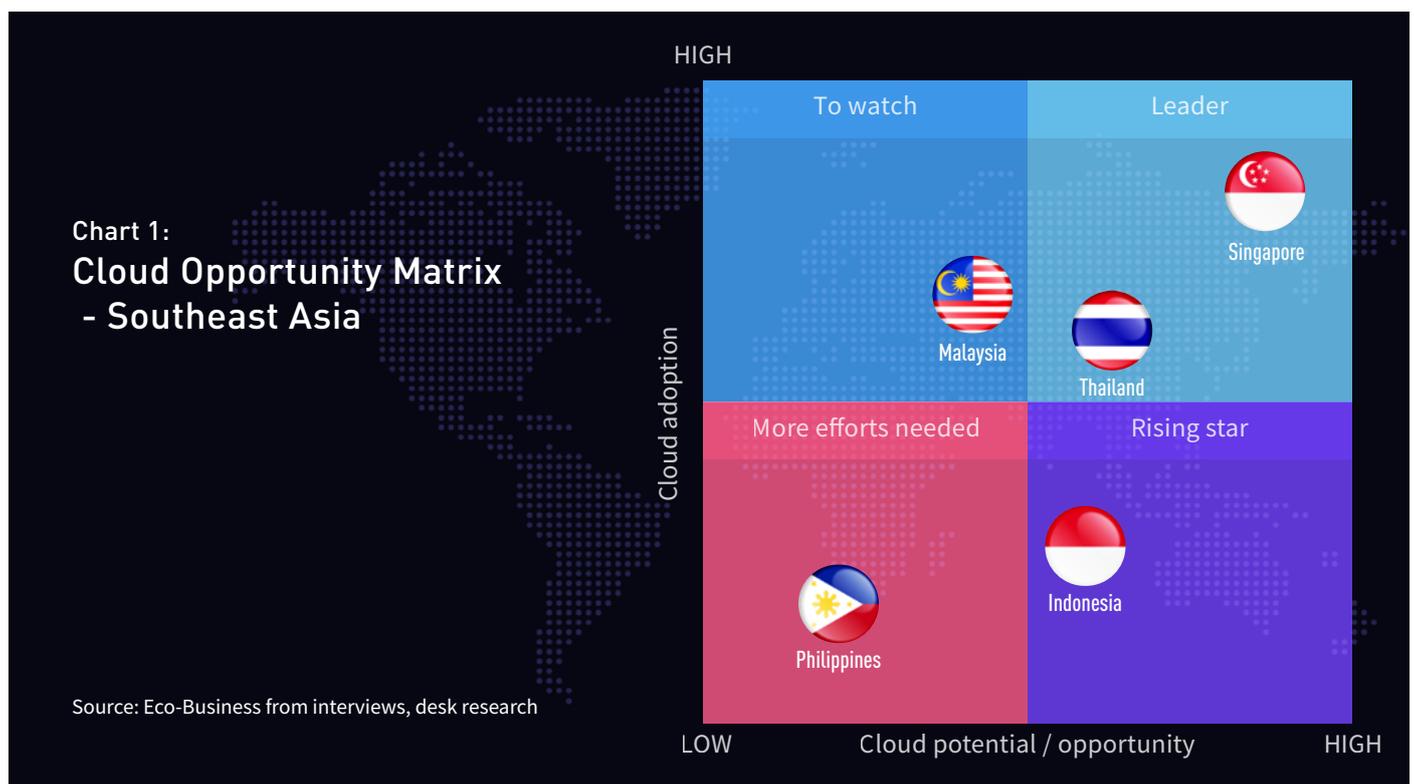
that Southeast Asia's cloud computing market revenue will reach US\$40.32 billion by 2025<sup>3</sup>.

A survey by Boston Consulting Group also reveals the rapid rise of cloud adoption in the region — back in 2016, most businesses in Asia Pacific spent approximately 3 per cent of their IT budget on cloud but, by 2018, this figure had risen to 5 per cent. By 2023, it is expected to jump to 10 per cent<sup>4</sup>.

Cloud technology development and adoption vary considerably across

Singapore, Malaysia, Thailand, Indonesia and the Philippines, the five focus markets of this white paper. Singapore leads by far when it comes to cloud technology adoption and growth potential. Its robust infrastructure, underpinned by high-speed fibre connectivity and penetration, has made digitalisation and cloud adoption an integral part of its society.

Healthcare, education and transportation are among the key sectors in which the country has developed greater efficiencies through cloud technology.



# The state of cloud technology by market

## Singapore - the number one advocate of digital transformation and cloud technology

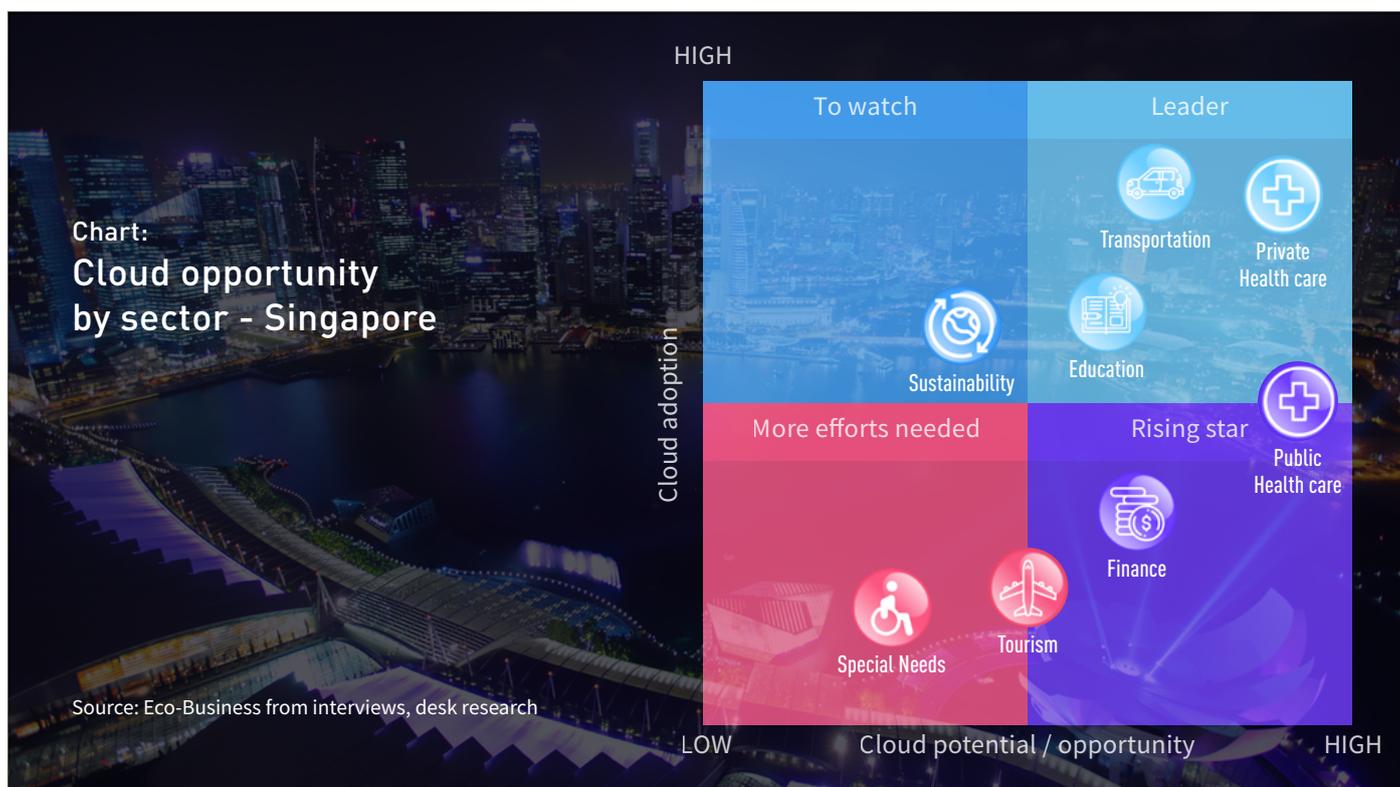
Singapore aims to become the world's first "Smart Nation", using technology to increase efficiency, provide better services and improve the quality of life for its citizens. The country has made cloud and digital technology a core part of its plans, embarking on a "cloud-first policy" in 2018 to migrate most

of its information technology systems from on-premise infrastructure to the commercial cloud over five years.

As of June 2020, over 150 government systems which had been classified as "restricted" had successfully shifted to the commercial cloud. In 2020, the government announced a further S\$870 million (US\$623.56 million) worth of contracts to transfer more of its systems to the cloud platform<sup>5</sup>. As the nation pursues

its COVID-19 recovery, it has established the Smart Nation and Digital Government Office (SNDGO) to ensure that all individuals and businesses go digital.

Richard Goh, Deputy Director of Skillsfuture Singapore, emphasises, "Today, in the government, 'cloud-first' is what we always tout for our systems and our solutions. What the cloud offers is it allows you to adopt new technologies that are available, quickly."



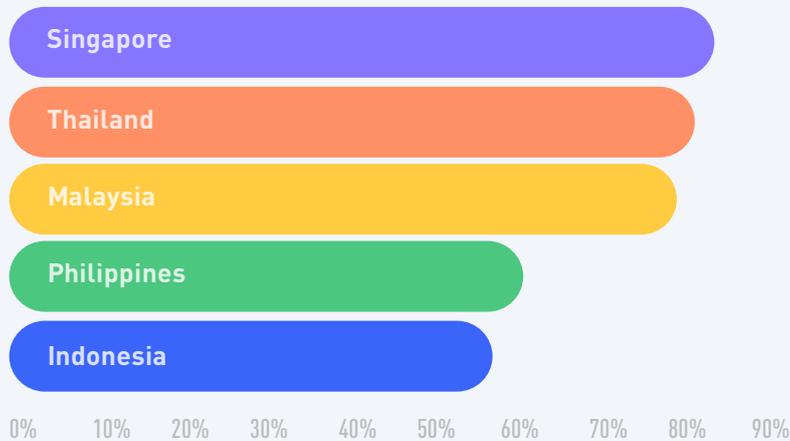
Today, in the government, 'cloud-first' is what we always tout for our systems and our solutions. What the cloud offers is it allows you to adopt new technologies that are available, quickly.



