

# Chapter 3

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## Digital Government to Counter the Effects of COVID-19: The Case of Singapore

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# 1. Introduction

Singapore is known for being digitally advanced, with strong regional and international connectivity. The country topped the International Institute for Management Development (IMD) Smart City Index 2021 for the third year in a row and came in fifth in the 2021 IMD World Digital Competitiveness Ranking. These indices track the ability to develop new technologies and the extent of the acceleration of the digital transformation of an economy (IMD World Competitiveness Center, 2021). Table 3.1 provides a snapshot of the key indicators reflecting internet adoption and speed in Singapore.

Economically, the country's role as a stable financial and legal hub has also attracted investments in the digital economy. Eighty out of the top 100 world tech companies have an office in Singapore (EDB, 2018a) and 59% of multinational tech companies pick the country as their Asian regional headquarters (Ruehl, 2020). With plentiful digital activities, Singapore presents an interesting case study in its approach to digital government.

Singapore is riding the wave of the Fourth Industrial Revolution by focusing on transforming into a 'Smart Nation' or a nation that makes use of technology for better living. The thinking behind Smart Nation is not only to maximise the positive potential of digitalisation but also to learn to manage the risks across the society, economy, and government. This includes the issues of digital security and increasingly relates to aspects of foreign policy. Singapore championed the Smart Nation initiative when it chaired the Association of Southeast Asian Nations (ASEAN) in 2018, recognising the need to boost digitalisation efforts across the region.

**Table 3.1. Singapore's Digital Economy**

Indicator	Metric
Internet penetration (January 2021)	90%
Broadband internet speed (March 2021)	234.40 Mbps
Mobile population penetration rate (January 2021)	145.5%

Mbps = Megabits per second.

Source: DataReportal (Kemp, 2021).

Singapore's existing digital infrastructure has helped the country adopt technological solutions quickly. Broadband access is now recognised as a necessity and many of the devices we use, such as headphones and laptops, are increasingly becoming a basic need (Reddick et al., 2020). The government has invested heavily in the development of a resilient 5G ecosystem (Choudhury, 2019). The ultra-fast network allows consumers and enterprises to enjoy a better mobile experience, with new services and applications that were not previously possible (e.g. remote surgery, autonomous vehicles, and cloud gaming). Singapore approaches this digital transformation with three key principles: (i) infrastructure readiness, (ii) a holistic regulatory approach, and (iii) public-private collaboration for 5G use cases (IMDA, 2019).

The coronavirus disease (COVID-19) pandemic accelerated the push towards introducing digital government and online services. During the pandemic period, we examine Singapore's 'Digital Government', which is defined as the government's use of information and communication technology (ICT) solutions to provide services to the public and facilitate interactions amongst different stakeholders to increase the inclusivity of decision-making. Lessons gleaned include the importance of Singapore's whole-of-government approach, the need to build digital competencies in government, the tensions between regulation and innovation, the growing role of the private sector in the digital space, and the importance of government initiatives in mitigating the digital gap.

## 1.1. Research questions and structure of paper

This research will focus on the digital government strategy in managing the pandemic by showing how policymakers use and develop digital services to tackle health and economic crises. It aims to answer three main research questions. (i) What are the digital initiatives implemented by the Singapore Government to manage COVID-19 and its effects? (ii) How have Singapore's e-government and online public services helped to counter the negative economic and social impacts of the pandemic? and (iii) How have partnerships with the private sector played a role in formulating Singapore's digital policies?