Richard Goh, Deputy Director of Skillsfuture Singapore

Chart:

## % Internet penetration - 2019



Source: Statista

### Malaysia and Thailand embrace the cloud

Malaysia and Thailand are next in the Eco-Business Cloud Opportunity Matrix. Both have innovation-friendly regulatory environments and relatively high online penetration.

As of June 2019, internet penetration in Malaysia and Thailand stood at 80.1 per cent and 82.2 per cent of the population respectively. Both markets are also supported by national policies which promote the adoption of cloud technology. Malaysia had a head start in the race for technological progress with its Multimedia Super Corridor (MSC) established back in 1996.

The government has indicated its intention to become a cloud-first market and major projects, including its myIDENTITY digital identity platform

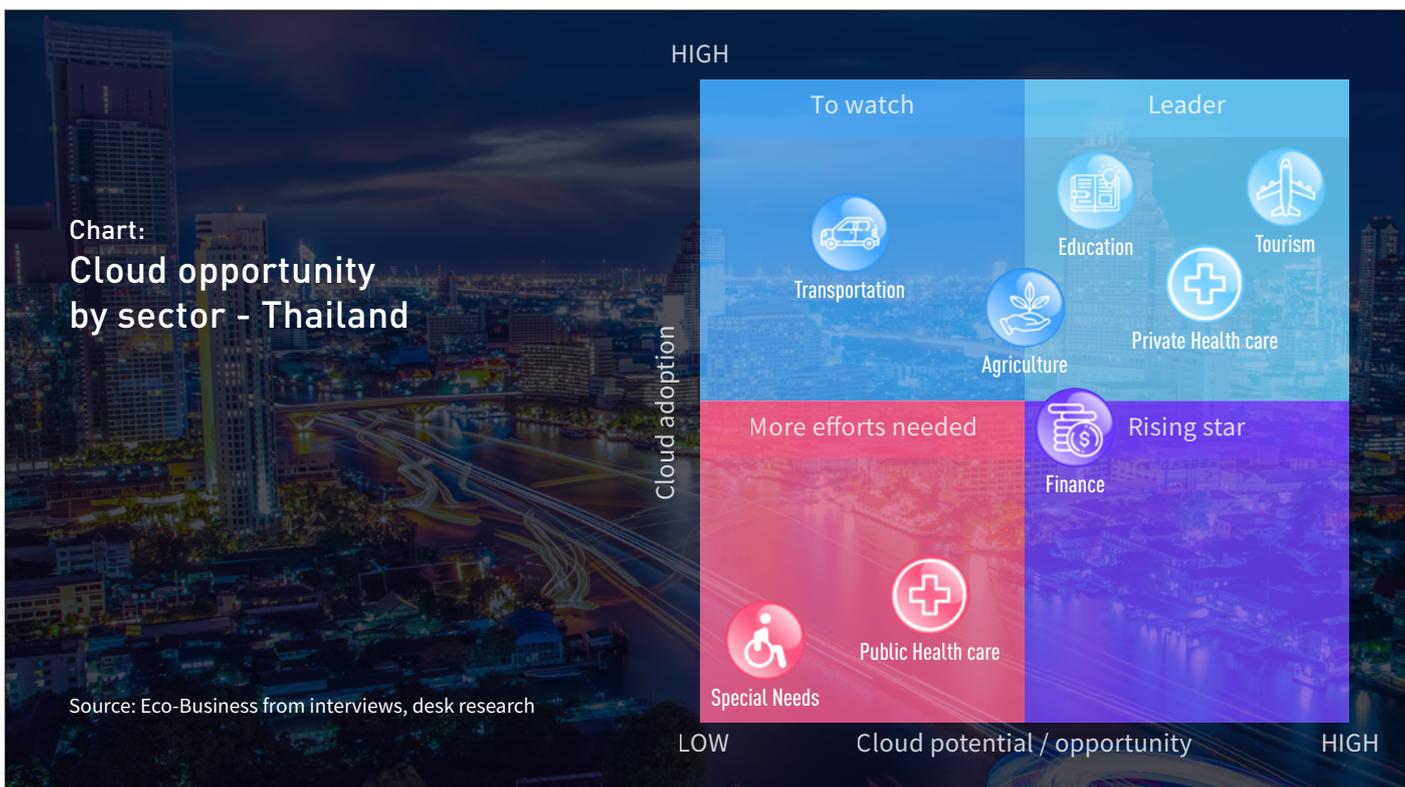
have been rolled out. Its smart city projects in places such as Johor, Sabah and Sarawak have resulted in benefits to its economy thanks to cloud technology. However, initiatives have been slow to roll out, and experts interviewed point out change management issues due to traditional mindsets. These need to be addressed if the country wants to fully leverage cloud for economic inclusivity.

While Thailand lags slightly behind Malaysia in its digital ecosystem, it is catching up fast. Cloud adoption is a core component of Thailand's 4.0 economic model aimed at revitalising existing industries and innovating to lift economic prosperity, social well-being and environmental protection.

The government aims to boost internet penetration in rural areas so that by 2023, 95 per cent of the

total population will have broadband access<sup>6</sup>. Smart city projects are already underway in Phuket and Chiang Mai to improve efficiencies in the tourism sector. The country's commitment to the development of the Eastern Economic Corridor will also advance its international connectivity and potentially make it a key e-commerce delivery hub for Cambodia, Laos, Vietnam, and Myanmar. Enhancement of digital banking services is also expected to drive cloud adoption.

In early 2020, the government approved a THB4.75 billion (US\$147 million) investment in state cloud and data centre services over the next two years<sup>7</sup>. Thailand can potentially become one of the region's most attractive markets for cloud technology growth in the future. It is a rising star in the Eco-Business Cloud Priority/Cloud Adoption Matrix.



**Indonesia and the Philippines still have some way to go**

Indonesia and the Philippines are the two less developed markets for cloud adoption. Despite having tech-savvy consumer markets and fast-growing digital start up environments, both countries still lack sufficient infrastructure to support full digital transformation, which is the precursor

for cloud technology development. However, Indonesia is one of the fastest growing markets for cloud computing. Its economic growth is partly driven by a thriving digital start-up industry, which includes home-grown players such as Go-Jek and Tokopedia. Technology has played a decisive role in economic inclusivity. The Philippines lags in digital infrastructure. The lack of access to electricity is an ongoing issue, and an

estimated 60 per cent of households do not have access to the internet. The country's broadband services duopoly also means that internet speeds are among the slowest in the region and prohibitively expensive.

The government will need to address its infrastructure before it can take greater advantage of digitalisation and cloud technology.

Chart:  
Cloud opportunity  
by sector - Indonesia

Source: Eco-Business from interviews, desk research



Chart:  
Cloud opportunity  
by sector - Philippines

Source: Eco-Business from interviews, desk research





# HOW CLOUD HAS TRANSFORMED BUSINESSES AND SOCIETY

Cloud technology's biggest draws are the minimal infrastructure and initial investment needed, as well as the ability to help companies scale up fast and on demand. When organisations install their own in-house storage systems, an in-house server can cost from US\$1,000 to over US\$30,000, depending on configuration, power usage and other installation fees.

Cloud subscription requires little upfront costs. Products such as Amazon Web Services' (AWS) Simple Storage Service (AWS S3) and Elastic Computing (EC2) basic packages are free for 12 months and subsequently cost US\$0.03 per GB of storage per month for its simplest

S3 plan. The transparent cost structure and low setup capital has enabled many start-ups to get their businesses off the ground quickly.

Cloud technology's "as-needed" pricing structure means that companies can adjust data storage space and scale up more easily than with on-premise systems, which typically involve the cost of purchasing and installing additional servers and hardware. In addition, there are the costs of higher power consumption, expanding server room space and, potentially, data centre space. While experts agree that the monthly costs of using cloud services can add up, the "pay for what

you use" business model has become the go-to model, unlocking growth opportunities for many organisations which would have otherwise faced cost and technology barriers. Giri Kuncoro, Senior Engineer and Member of the Cloud Foundation Team at Go-Jek, shared, "Before the cloud era, we would need to shop for a bunch of servers, go to some computer shops to purchase machines and then put them in a building with air-conditioning, in order for us to run a single web application. And that usually took weeks, months or even years. Now you can go to any cloud provider, perform a single or two clicks and then, boom, you have your web application running."

## Enabling Southeast Asia's key industries

### Improving the lives of agricultural workers

Cloud technology has been instrumental in lifting the agricultural industry, which is a critical component of the economy in Indonesia, the Philippines and Thailand. Demand for agricultural goods continues to rise globally and the region relies heavily on farming for exports and economic growth. However, natural disasters, climate change, and disease affect crop yields. Farmers remain among the poorest people in society, often excluded from the region's overall progress and development.

The region has seen the rise of cloud-powered apps that help farmers to sell their produce directly to a wider market, and to obtain financial support and small loans. Smart farming apps that use data analytics

and AI to increase harvests have also taken centre stage. Despite major gaps in connectivity and broadband infrastructure, smartphones have enabled the platforms to reach remote rural communities, contributing to the Sustainable Development Goal number 8 - decent work and economic growth. The technology has enriched the lives of farmers, increased business inclusivity and enhanced sustainable economic growth.

Many marketplace apps have emerged in the last five years. They have simplified farmers' supply chains and allowed them to secure better prices for their crops. Farmers have embraced these easy-to-use apps, which allow them to communicate directly with customers and provide them with fresh produce. This farm-to-customer model has also helped the industry address the ongoing problem of multiple

middlemen who typically take a 10 to 15 per cent margin each. This subjects farmers to brutally low prices for their produce and may increase retail prices. Cloud-powered apps have helped address a longstanding problem that has kept farmers at the bottom of the income ladder.