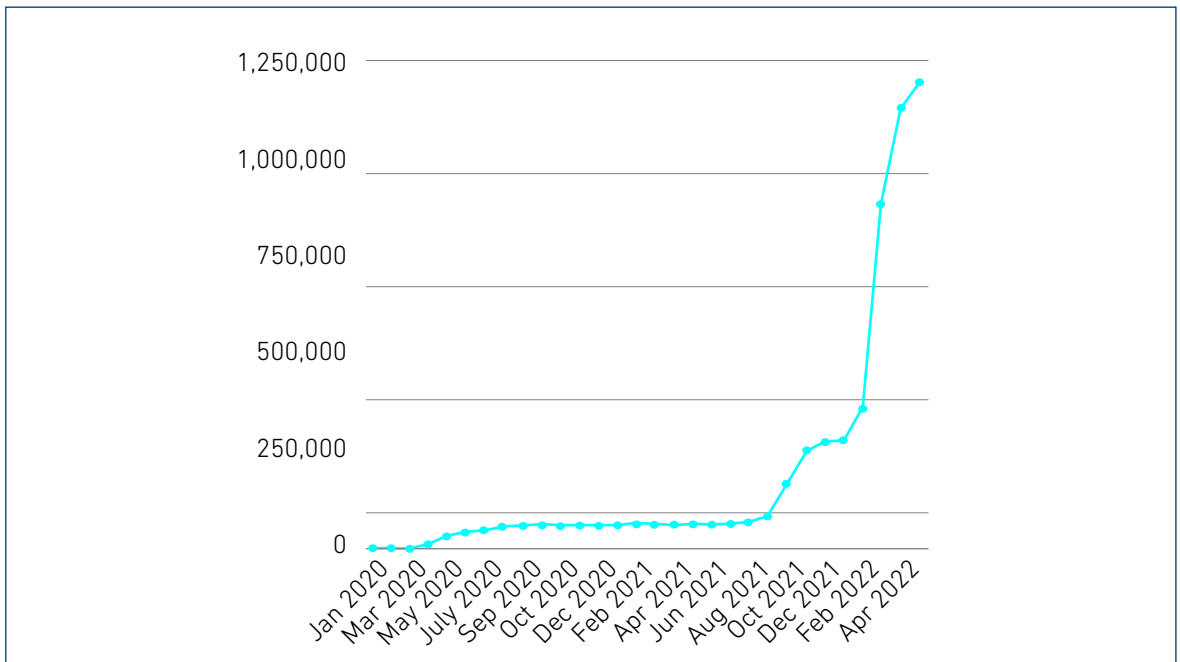
The chapter will observe the strengths of Singapore's policies, including a whole-of-government approach, inter-agency coordination, engagement with the private sector, business and social welfare support, and the effect of long-term investments. It will also observe areas that need to be improved, including security and data privacy issues and the risk of a growing digital divide, exacerbated by COVID-19.

The chapter is structured into three main sections. After laying out the introduction, the paper will expound on Singapore's approach to digital government and its policy framework, in particular the Smart Nation initiative. The next section will delve into the impact of COVID-19 on Singapore's digital transformation and the key findings regarding how digital government and online services were introduced to tackle the fallout from the pandemic. These include the accelerated adoption of online services and the side effects of digital inequalities. It will also reveal the Singapore Government's interaction with the public and private sectors and highlight pertinent digital issues of security and digital infrastructure. Lastly, the chapter will offer policy recommendations.

## 1.2. Background

Singapore detected its first COVID-19 infection on 23 January 2020, when a traveller from Wuhan tested positive for the virus. Despite travel restrictions to and from mainland China, the virus began to spread amongst the community in Singapore. The World Health Organisation (WHO) declared the virus of 'international concern' on 30 January 2020 and a pandemic on 11 March 2020. Singapore announced a 'circuit breaker' period or a partial lockdown on 7 April 2020 to contain the spread of the virus amongst the community. Under the circuit breaker measures, residents were advised to stay at home, work from home was the default mode for employees who were able to do so, and non-essential services and eateries were closed. While the circuit breaker helped slow the rate of infections, new variants such as Delta, which became the dominant strain in March 2021, caused a wave of infections in Singapore resulting in prolonged movement restrictions throughout 2020 and 2021. Figure 3.1 shows the number of COVID-19 cases from January 2020 to May 2022. By mid-2022, Singapore had removed most social restrictions and reopened its borders to international tourists.

**Figure 3.1. COVID-19 Cases in Singapore (Jan 2020–May 2022)**



COVID-19 = coronavirus disease.

Source: Johns Hopkins University.