Indonesia's Tanihub (<https://tanihub.com>) is one such app that has improved the welfare of small-scale farmers. Established in 2016, the agritech start up connects farmers directly with the country's leading retailers such as Hero, Giant and Lotte Mart. Thanks to the scalability of cloud, as of November 2020, the agritech start-up has expanded rapidly to run five distribution hubs for over 25,000 farmers nationwide. It continues to build new partnerships and anticipates having close to 100,000 smallholder farmers in its membership network by 2021<sup>8</sup>.

## Cloud-powered marketplace apps in Southeast Asia

<b>Warung Pintar</b>	<a href="http://www.warungpintar.co.id">www.warungpintar.co.id</a>	Indonesia	Mobile app which supports small-scale kiosks with inventory and supply by sourcing staples directly from farms.
<b>Regopantes</b>	<a href="http://www.warungpintar.co.id">www.warungpintar.co.id</a>	Indonesia	Mobile app to support small-scale farmers through farm-to-home platforms.
<b>Tagani</b>	<a href="http://www.agani.ph">www.agani.ph</a>	Philippines	Online wholesale platform which connects farmers with businesses for bulk transactions and contract farming.
<b>Talad</b>	<a href="http://www.talad.co/en/home">www.talad.co/en/home</a>	Thailand	Mobile app which connects farmers with services including full and part-time contractors and other services. Also has a marketplace for farmers to post their produce for sale.
<b>Tanihub</b>	<a href="http://www.tanihub.com">www.tanihub.com</a>	Indonesia	E-commerce platform to connect farmers with consumers and large domestic retailers such as Hero, Giant, Lotte Mart.

Source: Eco-Business from interviews, desk research

### Data analytics and AI improve performance and sustainability

Cloud-powered innovations have played a vital role in the transition towards more modern and efficient farming practices. Indonesia, the Philippines and Thailand rely on export earnings from palm oil, rice, rubber, cassava, sugar and other commodities. Governments and universities have made efforts to modernise farming and increase

its efficiencies, and have leveraged cloud technology to do so. In 2019, Indonesia's Ministry of Agriculture and the Bandung Institute of Technology (ITB) jointly developed the Agribusiness Smart Information System (SICA), a cloud-powered app which predicts the monthly weather and identifies precisely when farmers should plant, fertilise and harvest crops. Thailand's government has also been proactive in enabling the adoption of better farming techniques.

In 2017, the country embarked on a 20-year Agriculture and Cooperatives Strategies plan (2017-2036), which included the goal to raise farmers' per capita income to US\$13,000 per annum by 2036. Cloud technology apps such as Ricult, which uses AWS cloud tools to provide farmers with weather alerts and soil analysis, as well as information on pesticides and pests, help optimise crop yield and farming efficiency to help achieve the goal.

Before the cloud era, we would need to shop for a bunch of servers, go to some computer shops to purchase machines and then put them in a building with air-conditioning, in order for us to run a single web application. And that usually took weeks, months or even years. Now you can go to any cloud provider, perform a single or two clicks and then, boom, you have your web application running.



Giri Kuncoro, Senior Engineer and  
Member of the Cloud Foundation Team, Go-Jek







**Indonesia - eFishery ([www.efishery.com](http://www.efishery.com))**

- Several motion sensors are analysed to detect a fish's appetite
- Dispenses food as and when it detects when the fish are hungry

**Thailand - CHIKCHIC ([www.chikchic.com](http://www.chikchic.com))**

- Helps chicken farmers monitor and maintain the condition
- Provides alerts when there are errors and malfunctions
- Helps farmers to manage different aspects such as temperature and environment

**Indonesia - Agribusiness Smart Information System (SICA) ([www.smartclim.info/sica/](http://www.smartclim.info/sica/))**

- Planting calendar which predicts the monthly weather
- Identifies the timings, including hours days and months when farmers should plant, fertilise and harvest
- Also features weather prediction, climate prediction
- Offers a feedback feature for users to enter disaster reports in their villages

**Thailand - Ricult ([www.recult.com](http://www.recult.com))**

- Uses cloud technology to provide visibility to farmers through pest and weather alerts and soil analysis
- Leverages on satellite imagery, agronomic models and weather data
- Also provides farmers with access to bank loans

**Indonesia - Habibi Garden ([www.habibigarden.com](http://www.habibigarden.com))**

- Uses over 600 sensors across Java and Sumatra
- Provides farmers with up-to-date data on soil conditions and the nutrients in plants
- Used by over 1,300 farmers to help them understand their crops better
- Increases productivity and reduces the possibility of crop failure

**Indonesia - Jala ([www.jala.tech](http://www.jala.tech))**

- Water-monitoring device to help shrimp farmers improve water quality
- Uses IoT to collect data and run it through algorithms
- Provides insights and alerts farmers of sudden changes in key variables such as dissolved oxygen, temperature, pH, salinity and total dissolved solids

# Increasing resilience in the face of natural disasters

Southeast Asia is hit by numerous natural disasters annually - Indonesia and the Philippines are located along seismic fault lines and the Pacific Ring of Fire, which makes them vulnerable to the most severe natural disasters in the world, including earthquakes, volcanic eruptions, typhoons and cyclones.

Experts have said the intensity and frequency of natural disasters and extreme weather conditions will increase across the region because of factors such as climate change and environmental degradation. This continues to have a devastating effect on the region's social development,

not only through deaths, injuries, and displacement, but also because it can reverse economic progress, widen the gap in inequality and disempower communities. Malaysia, Singapore and Thailand are spared from the most severe natural disasters, but face the challenges of landslides and flooding.

## Cloud technology strengthens governments' preparedness and recovery

Research and technology can boost governments' ability to prepare and respond to natural disasters. Cloud technology has enabled a wave of new tools which incorporate AI, machine learning, and open-source information sharing networks, which have helped governments and organisations to prepare for, mitigate and manage natural disasters more effectively, thus preserving life and helping to rebuild communities faster in their aftermath.

In the Philippines, cloud-enabled platforms such as Project NOAH

(<http://noah.up.edu.ph/#/>) and Project AGOS (<https://agos.rappler.com>) use geomapping technology combined with social media to enable communities on the ground to share observations and concerns to generate hazard alert maps and disaster management plans.

In March 2019, the United Nations Global Pulse developed a prototype of an automated, open-source platform in Indonesia called MIND (Managing Information for Natural Disasters). It gathers data from multiple sources including the Global Disaster Alert and Coordination System (GDACS), OpenStreetMap, Twitter alerts, Google Trends and other news feeds, which it then analyses to provide a picture of

what is taking place on the ground. This can lead to faster and better responses. Such open-source, multiple source technology could be applied to other types of disasters across the region as well. On top of this, AI and machine learning can be used to produce better insights, such as predicting locations and communities that may be most badly affected, or developing the best emergency escape routes in the event of a disaster.

Such technology leverages on cloud's unique ability to function and grow seamlessly, and will be crucial as the region faces more extreme weather conditions and devastating natural disasters.

Chart 3:  
Unbanked Population - Southeast Asia in 2017



Source: World Bank

# Building financial inclusion to reduce poverty

Financial inclusion — providing all members of society with access to financial services — helps reduce poverty and promote economic inclusion. Southeast Asia is home to one of the largest unbanked populations - those who do not have a bank account at all, as well as underbanked populations - those who have a traditional bank account but still strongly rely on non-traditional forms of financial services - in the world.

Experts estimate that over 70 per cent of adults in Southeast Asia are either unbanked or underbanked, lacking sufficient access to financial services. To improve social equality, it is important that poorer and remote communities have access to consumer lending, savings and basic banking services.

Unbanked households, which US government banking insurance agency FDIC defines as those that don't have an account at an insured institution, can't use savings accounts to build emergency funds and can't turn to time-saving tools for transactions such as paying bills and transferring money.

A person or household is considered "unbanked" when they are not served by a bank or other financial institution in any capacity. Additionally, 16

percent of Americans are considered "underbanked." This means they have a traditional bank account, but also use alternative financial services, such as payday loans or car title loans. Let's take a look at how it happens, the downsides of being unbanked or underbanked, and some potential solutions.

In recent years, large banks have offered e-wallets and digital payment solutions to their customers. However, such services and the traditional banking model do not always extend to consumers in the lower-income bracket.

Major banks, most notably in countries such as Indonesia and the Philippines, have been slow to go the extra mile and increase financial access to these income groups, many of whom live in rural areas.

While some banks have tried to increase financial inclusion, many in these communities still struggle to access basic banking services – 66 per cent of Filipinos and 51 per cent of Indonesians do not have a bank account – as there are no bank branches in their vicinity.

These consumers also lack the traditional requirements, such as a stable income, to obtain any credit or other financial support.

## Access to finance and lending services for farmers

Farmers are one of the poorest groups in the region – in Indonesia, approximately one-third of the low-income population are farmers. With minimal collateral to their name and an irregular income, their credit scores are low and they are considered high-risk borrowers by traditional financial institutions.

Powered by cloud technology, many fintech start-ups have come onto the scene to provide farmers with loans and financial support. Some start-ups, including Filipino players Cropital and FarmOn, have leveraged cloud technology to connect farmers with investors through crowd-funding platforms. Others such as Tanifund (a sister company of Tanihub) use proprietary data analytic tools to track the buying and selling behaviour of their users. This enables them to come up with new methods of credit scoring that differ from the assessment criteria of traditional banks. Cloud technology has helped unlock opportunities for greater financial inclusion of the region's farmers. These cloud-enabled lending platforms have also provided farmers with a legitimate and safer alternative to predatory loan sharks, which often impose exorbitant interest rates.

## Cloud-powered Crowdfunding and Finance Apps

<b>CHIKCHIC</b>	<a href="http://www.chikchic.com">www.chikchic.com</a>	Thailand	Mobile app which helps chicken farmers monitor their chicken houses, and offers financial management services to users
<b>Cropital</b>	<a href="http://www.cropital.com">www.cropital.com</a>	Philippines	Crowdfunding app to help farmers with financial support
<b>FarmOn</b>	<a href="http://www.ommunity.farmon.ph">www.ommunity.farmon.ph</a>	Philippines	Crowdfunding app to help farmers with financial support
<b>Ricult</b>	<a href="http://www.ricult.com">www.ricult.com</a>	Thailand	App which helps farmers to implement best practices and get better access to credit and crop buyers.
<b>Tanifund</b>	<a href="http://www.tanifund.com">www.tanifund.com</a>	Indonesia	Platform which provides financial support and peer-to-peer (P2P) lending to its member farmers

Source: Eco-Business from interviews, desk research

## Unlocking opportunities for e-payments

Digitalisation and cloud computing have been central to many fintech start-ups, providing the infrastructure needed to for financial inclusion across the region. Leveraging on the region's high smartphone penetration, several fintech players using cloud platforms have launched hugely successful digital mobile payment systems.