To deal with the economic crisis, the Singapore Government rolled out four stimulus packages in 2020 worth nearly US\$70.4 billion to businesses and individuals (Lee, 2020). However, the lockdown restrictions and movement restrictions resulted in a drastic hit on Singapore's economy. In 2020, the economy shrank by 5.4% – the biggest contraction since the country's independence (Subhani, 2021). According to the Ministry of Finance, the government support measures helped bolster employment, with projections indicating that the resident unemployment rate could have doubled if stimulus measures had not been rolled out (Chew, 2022). Table 3.2 gives an overview of the extent of the impact on specific industries. Almost all industries turned to digital technology to enable work to continue through remote working arrangements, virtual classrooms, and e-commerce. This shift enabled the infocomm media sector to grow by 4.8% in 2020, even as the overall economy shrank (Anjum, 2021).

**Table 3.2. Economic Impact on Singapore's Industries**

Severely affected	Significantly affected	Moderately affected (export-oriented)	Moderately affected (domestic)
Hospitality and tourism	Food & beverages	Manufacturing	Construction
Airlines	Retail	Wholesale trade	Real estate
Arts, entertainment, and recreation	Land transport	Information & communication	Other business services
		Professional services	
		Finance & insurance	

Source: MTI (2020).

## 2. The Development of Digital Government in Singapore

### 2.1. Country context

Singapore's investment in digital government is not recent. Since the 1980s, the public service in Singapore has been looking into adopting digital technology to simplify processes and transfer paper documents to digital documents. The National Computerisation Programme was introduced in 1981 for the civil service to automate data, processes, and systems (Ng, 2019). Following that, the National IT Plan was launched in 1986 and laid the foundation for a national broadband system (Hoe, 2016).

The Public Service for the 21st Century (PS21) was introduced in 1995 as a paradigm shift in the way the civil service operated to deliver higher standards of public service and keep up with the changing economy (HistorySG, 1995). While digitalisation was not the focus of this initiative, the customer-centric approach taken by the public sector inevitably saw the increased use of technology to meet these objectives. Under the PS21, government agencies began to set up their websites, allowing for information and application forms to be readily available online. The government electronic mailbox was also set up at that time, which allowed the public to contact the public sector for any feedback or enquiries online at any time (IMDA, 1996).

Since its early days, the Singapore Government's approach to digitalisation has evolved from computerising information to adopting end-to-end digital solutions. In this vein, the Smart Nation initiative was established in 2014 as a cohesive, whole-of-government approach to incorporating technology into every facet of life in Singapore.

As outlined by Prime Minister Lee Hsien Loong, the Smart Nation initiative aims to transform Singapore into:

a nation where people live meaningful and fulfilled lives, enabled seamlessly by technology, offering exciting opportunities for all. We should see it in our daily living where networks of sensors and smart devices enable us to live sustainably and comfortably. We should see it in our communities where technology will enable more people to connect to one another more easily and intensively (Lee, 2014).

The Smart Nation and Digital Government Office (SNDGO) was set up under the direction of the Prime Minister's Office to oversee and drive Singapore's transformation into a 'smart nation'. The Smart Nation initiative has three main pillars: digital society, digital economy, and digital government (Smart Nation Singapore, n.d.). Under the digital government pillar, the Digital Government Blueprint was introduced in 2018 as a way for the government to better utilise data and harness new technologies. The blueprint sets forth 14 specific goals to be realised by 2023 and envisions public sector agencies delivering 'seamless, secure, and relevant digital services' to the public and stakeholders (Koh, 2018).

## 2.2. Use of digital technology to deal with SARS

The COVID-19 pandemic was not the first instance when the Singapore Government had to rely on digital technology to cope with a health crisis. During the severe acute respiratory syndrome (SARS) outbreak in 2003, the government relied on e-government infrastructure to manage the crisis. Devadoss and Pan (2004) outlined how e-government services were used by the Defence Science and Technology Agency to support contact tracing efforts and coordinate responses across various government agencies. Similarly, Pan, Pan, and Devadoss (2005) highlighted that information technology (IT) infrastructure such as Radio Frequency Identification (RFID), video conferencing, and the infrared