Cloud service providers have enabled these organisations to handle a high volume of users, and scale up at much lower costs than if they were to use their own on-premise platforms. GCash ([www.gcash.com](http://www.gcash.com)) is the top e-payment platform in the Philippines.

As of October 2020, it has 20 million registered users, the equivalent of 18 per cent of the country's population,

and is accepted at approximately 63,000 physical and online stores, as well as local taxis, thanks to an initiative between GCash and the government. PayMaya ([www.paymaya.com](http://www.paymaya.com)) is a similar cloud-based mobile payment system in the Philippines that runs on AWS cloud and commands eight million registered users.

It has become a key enabler for lower-income groups who need to pay bills and send and receive money. PayMaya has become a particularly popular payment method in the agricultural sector as well as urban areas such as Metro Manila. PayMaya account holders can even purchase retail Treasury Bonds, enabling them to invest without a bank account.

Similarly in Indonesia, cloud-based digital wallets such as Go-Pay ([www.gopay.com](http://www.gopay.com)), OVO ([www.ovo.id](http://www.ovo.id))

and Doku ([www.doku.com](http://www.doku.com)) have transformed the local payments landscape. Similar to GCash and PayMaya in the Philippines, these players have fostered financial inclusion by offering those with zero access to banking services the opportunity and convenience of cashless transactions.

Even more importantly, the uptake of cloud-based mobile payment apps has opened a gateway for fintech providers to scale up and offer credit and other types of financial support. A growing number of fintech companies make use of the digital credit profiles created when users make transactions and payments. The online financial profile means that these communities are no longer "financially invisible". This has given rise to more credit facilities and loan services from cloud-based fintech players, which are able to scale rapidly to meet this demand.

## Cloud-powered lending apps

<b>Amartha</b>	<a href="http://www.amartha.com">www.amartha.com</a>	Indonesia	Peer-to-peer (P2P) lending service which specifically targets working-age mothers with dependents in rural areas.
<b>Cashalo</b>	<a href="http://www.cashalo.com">www.cashalo.com</a>	Philippines	Online lending system which also provides digital credit on-demand. As of March 2020, it had a user base of over 2.5 million consumers. According to the company, it has helped over 1.5 million Filipinos who were "credit-invisible" build their financial identities.
<b>Julo</b>	<a href="http://www.julo.co.id">www.julo.co.id</a>	Indonesia	Peer-to-peer (P2P) lending service which uses machine learning and advanced credit analytics. Typically provides small-scale loans of US\$300.
<b>TendoPay</b>	<a href="http://www.tendopay.ph">www.tendopay.ph</a>	Philippines	Mobile app offers digital instalment plans for purchases from the 2,900+ 7-Eleven stores in the country

Source: Eco-Business from interviews, desk research

## Cloud helps previously unserved communities gain access to credit lines

Cloud technology has also helped scale digital finance initiatives within rural areas, which has contributed to overall economic growth. According to a report by Oliver Wyman, the digitally driven acceleration in financial inclusion could boost GDP by 2 per cent to 3 per cent in markets like Indonesia and the Philippines, and 6 per cent in Cambodia<sup>9</sup>.

Indonesian cloud-based fintech players, Amarnya (<https://amartha.com/>) and Julo (<https://www.julo.co.id/>), which offer peer-to-peer (P2P) lending services to lower-income communities, have been a driving force for financial inclusion. Julo offers loans of approximately US\$300 and uses its own credit scoring system developed with machine learning and advanced credit

analytics. Amarnya, which offers loans and financial counselling, specifically targets working-age mothers with dependents in rural areas. Its digital intelligence, powered by AWS, enables it to identify villages which are not yet served by financial institutions.

As of September 2019, Julo had disbursed approximately US\$50 million in small loans to the unbanked community<sup>10</sup>. As of November 2019, Amarnya had lent US\$113 million to over 343,000 partners across 5,200 villages in Java and Sulawesi.

### Financial support for SMEs builds economic inclusivity

Besides individuals, fintech companies have also been able to provide credit support to small and medium enterprises (SMEs) which

had previously been unable to access credit. Experts estimate that there are over 70 million micro-, small- and medium-sized enterprises (MSMEs) in Southeast Asia, three times more than in the United States.

It is estimated that two-thirds of these enterprises do not have access to a line of credit. However, cloud service providers have enabled several fintech players to bridge this gap. Singaporean player Aspire (<https://sg.aspireapp.com>) and Filipino player First Circle (<https://www.firstcircle.ph/>) provide financial solutions to SMEs which previously struggled to get a line of credit.

Aspire uses alternative data to assess credit history and offers flexible loans of up to SG\$300,000 to small businesses. First Circle provides short-term loans to small Filipino businesses.

## Improving quality of life

### Cloud, the driving force behind Southeast Asia's smart cities

According to the World Bank, almost 56 million more people now live in Southeast Asia's urban areas compared to 10 years ago. In Indonesia, for instance, the urban population increased by almost 30 per cent between 2009 and 2019. While cities may offer job opportunities, they are becoming denser and more congested and polluted. City governments must also manage crime rates and ensure the health and wellbeing of residents, in order for the urban centres to grow sustainably in the longer term.

Cloud technology helps urban authorities to integrate technology and data into public services to boost economic inclusion and quality of life.

A report by McKinsey Global Institute highlights the positive impact that smart cities can have on employment, living expenses and standards, as well as sustainability. Smart technologies can reduce water consumption by 20 to 30 per cent and greenhouse emissions by 10 to 15 per cent. They can also lower disease rates by 15 per cent, emergency response times by 20 to 35 per cent, and crime rates by 30 to 40 per cent<sup>11</sup>.

### Singapore leads the way in smart city development

Cloud has been at the heart of the region's biggest smart city success stories. Singapore is a prime example, having readily deployed cloud technology across all its public services to transform its urban landscape.

It has one of the world's highest living standards and lowest crime rates. Its "Smart City, Smart Nation" goals, launched in 2014, have been enabled by the migration of strategic systems to the commercial cloud.

Its cloud-run mobile apps include Parking.sg ([www.parking.sg](http://www.parking.sg)), which allows drivers to pay parking fees, and LifeSG (previously named Moments of Life), a one-stop portal to more than 40 services such as topping up of Central Provident Fund accounts for savings and retirement, applying for a passport, and paying for season parking.

In June 2020, the country announced it would intensify its "cloud-first" policies even further. For instance it would migrate and upgrade its Inland Revenue Interactive Network (IRIN) – the main technology system behind its inland tax revenue services – as well

as its Infocomm Media Development Authority Integrated Regulatory Info System (IRIS). It also plans to migrate its water metre services to the commercial cloud by 2021, which would allow households to capture water usage readings wirelessly and learn water-saving measures via a customer portal.

### Other Southeast Asian cities getting on the cloud

Other cities are embracing their own smart city projects with the support of 5G cloud tools and technologies. Thailand plans to develop 100 smart cities by 2022. Indonesia has earmarked Jakarta to become a smart city by 2025, and there are plans for its new capital in East Kalimantan to be the first capital city that uses only autonomous and electric vehicles for mass and private transportation.

Similarly, Malaysia's Johor, Sabah, Sarawak, Greater Kuala Lumpur, Putrajaya, Selangor and Iskandar Malaysia are also expected to increasingly leverage cloud, analytics, and mobile solutions to develop smart cities that enhance the liveability, inclusivity and sustainability for the long term.

# Chart 3: Singapore's Smart Nation Initiatives

# SMART, TANGIBLE BENEFITS FOR CITIZENS AND BUSINESSES

### MyInfo

- 110,000+ daily transactions with **verified info pre-filled** for users at each transaction
- 460 government and commercial digital services on-boarded to date, **cutting application time by 80%** for users
- **Savings of up to \$50** per transaction, and **80% reduction in transaction time** for business

### SingPass Mobile

- Almost 1 million users seamlessly logging in **without the need for passwords**

### Moments of Life (MOL)

- 120,000+ app downloads with **personalised services for citizens** (as of Jan 2020)

### PayNow

- 3.2 million\* registered mobile and NRIC(National Registration Identity Card) registrations for **instant funds transfers**
  - 137,000\* UEN(Unique Entity Number) registrations by companies for **instant funds transfers**
  - 71 million PayNow transactions in 2019
- \*As of Dec 2019

### MOL Families:

- **Time** needed for birth registration, application for Baby Bonus, and NLB(National Library Board) membership **cut by 3x**
- 18,00+ births e-registered **without physical queues and manual form-filing** since 2018

### MOL Active Ageing:

- MOL enhanced to include services and info for seniors to encourage active ageing. Includes access to Merdeka Generation Package e-cards and info on government benefits tailored for seniors
- Content generates hits averaging 37,000 times per month

### Healthy 365

- 2.25 million+ downloads (as of Dec 2019)
- 830,000+ new sign-ups coinciding with season 5 of National Steps Challenge™ (as of Dec 2019)

### Myinfo Business

- 260,000+ business enjoy **convenience of pre-filled forms**
- 20,000+ B2B transactions in 2019

### Networked Trade Platform

- 3,500+ businesses benefits from a **one-stop ecosystem** to access Customs and TradeNet e-services

### GoBusiness

- 460+ F&B companies enjoy **ease of applying for business licences**
- **Simpler, faster and better processes** that result in **\$500 cost savings** for business

### National Digital Identity (NDI) APIs

- More businesses leveraging on NDI APIs to **build better services** for their customers and **streamline business processes**

### STORE

### MyCareersFuture.sg portal

- **Personalized job recommendations** aided by machine learning for 540,000+ unique users

### DigiMC

- 400,00+ digital MCs(Medical Certificate) issued (as of Feb 2020), for **convenient MC retrieval and routing to employers**
- Progressive roll out to private healthcare sector from 1H 2020

### Wireless Alert Alarm System (Wireless AAS)

- Progressive deployment of Personal Alert Buttons **benefitting 10,100 elderly households** in 53 HDB(Housing Development Board) rental blocks

### myResponder

- **Quick medical intervention has saved 20 lives** to date
- About 70,000 sign-ups to be first responders
- 3,500 active community first responders who **arrive on scene before SCDF (Singapore Civil Defence Force)**

■ Benefits for citizens and community

■ Benefits for business

## Cloud-enabled Wi-Fi hotspots empower smart cities

Free and widely available Wi-Fi is a simple and effective way to enhance communication and allow small and medium enterprises (SMEs) to operate seamlessly and at minimal cost. Singapore's cloud-based Wireless@SG initiative offers free Wi-Fi in many areas, while Bangkok has over 2,300 free Wi-Fi hotspots. Phuket's 1,000 free Wi-Fi hotspots cover parts of the city, as well as its beaches.