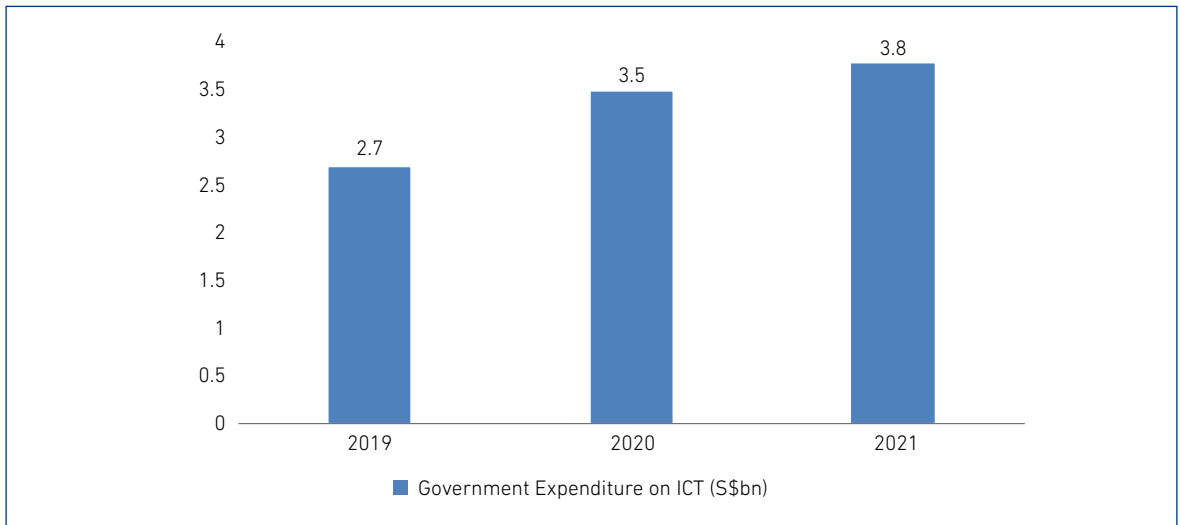
fever screening system were used to contain the spread of SARS. While both studies point to how technology was used to contain the SARS outbreak, the emphasis remains on the health impact. As a result of the prolonged and drastic impact of the movement control restrictions on lives and livelihoods, the use of e-government services to manage the effects of COVID-19 was more extensive compared with the SARS outbreak. Furthermore, since 2004, technology and e-government services have advanced significantly, as this chapter will highlight in the subsequent sections.

## 2.3. Singapore's digital policy framework: Smart Nation initiative

The Smart Nation initiative was a fundamental shift from the government's earlier digital push in that it was a whole-of-government undertaking. As part of the whole-of-government approach adopted under the Smart Nation initiative, the Government Technology Agency (GovTech) was set up in 2016 as the implementing arm of the SNDGO. As the primary agency behind Singapore's digital transformation, GovTech has invested in its own tech capabilities, with more than 400 data scientists, software developers, UX designers, product managers, hardware engineers, infrastructure specialists, and cybersecurity specialists to support the public sector in their digitalisation efforts (Koh, 2018).

To allow for interoperability across all public sector agencies, GovTech created the Singapore Government Tech Stack (SGTS), which serves as the Singapore public sector's 'digital backbone'. The SGTS is a three-layered platform (Koh, 2018). A variety of hosting infrastructures, including on-premises and private cloud hosting platforms for classified systems and commercial cloud hosting platforms for limited systems, form the foundation (Koh, 2018). A suite of middleware, or common software components used in app development, is the next layer. This contains the Whole-of-Government Application Analytics module, which allows agencies to track the performance of their websites and digital services (Koh, 2018). The top layer is a library of widely used micro-services that government agencies may simply consume and exchange for application interoperability. The SGTS assists government agencies in developing digital solutions that are both rapid and smooth.