In October 2020, Thailand's Digital Economy and Society (DES) Ministry announced plans to roll out free Wi-Fi services for urban communities, starting with 10 communities from 1 October 2020. Availability of digital solutions to all members of the community via Wi-Fi and cloud services has helped underpin growth in inclusivity in cities.

### Better commutes

Cloud technology has also helped governments to improve public transport systems. Phuket, Thailand's first smart city, launched its "Smart Buses" in 2018, which deploy cloud technology and use GPS and smart modelling to track buses' locations and estimate bus arrival times. Its Smart Bus route from the international airport to the main beaches and hotels provides a convenient and less costly ride from the airport to town, benefiting tourists.

In Singapore, the National University of Singapore has a self-driving shuttle bus to transport students across the campus. By 2022, the nation plans to introduce driverless buses on a wider scale, starting with three residential districts: Punggol, Jurong and Tengah. The country has rolled out "smart bus stops" at high-traffic locations such as Dhoby Ghaut interchange.

These bus stops which show bus arrival times, generate cool air for waiting passengers, and display real-time information about air pollution in the vicinity. They use cameras to track commuter movements as well as suspicious activities.

The country's Smart Travel Programme uses analytics and monitoring tools to manage crowds and distribute peak-

hour travel demand more evenly. Reduced congestion and better experiences for commuters improve liveability, which supports better health and wellbeing. Jamie Leather, Chief of Transport Sector Group at the Asian Development Bank, shared, "We now have the ability to use data to manage transport systems like never before, by linking the operations and management systems and coupling them to the data which can then be organised, analysed and utilised in new ways not attempted before."

### Improving public safety

Cloud platforms can also help reduce crime. Singapore has an estimated 86,000 cameras across the country which run on the cloud and have advanced features including pan-tilt-zoom and 360-degree views.

In April 2018, the government introduced a Lamppost as a Platform (LaaP) pilot project, which operates on a cloud-based infrastructure combined with wired and wireless technologies. It incorporates intelligent sensors, facial recognition software and surveillance cameras on 100,000 lampposts to detect the speed of personal mobility devices (PMD) and bicycles along pathways, perform crowd analytics, support anti-terrorism operations, and assess surroundings to improve urban planning.

Similarly in Phuket, the city government is seeking to improve public safety by installing over 2,000 cloud-based surveillance cameras in most public areas. In addition, its cloud-powered mobile app, "police I lert u", allows residents to report incidents and request help from the police.

Cloud platforms have enabled better waste management. Cloud-powered apps such as Traffy Waste, a waste-collection management tool used in Bangkok, allow citizens to report environmental problems and waste issues so that they are dealt with swiftly.

Traffy also uses AI technology to analyse data such as routes taken by garbage collectors, the state of garbage at collection points and routes taken by garbage trucks, so that these can be optimised.

**We now have the ability to use data to manage transport systems like never before, by linking the operations and management systems and coupling them to the data which can then be organised, analysed and utilised in new ways not attempted before.**



Jamie Leather,  
Chief of Transport  
Sector Group at the  
Asian Development Bank

## Connecting charities with volunteers

Social enterprises, charities and non-profit organisations have also benefited from cloud tools and services. Open platforms and analytical tools have enabled volunteers and donors to connect more easily, and brought greater transparency to transactions.

Volunteer.org and Giving.org are cloud-enabled one-stop portals in Singapore which connect charities and volunteers by aggregating local charities into one database for volunteers and donors to browse and apply, or donate, respectively. These community-building activities are vital and enhance the wellbeing of citizens. As of December 2020, these portals supported 588 charities, raised SG\$241 million, and saw 195,000 volunteer sign-ups.

## Reducing donation fraud

Powered by cloud technology, charities receiving funds can better track donations and ensure they are used for the right purpose. Cheewid (<https://cheewid.com/>), a Thai social enterprise which provides HR resource support and crowdfunding for charities, was able to leverage cloud technology to scale up operations and organise large volumes of data on donors and charities. Its cloud tools create a digital ID and digital footprint for every donor, which enables the organisation to monitor and trace the journey of the donated funds, ensuring that the money reaches its intended destination.

Kris Supavatanakul, Founder of Cheewid, highlighted the extent of fraud in Thailand has led to nation-wide e-donation programs implemented by the Revenue Department and the Government. The exact amount of donation fraud is unknown but has reached local media headlines every month. It can be a considerable figure under the US\$3 billion annual donations reported by the Revenue Department or completely untraceable in the cash donation economy.

He added, "Fraud is quite prevalent – schools and clinics are underfunded despite the high volume of overall donations and culture of giving. That's one of the reasons why we started with Cheewid – we wanted to build a digital profile such that it allows for complete

transparency. Cloud data has the ability to reduce fraud and advocate for the deserving champions of the market, providing digital visibility and footprint. Cloud comes in to say that (if any organisation wants) to penetrate the market of philanthropy and giving, it has to lead by example and become transparent first. As donors become more conscious of giving than ever before, charities need to adapt."

Cloud data brings a lot of transparency; transparency reduces fraud. Cloud comes in to say that (if any organisation wants) to penetrate the market of online giving, it has to be (transparent)."

## An invaluable asset during COVID-19

Cloud has been one of the most in-demand mainstay services during the COVID-19 pandemic. During the outbreak, essential workers in healthcare and other industries were overwhelmed across the region, facing bottlenecks and insufficient capacity to treat the growing number of patients. However, organisations which leveraged cloud technology were able to respond and scale up rapidly, and were subsequently in a much stronger position to manage the challenges from the outbreak. Mobile applications which were driven by cloud technology also saw a spike in demand, which helped alleviate the burden of hospitals and clinics.

## Healthcare and education: A stronger response to the pandemic

Besides small and medium enterprises, hospitals and clinics which had prioritised digital transformation and had access to cloud capabilities were able to respond faster and offer more services in the wake of COVID-19. Samitivej Hospital, a private hospital with eight locations across Thailand, had invested in cloud technology early on. It launched a one-stop online hospital app, the Samitivej Virtual Hospital (<https://www.samitivejhospitals.com/>), offering a plethora of services which could be easily accessed via different channels.

In addition to teleconsultation, home blood collection services and medicine deliveries, patients also have access to other services. Most notable were "Tyto Care", a portable medical exam device which enables physicians to perform physical examinations remotely,





and “Engage Care’, a telemonitoring service for patients with chronic or long-term illnesses including diabetes, hypertension and stroke.

The app can be accessed via multiple channels, including its Samitivej Plus app, the hospital website, LINE (@Samitivej) as well as partner apps including myAIS, MTL Smile service, Sansiri home service app and SCD. At the height of the COVID-19 outbreak in 2020, the number of patients using the Samitivej Virtual Hospital increased six-fold.

As lockdowns and heavy restrictions on travel and face-to-face meetings took hold, cloud-powered applications such as Zoom and Blue Jeans, helped to mitigate the disruption and ensured some continuity and normalcy. Schools and universities were able to conduct online classes and maintain a certain level of communication between students and teachers. Governments increasingly recognise how cloud-enabled education apps can add value to the school curriculum and enhance the quality of education. In May 2020, Thailand’s Ministry of Education selected cloud-based apps to incorporate into its national education system. One of the tools was Edmodo, a cloud-based learning app for connecting

teachers with students, which will be used as part of a teaching trial for 10,000 Kindergarten to Year 12 children.

### **Making life easier during lockdown**

Cloud technology helped make everyday life easier during the lockdown period. Netflix, which uses AWS cloud for its storage and infrastructure needs, reported that its number of subscribers in Asia Pacific increased by 3.6 million in the first quarter of 2020 as a direct result of widespread movement curbs.

Cloud technology provides the infrastructure for apps such as Grab, Go-Jek, Foodpanda and Deliveroo to scale up and partner with restaurants to meet the heightened demand for food delivery services in metropolitan cities. While regional food delivery apps were able to meet the surge in orders across multiple markets – Delivery Hero’s brand, Foodpanda, saw particularly high demand in the Philippines and Thailand thanks to its AWS cloud-based infrastructure which is run on Amazon Xle instances and powered by Intel Xeon e7 8880 v3 processors. Smaller companies such as Oddle and WhyQ also benefited from being on cloud platforms and were able to support local food businesses. For instance, White

Restaurant in Singapore was able to take up to 10 times more orders using Oddle, a cloud-based mobile platform, than on the phone.

### **Enabling the recovery**

Cloud technology will play a pivotal role in ensuring economic stability and helping societies to transition to the new normal, post-COVID. Online and hybrid learning tools using cloud technology will be an indispensable part of the education system on a global scale. Similarly, citizen-centric apps to assist citizens in carrying out important tasks in daily life, including banking, going to the library, or making important applications such as a passport renewal will become essential tools during the recovery.

Singapore has introduced several apps powered on the cloud as part of its phased easing of restrictions. These include the TraceTogether mobile app to enhance contact tracing, the CrowdInsights app to measure the density of crowds at public locations, and the RamcoGeek app which uses facial recognition technology. Countries which are digitally- and cloud-ready will be in a strong position to adapt their processes and protect their citizens post-COVID-19.

**Fraud is quite prevalent – schools and clinics are underfunded despite the high volume of overall donations and culture of giving. That’s one of the reasons why we started with Cheewid – we wanted to build a digital profile such that it allows for complete transparency. Cloud data has the ability to reduce fraud and advocate for the deserving champions of the market, providing digital visibility and footprint. Cloud comes in to say that (if any organisation wants) to penetrate the market of philanthropy and giving, it has to lead by example and become transparent first. As donors become more conscious of giving than ever before, charities need to adapt.**

Kris Supavatanakul, Founder of Cheewid



## **Better access to healthcare**

### **Enabling Southeast Asia’s fast-growing telehealth industry**

Offering convenience, telehealth was already growing steadily before COVID-19. Social distancing measures and the high risk of travelling and

socialising during the COVID-19 have made telehealth apps even more popular. Defined by the World Health Organisation (WHO) as the use of telecommunications and virtual technology to deliver healthcare services outside of traditional facilities,

telehealth has skyrocketed in certain markets across Southeast Asia.

Many of these apps have been able to respond fast and provide better patient care as a direct result of them using cloud platforms.

By leveraging cloud computing such as AWS cloud has enabled telehealth apps to operate at scale and provide reliable service. In the region, Thailand has been among the most active in driving telehealth apps and digitalising its healthcare industry. Dr Raksa ([www.doctorraksa.com](http://www.doctorraksa.com)), is one of the country's leading cloud-based telehealth apps, and connects patients with over 700 registered doctors with 10 or more years of medical experience.

Patients can get advice on 30 different specialities, 24 hours a day. The app has also integrated seamlessly with hospitals, insurance providers and pharmacies. With most of its infrastructure taken care of, the company can focus on building its core operations. With the number of telehealth users growing rapidly, cloud architecture has provided the flexibility for telehealth players to scale up seamlessly to meet increased demand. Singapore telehealth app Doctor Anywhere ([www.doctoranywhere.com](http://www.doctoranywhere.com))

experienced a three- to-four-fold increase in demand for its services during COVID-19, and relied on cloud technology to operate at scale and provide a reliable service to its users in Singapore, Vietnam and Thailand. In August 2020, it launched its Malaysian operations, and plans to expand into the Philippines.

Indonesia remains underserved compared to other markets such as Singapore, Malaysia and Thailand, as it continues to struggle to provide sufficient healthcare to its citizens. According to the World Health Organization, there are only four doctors and 12 hospital beds for every 10,000 Indonesians, which makes technological solutions powered by cloud even more vital to the community.

Jakarta-based mobile platform Halodoc ([www.halodoc.com](http://www.halodoc.com)) has made a positive impact on communities which have previously struggled to access

medical services. Cloud technology reduced the company's IT costs by 20 to 30 per cent, and improved its physician mobile-call response times by 30 per cent. Cloud technology also enabled Halodoc to scale up fast – in the six months following its rebranding exercise in May 2017, the app achieved over 500 per cent growth in its user base, and its cloud architecture allowed it to scale up seamlessly. Other cloud services, including Amazon CloudWatch, enabled its tech team to immediately address any bugs or feedback received from app users.

Before the outbreak of COVID-19, Halodoc served approximately seven million patients per month, 80 per cent who live outside the cities of Jakarta and Surabaya. Between March and June 2020, the company's mobile app downloads increased by 300 per cent because of COVID-19, indicating its indispensable role in servicing the communities during the pandemic.

## Cloud-powered telehealth apps in Southeast Asia

<b>Alodokter</b>	<a href="http://www.alodokter.com">www.alodokter.com</a>	Indonesia	App which connects patients with doctors. Has 20 million active users on its platform per month
<b>Chiiwii LIVE</b>	<a href="http://www.chiiwiidoctor.com">www.chiiwiidoctor.com</a>	Thailand	Connects female patients to over 20 specialist doctors on mother and child health issues, menstrual problems, birth control and pregnancy
<b>Doctor Anywhere</b>	<a href="http://www.doctoranywhere.com">www.doctoranywhere.com</a>	Singapore	App which offers video consultations with doctors, as well as medicine delivery
<b>Dr Raksa</b>	<a href="http://www.doctorraksa.com">www.doctorraksa.com</a>	Thailand	Connects patients with over 700 registered doctors with 10 or more years of medical experience. Patients can get advice on 30 different specialities, 24 hours a day. App is also integrated seamlessly with hospitals, insurance providers and pharmacies
<b>Halodoc</b>	<a href="http://www.halodoc.com">www.halodoc.com</a>	Indonesia	Mobile platform for patients to access doctors any time of the day and pharmacy delivery across 50 cities
<b>Ooca</b>	<a href="http://www.ooca.co">www.ooca.co</a>	Thailand	App which connects patients with psychiatrists or psychologists to provide immediate mental support via video call
<b>See Doctor Now</b>	<a href="http://www.seedoctornow.com">www.seedoctornow.com</a>	Thailand	App offering online doctor consultations 24 hours a day

Source: Eco-Business from interviews, desk research



# LOOKING AHEAD - NEXT STEPS FOR CLOUD

Digital transformation is set to accelerate, especially in the wake of the COVID-19 pandemic and the integration of technology into citizens' daily lives. It is certain that digital tools and cloud technology will be at the forefront of

business opportunities and overall economic growth in the future. Thomas Abell, Chief of Digital Technology at the Asian Development Bank, states, "Any future development will be through digital, and cloud is an essential piece

of that. Cloud will allow infrastructure to be deployed much more easily, cost effectively and scaleably than before." However, key challenges remain including data security, data nationalism and the digital divide.

## Cloud's biggest challenge: Data security

### Data security problems could overshadow the benefits of cloud

Data security is one of the barriers to cloud technology adoption. Cloud providers have robust security systems in place and are acutely aware of the risks of hackers and data breaches. Nevertheless, incidences of account hijacking and data loss continue to burden businesses and governments across Southeast Asia, putting up barriers to cloud adoption.

Hackers persist in targeting data systems and stealing valuable personal information, including people's identities, bank account details and credit card numbers. Cloud technology has played a key role in helping to mitigate this by supporting several organisations involved in the fight to keep data secure. A "shared responsibility" model is promoted by providers, where ensuring underlying security of the core cloud infrastructure may be vital, but the security of the work being deployed is the responsibility of

the user. Nevertheless, companies are still vulnerable to data security risks, a factor that has deterred organisations, particularly in the health care and education sectors, from leveraging on cloud services, which they still perceive to be susceptible to security risks.

### Singapore shaken by data breaches

Singapore's overall success in becoming a cloud-first nation has been marred by inadequate security measures which have resulted in several serious and high-profile data breaches. One of the country's worst breaches was in July 2018 when hackers were able to access the medical records of 1.5 million patients, including Prime Minister Lee Hsien Loong himself. In 2019, health data of 14,200 people was again leaked, this time from the country's HIV registry. That same year, the Health Sciences Authority (HSA) announced that details of over 800,000 blood donors had also been exposed due to mishandling by one of the government's third-party vendors. Such incidences overshadow

the many benefits of cloud and hinder its potential contribution to economic growth by discouraging uptake of cloud services.

### COVID-19 and cybercrime

Data breaches have intensified across the region in the wake of COVID-19, in tandem with people spending longer hours online. According to the Malaysia Computer Emergency Response Team (MyCERT), the number of complaints lodged with its Cyber999 Help Centre between 18 March and 30 June 2020 increased by more than 90 per cent from the previous year.

In September 2020, Thailand's Saraburi Hospital and other government hospitals were hit by a series of ransomware attacks. Several businesses across the region also saw their customers' data compromised. They include Ninjavan and Lazada in Singapore, Tokopedia in Indonesia, and Kasikorn Bank and Krung Thai Bank online banking services in Thailand.

The breaches have forced companies to reassess processes and find ways to better safeguard their customers' data.

### Cloud technology is secure

While data breaches are a major cybersecurity threat, they are not caused by cloud service providers. Identity theft and hacking have affected businesses and organisations long before the rise of digitalisation and cloud technology. Cloud service providers invest heavily in security.

Organisations are designed to be highly resilient and secure, offering several tools such as network firewalls, automatic encryption of all traffic on its global and regional networks between secured facilities, as well as options to configure access and monitor activity. While there is no 100 per cent guarantee against cyberattacks, the cloud providers' economies of scale mean that they can offer a comprehensive set of the latest security measures to all users. This is potentially more reliable and secure than a traditional on-premise system.

A "shared responsibility" model is promoted by providers, where ensuring underlying security of the core cloud infrastructure may be vital, but the security of the work being deployed is the responsibility of the user. On cloud infrastructure, users can restrict access to the most sensitive data and control what is made public. Thomas Abell,

Chief of Digital Technology at the Asian Development Bank, says, "I do not think that cloud is less secure than other forms of internet or computing infrastructure.

There may be a perception that cloud computing is less secure because it is not in your building. But this is not true because cloud providers offer the latest security capabilities, and they are generally ahead of your in-house data centres on security practices."

### Security should be a basic component of the cloud service package, not an add-on

All parties involved in handling citizens' data, from cloud service providers to governments and industry players, must do better to mitigate the risk of breaches and safeguard the data. Users must also treat security as a priority, and ensure they are carrying out best practices, with data access being properly restricted.

Cloud service providers possess the latest security and encryption technologies, and these technologies should be made compulsory or included as a core part of the basic cloud package to all businesses, rather than as an optional add-on.

Organisations also need staff with the highest technical skills to defend against and respond to potential cyber attackers. Consumers should take the necessary precautions when online to prevent data from being compromised.

### Service providers and the industry should reduce security risks collectively

Singapore has taken the lead in addressing data security. Organisations which saw their customers' data compromised, including SingHealth, Singtel, SPH Magazines, NTUC, AXA, Royal Caribbean Cruises and SCAL Academy, were all fined. In February 2020, the government announced it would spend SG\$719 million to enhance its cyber and data security systems further.

In November 2020, it also announced it would be launching the Tech.Pass, a new type of work pass aimed at attracting top-tier foreign technology professionals. The Public Sector Data Security Review Committee (PSDSRC), which the government created to assess new ways to address data security, recommended several measures to build on the country's 2018 Cybersecurity Act. These measures are expected to be rolled out across most of its systems by the end of 2021.

May Ann Lim, Executive Director of the Asia Cloud Computing Association, says, "Cloud technology, and technology in general, have accelerated a lot of discussions around these issues of data security. Governments are really upskilling their ability to understand the discussions around privacy and security."



# Preventing cloud from being used to circumvent the law

## Online scams, fraud and phishing are increasing

Despite their benefits, cloud technologies have also been used for criminal activities. Online scams, fraud and phishing – where an attacker steals personal data by impersonating a trusted organisation or individual – remain a problem.

In Singapore, the Cyber Security Agency of Singapore (CSA) reported 9,430 cybercrime cases in 2019, a 52 per cent rise from the previous year. This number also represented 27 per cent of the country's overall crime for 2019. Many of these activities could have been powered by cloud technologies.

## Illegal activities on the rise

The internet is being used for sexual exploitation, sex trafficking, pornography and acts of terrorism across the region. The cloud platform's encryption capabilities appeal to criminals as their activities can be hidden and offenders can be at a different location from where the crime takes place. In developing markets, pay-as-you-go streaming services are often used to connect sexual predators with vulnerable children and their families.

In Indonesia, criminals are known to use cloud-based social media apps such as Facebook to find and lure victims into their illegal operations involving child abuse or sex trafficking. In October 2020, it was reported that home cameras in Singapore had been hacked and videos featuring women in compromising positions had been uploaded to pornographic websites.

## Can cloud gain the upper hand?

Current laws and campaigns in the region are not sufficient to effectively

address the growing threat posed by online criminals. Collaboration among cloud service providers, governments, policymakers and businesses will be essential to combat criminal activity.

Richard Goh, Deputy Director of Skillsfuture Singapore, adds, "The question is whether cloud services can help to detect when something is not right and help to prevent such usage of their services for such illicit and illegal purposes." Indeed, cloud technology is in a strong position to be a "force for good" by supporting organisations in the region which are committed to putting a stop to it.

In the US, cloud technology is already involved in the fight against malicious activities. US-based company Thorn is a non-profit organisation that aims to stop child sexual abuse and trafficking. Its tool, Spotlight, uses machine learning to flag up advertisements which could present a risk of children being sexually exploited.

The company's infrastructure uses Amazon Rekognition and Amazon EC2 cloud technology, powered by 3.0 GHz Intel Xeon Scalable processors to absorb large amounts of data which helps law-enforcement officers to find and protect vulnerable children faster.

Using AWS and Intel processors allows the company to scale up and down rapidly according to their changing needs. The number of law-enforcement officers using Spotlight increased from 100 to 1,000 officers in one year, thanks to its cloud infrastructure. It reduced the officers' investigative time by up to 65 per cent.

Southeast Asia will benefit from similar initiatives to Thorn. With cloud-based crime often being cross-border, cloud technology's seamless integration capabilities can also form a bridge

between governments and facilitate the sharing of information to effectively deal with criminals and win the war on cybercrime.

Clear and standardised regulatory frameworks both within and across countries will help ensure stronger enforcement measures to detect and respond to cybercriminals involved in scams and fraud. In the US, the Financial Industry Regulatory Authority (FINRA) specialises in protecting investors from fraud and unfair business practices by applying data analytics tools to detect signs of insider trading or other activities which generate an unfair advantage in the stock market. Its technology infrastructure relies heavily on AWS Lambda serverless computing, enabling it to deliver the intelligence at a much larger scale, more rapidly.

Such frameworks empowered by cloud technology would also be an asset to Southeast Asian markets. Singapore, which has been hit by several cases of financial scams and trade fraud, announced its plans to implement a system in October 2020 – DBS Group, Standard Chartered and 12 other banks announced they would work with the Association of Banks of Singapore (ABS) to implement a digital registry to oversee trading practices, improve transparency and mitigate risks of trade fraud. Cloud technology could play a key role in enabling better business practices and enhancing stable economic growth.

In addition, campaigns, networks and forums to support and educate consumers will be paramount to build a better understanding of the risks and ways to avoid being victims of crime. Businesses, schools and educational institutions can play a proactive role in instructing consumers and students about online safety, security, privacy, as well as digital ethics and etiquette.

# Open borders key to enabling cloudtech to support economic growth

## The concern of data localisation

One potential challenge to the growth of digitalisation and cloud is the enactment of data sovereignty and data localisation laws. Data sovereignty laws determine how data is dealt with in a particular country and according to the local law. Data localisation laws ensure that data obtained in a country is stored and used locally, and not transferred to another country.

Some countries are considering, or have already put in place these laws in the belief that this will better protect their citizens' data. Singapore, the Philippines and Thailand do not have data sovereignty or data localisation laws. However, Malaysia and Indonesia have data localisation laws which restrict how and where data can be stored – Malaysia's Personal Data Protection Act requires data on Malaysians to be stored on local servers. Indonesia used to have strict data localisation laws until October 2019, when laws were relaxed to encourage foreign investment. In October 2019, the government issued Government Regulation No. 71, revoking Government Regulation 81, to allow private sector players to provide internet services from both inside and outside the country.

## Keeping data borders open

For certain governments and public sector organisations, data residency requirements and data sovereignty laws are a means to maintain security and control within an increasingly open, global computing environment. However, restricting how cloud and IT services operate within a country and across borders will be detrimental to the economic growth and society. Cloud services have benefited communities because of their high degree of efficiency, agility and ability to enable businesses and organisations to operate seamlessly across sectors and borders. Closing borders will have a negative impact on the progress and benefits that cloud technology can offer. While controlling the geographic placement of data may be perceived as being more secure, it also does not necessarily provide better security, as regardless of physical location, the internet will still provide a channel which poses security and political risks.

Similar to trade protectionism, data localisation laws close borders, impeding communication, trade and economic development. Experts interviewed alluded to major business disruptions because of conflicts

between the US and China, which has meant that companies which host on US-based companies may be subject to firewalls regardless of the region where their cloud service is based. Cloud services for these businesses will not be accessible because of the China firewall, disrupting operations and their ability to contribute to economic growth. As the world looks towards digitalisation and becomes more connected, it will be vital to allow the transfer and seamless flow of digital information across borders and avoid politicising the flow of data and technology.

## A common code of conduct to support interests across the region

To ensure open borders and sustainable free movement of data across countries, it will be necessary for the region's governments, cloud service providers and industry stakeholders to collaborate and create a common set of principles governing cross-border data flows. Such guidelines should respect each country's concerns, including political and trade interests, yet also acknowledge the benefits of a unified, regional agreement. If a common code of conduct can be created, all countries will be well-placed to boost economic competitiveness collectively as a region.

# The urgency of addressing the digital divide

A key challenge of digitalisation is to ensure that all citizens have the opportunity to benefit from, and contribute to economic growth. To achieve this, it is essential for digital leaders, policymakers, businesses, and educators to ensure that all members of society have the skills and tools to succeed in a cloud-based economy.

At present, Southeast Asia still shows signs of a "digital divide", where parts of society lack the skills and access to equipment. As a result, they are left behind in the digital transformation. If the divide is not addressed, it will

lead to greater marginalisation and social inequality. To enable all citizens to leverage technology and cloud, it is crucial to: develop a solid, country-wide infrastructure enabling digital connectivity across the region; ensure all citizens have access to digital services and equipment; and provide relevant training and education on using digital technology.

Internet access was cited as a core requirement by the United Nations to achieve its Sustainable Development Goals<sup>12</sup>. Tackling the digital divide will ensure sustainable and inclusive growth.

## Basic infrastructure is fundamental

Governments in developing markets such as the Philippines and Indonesia must improve infrastructure to make the most of digitalisation. In the Philippines, key cities still experience electricity shortages or "brownouts" throughout the year. Supply of electricity remains severely limited in remote parts of the country.

Internet connection is unstable in several parts of Indonesia, although the development of the Palapa Ring, which will establish a comprehensive

4G network across the country, will be a huge milestone. Even in markets with high internet penetration, policymakers and digital service providers need to address the disparity between different segments of society. Malaysia's internet penetration may be over 80 per cent but while residents in Kuala Lumpur enjoy internet speeds of up to 800 Megabits per second (Mbps), residents in Sarawak in East Malaysia experience much slower speeds, with some areas having no access to internet service.

Singapore's internet penetration is the highest in the region at 88 per cent. But according to the country's Household Expenditure Survey 2017/2018, 96 per cent of households living in private condominiums and other apartments have internet access, compared to only 45 per cent of households in one- and two-room public flats<sup>13</sup>.

#### **Improve access to services and equipment**

To be digitally inclusive, every citizen needs access to solid infrastructure and broadband internet. In metropolitan areas, governments already offer effective initiatives such as free Wi-Fi, but this should now expand beyond public, high-traffic areas to residential communities. Local initiatives such as the "Too Fast To Sleep" internet cafes in Thailand contribute to greater digital access and should be developed on a wider scale. In Singapore, the Asia Cloud Computing Association is assessing the feasibility of establishing wireless access points in a block of public flats in Boon Lay so that all households can have free Wi-Fi.

As Johann Annuar, Executive Director of the non-profit organisation Engineering Good, states, "The one thing that is severely lacking in Singapore, that I hope will come to the fore within the next 10 years, is connectivity island-wide... while I understand that there is a need for ISPs (Internet Service Providers), let's make a basic level (of connectivity), like 20 Mbps, available to the entire country."

Getting access to equipment such as laptops, tablets or desktops is also crucial. Currently, computers and laptops are unaffordable to the lowest-income families. Without such

equipment, citizens are unable to access digital tools and services and will fall behind. The COVID-19 pandemic has revealed and exacerbated the digital divide. Online learning was a challenge for families without a laptop or reliable access to the internet.

Even in Singapore, which has a well-established digital infrastructure, families with multiple children who share one laptop faced difficulties with online learning when classes were scheduled to take place at the same time. The Singapore government has sought to improve access to digital equipment as early as 2006 with its NEU-PC Plus Scheme, which offers students and persons with disabilities from low-income households a new personal computer, plus three years of free internet. More needs to be done to refine such schemes to become even more inclusive.

#### **Ensure digital literacy and talent pipeline**

For digitalisation and cloud technology to be inclusive and effectively drive economic growth, all citizens must have the opportunity to be equipped with computer skills such as computer programming and digital communication. The Singapore government leads the way in this respect, most notably through campaigns such as the Hawkers Go Digital and Seniors Go Digital initiatives aimed at nudging hawkers and training senior members of the community to go digital. Other countries can follow suit with similar initiatives.

It is also essential to build a pool of skilled high-tech workers. In November 2020, Singapore launched the Tech. Pass, a new type of work pass aimed at foreign tech entrepreneurs and leaders who can contribute to the digital industry. Cloud service providers have also launched training events to attract graduates and teach them the latest skills needed in cloud technology.

AWS Educate offers programmes that develop and upskill individuals for cloud-related careers. AWS also runs initiatives such as the Build On ASEAN 2020 Hackathon, which empowers students from vocational institutions, polytechnics, and universities in

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Singapore, Malaysia, Thailand, Indonesia and the Philippines, to learn and apply their technical skills. Setiaji, Head of Jakarta Smart City Management Unit at Jakarta Smart City, shared, “As technology is incorporated into the public sector and education systems, governments and educational bodies

must ensure that everyone is given the opportunity and means to keep up and stay ahead. In general, the biggest challenge is the talent readiness. As of now, the amount of talent locally with the required skill is not nearly enough for what the industry and what the nation needs.”

## Strengthening key sectors for the future

Several sectors are expected to increase the use of technology and rely on cloud to benefit communities in the future. The education sector faced huge challenges during the COVID-19 pandemic as it encountered limitations in its traditional teaching methods. Cloud-based apps, virtual learning methods, e-textbooks, and other interactive cloud-based tools will ensure continuity in education for citizens in the region in the long term.

Another key sector expected to strengthen in the future is health care. The industry has been slow to adopt cloud solutions, mainly due to concerns over data security. However, Southeast Asia’s governments and private organisations are increasingly recognising cloud technology’s invaluable role in integrating, streamlining and strengthening healthcare services.

Southeast Asia’s rapidly growing and ageing population, and the rise of cancer and chronic diseases such as diabetes also mean that hospitals and

clinics will need to process increasingly large volumes of data efficiently and seamlessly.

Cloud technology can provide the necessary infrastructure such as storage services, analytical tools and other services to improve healthcare. Singapore, Thailand and Malaysia have a clear digital strategy for healthcare that includes working with cloud providers.

All markets will need greater cloud migration to ensure healthcare can meet the needs of society in the future. Omar Cruz, CEO of Stash Philippines, adds, “Assuming that personal data privacy and security are maintained, leveraging the cloud will allow patient data to be processed further down the value chain, allowing big data analysis at scale, which will allow stakeholders to understand the incidence of illnesses in specific regions. Such data analysis will benefit patients by providing insight to healthcare stakeholders and provide the best targeted medical care to patients.”

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Head of Jakarta Smart City Management Unit  
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Omar Cruz, CEO of Stash Philippines



## Achieving more through collaboration

Cloud technology is powering the region's economy and has improved the lives and work of many people. It will continue to unlock new opportunities and enable more organisations to scale up and work more seamlessly. However, for cloud to maximise its potential and have greater positive impact, more collaboration is needed in the region among governments and the digital and cloud technology industry.

Achieving a solid country-wide infrastructure, one of the three pillars essential for digital connectivity to reach all citizens, can be accelerated if private companies with the technical expertise and agility, and government organisations with the national influence, can join forces. Joint efforts between technology equipment providers and governments will enable digital equipment to be made available

to every citizen, addressing one of the key challenges that all citizens must have access to digital services and equipment to benefit from cloud technology. The challenge of needing to build a strong pipeline of people armed with digital literacy and skills can also be realised through strong political will and greater collaboration between governments and technology players.

Public-private partnerships (PPP) in different forms are already making a difference – the partnership between ride-hailing app Grab and the Singapore government to develop an intelligent traffic management system is expected to improve residents' quality of life by reducing the number of vehicles on the roads. Similarly, in Indonesia, an alliance between Go-Jek and the government has meant that private-hire drivers who were facing hardship

during COVID-19 could be identified using cloud-based data analytics tools, and be provided with IDR1 million (US\$93) in economic aid.

In conclusion, cloud has already proven to play an invaluable role in enriching communities across many sociodemographic segments and industry sectors in Southeast Asia. Even greater collaboration between governments and other enterprises, as well as more uptake in other industries, will result in cloud having an even more positive impact on the liveability and inclusivity, and sustainable growth across the region in the long-term. A higher level of collaboration across industries will also foster a collective approach to help address any future potential challenges that may arise from increased use of digital platforms and cloud technology. 🌐



## APPENDIX: Research sources

Source	Name of Publication/ website
Asia Cloud Computing Association	Cloud Readiness Index 2020
Amazon Web Services	5 Ways the Cloud Can Drive Economic Development (August 2018)
Amazon Web Services	Data Residency, AWS Policy Perspectives (February 2018)
Amazon Web Services	How the Cloud Helps Cities Become Sustainable and Inclusive (January 2021)
Amazon Web Services	Introduction to AWS Security (January 2020)
ASEAN Today	<a href="http://www.aseantoday.com">www.aseantoday.com</a>
Asian Development Bank	<a href="http://www.adb.org">www.adb.org</a>
Asia-Pacific Economic Cooperation	<a href="http://www.apec.org">www.apec.org</a>
Bangkok Post	<a href="http://www.bangkokpost.com">www.bangkokpost.com</a>
Boston Consulting Group	<a href="http://www.bcg.com">www.bcg.com</a>
Business Mirror	<a href="http://www.businessmirror.com.ph">www.businessmirror.com.ph</a>
Business Times	<a href="http://www.businesstimes.com.sg">www.businesstimes.com.sg</a>
Channel News Asia	<a href="http://www.channelnewsasia.com">www.channelnewsasia.com</a>
Data Center News	<a href="http://www.datacenternews.asia">www.datacenternews.asia</a>
e27	<a href="http://www.e27.co">www.e27.co</a>
GovTech Singapore	<a href="http://www.tech.gov.sg">www.tech.gov.sg</a>
IBM	<a href="http://www.ibm.com">www.ibm.com</a>
Infocomm Media Development Authority Singapore	<a href="http://www.imda.gov.sg">www.imda.gov.sg</a>
Malay Mail	<a href="http://www.malaymail.com">www.malaymail.com</a>
Manila Standard	<a href="http://www.manilastandard.net">www.manilastandard.net</a>
McKinsey Global Institute	Smart Cities: Digital Solutions for a more liveable future (July 2018)
Nikkei Asia	<a href="http://www.asia.nikkei.com">www.asia.nikkei.com</a>

## APPENDIX: Research sources continued

Source	Name of Publication/ website
Oliver Wyman	Accelerating Financial Inclusion in Southeast Asia with Digital Finance (January 2017)
Organisation for Economic Co-operation and Development	Southeast Asia Going Digital: Connecting SMEs (2019)
Singapore Economic Development Board	<a href="http://www.edb.gov.sg">www.edb.gov.sg</a>
South China Morning Post	<a href="http://www.scmp.com">www.scmp.com</a>
TechCrunch	<a href="http://www.techcrunch.com">www.techcrunch.com</a>
Tech Wire Asia	<a href="http://www.techwireasia.com">www.techwireasia.com</a>
Techshake	<a href="http://www.techshake.asia">www.techshake.asia</a>
Thailand Board of Investment	Thailand Investment Review, Smart Farming (January 2020)
The Jakarta Post	<a href="http://www.thejakartapost.com">www.thejakartapost.com</a>
The Nation Thailand	<a href="http://www.nationthailand.com">www.nationthailand.com</a>
The Philippine Star	<a href="http://www.philstar.com">www.philstar.com</a>
The Philippines News Agency	<a href="http://www.pna.gov.ph">www.pna.gov.ph</a>
The Star	<a href="http://www.thestar.com.my">www.thestar.com.my</a>
The Straits Times	<a href="http://www.straitstimes.com">www.straitstimes.com</a>
United Nations Economic and Social Commission for Asia and the Pacific	<a href="http://www.unescap.org">www.unescap.org</a>
United Nations Educational, Scientific and Cultural Organization	<a href="http://www.en.unesco.org">www.en.unesco.org</a>
World Bank	<a href="http://www.worldbank.org">www.worldbank.org</a>
World Economic Forum	<a href="http://www.weforum.org">www.weforum.org</a>
Yusof Ishak Institute - ISEAS	Report on The Missing (Small) Businesses of Southeast Asia (July 2020)
ZDNet	<a href="http://www.zdnet.com">www.zdnet.com</a>

# FOOTNOTES

1. <https://sdgs.un.org/goals>
2. <https://datacenternews.asia/story/apac-cloud-market-to-grow-117-in-five-years-report>
3. <https://theaseanpost.com/article/singapore-leads-cloud-tech>
4. <https://www.bcg.com/publications/2019/economic-impact-public-cloud-apac/default>
5. <https://www.straitstimes.com/singapore/doubling-down-on-cloud-to-deliver-better-government-services>
6. <https://w.media/news/are-thailands-cloud-and-data-center-markets-on-the-verge-of-greatness/>
7. <https://www.bangkokpost.com/business/1913148/funding-for-state-cloud-approved>
8. <https://www.thejakartapost.com/news/2020/04/02/tanihub-group-raises-17m-to-expand-services-to-100000-farmers-by-2021.html>
9. 2017 Report - Accelerating Financial Inclusion in Southeast Asia with Digital Finance, Oliver Wyman
10. <https://techcrunch.com/2019/09/18/julo-indonesia/>
11. McKinsey Global Institute Smart Cities: Digital Solutions for a More Liveable Future, June 2018
12. <https://www.un.org/development/desa/en/news/administration/internet-for-sdgs.html>
13. <https://www.channelnewsasia.com/news/commentary/covid-19-has-revealed-digital-divide-literacy-singapore-12783252>

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