During Singapore's digital transformation, the COVID-19 pandemic struck. The start of 2020 accelerated the timeline for investments in ICT. While digitalisation was a focus for the Singapore Government prior to the pandemic, the lockdown measures introduced in early 2020 to prevent the spread of the virus accelerated the roll-out of digital services. According to the Smart Nation and Digital Government Group in Singapore, the country's digitalisation efforts have helped it cope with the pandemic (Wong, 2021) and will be elaborated upon further in our key research findings. Digitalisation efforts helped with the country's vaccination drive, contact tracing, and digital transactions, amongst other areas. In 2021, the Singapore Government boosted spending on the procurement of ICT technology to S\$3.8 billion, a 10% increase from 2020 (Figure 3.2) (GovTech, 2021a). Furthermore, in the second year of the pandemic, Singapore's internet economy was predicted to reach US\$15 billion despite significant challenges due to lockdowns (Google, Temasek, and Bain, 2021).

**Figure 3.2. Singapore Government Expenditure on ICT**

ICT = information and communication technology.

Source: Statista (Hirschmann, 2021).

### 3. Methods and Data

A qualitative case study methodology was used for this chapter for an in-depth analysis of how digital government can be used to manage a crisis such as a pandemic. The primary research method used for this chapter was holding interviews with key government and private sector stakeholders, and secondary research involved newspaper articles, reports, and references to government websites. Interviewees include senior executives from Singapore's Ministry of Communications and Information (MCI); Infocomm Media Development Authority (IMDA), a statutory board under the MCI; and the SNDGO. These government organisations were identified as the main bodies driving Singapore's digitalisation journey.

Additional interviews were conducted with private sector stakeholders such as e-commerce giant Lazada, cloud services provider Amazon Web Services, Google, and Microsoft. These companies were chosen as they have a significant presence in Singapore and have partnerships with the Singapore Government, which will be illustrated in the subsequent sections. The interview questionnaire and full list of participating organisations are listed in the appendix. The chapter also relies on publicly available information such as details of policy initiatives and statistics on the effectiveness of government schemes to substantiate the information gathered during the interviews.



## 4. Key Research Findings

### 4.1. COVID-19 and Singapore's digital transformation

In 2020, the Singapore Government committed nearly S\$100 billion (US\$75.76 billion) to support the country's economic recovery. More than S\$500 million (US\$378.79 million) was allocated to support digital initiatives, including support for e-payments and deepening digital capabilities (Ang, 2020). Table 3.3 provides an overview of the digital tools rolled out by the Singapore Government during the pandemic.

Two main effects were observed. First, the roll-out of new digital services to tackle the pandemic became crucial, such as the need for contact tracing and online appointment systems for vaccinations (Table 3.4). Second, the pace of acceleration of digitalisation was observed in work life and e-commerce. Third, digital inclusion was thrust into the spotlight, and the need for efforts to help small and medium-sized enterprises (SMEs) and seniors adopt technology and digital practices became salient.

**Table 3.3. Overview of Singapore's COVID-19 Digital Tools**

Controlling the spread of COVID-19	Crowd control and distribution of information/resources	Supporting the community
TraceTogether app and token	SpotON AI thermal camera	SGUnited Jobs Portal
SafeEntry system	VigilantGantry	Business Grants Portal
HealthCerts (Notarise, Verify, Digital Certificates)	COVID-19 ChatBots	Government Assisted Living Ecosystem (GALE) – Senior Support Care
	GoWhere	SupplyAlly laptops
	SupplyAlly	
	Spot safe distancing	

AI = artificial intelligence, COVID-19 = coronavirus disease.

Source: Singapore Government Developer Portal (2021).

## 4.2. Digitalisation: Crucial to handling the pandemic

As many governments quickly tried to adapt to managing the outbreak of COVID-19, Singapore mobilised its digital capabilities to respond to the pandemic. Technology was critical for policymakers to determine whether they could ease restrictions and allow the domestic economy to reopen. A slew of digital tools (Table 3.4) from contact tracing apps to information sharing platforms were developed by GovTech to enable life to move forward as much as possible, as contact tracing apps allowed the domestic economy to reopen.

With the speed at which COVID-19 could spread, there was a rapid move by the government towards a centralised approach in handling the pandemic. Although different hospitals and clinics were mobilised to treat COVID-19 patients, the government formed a multi-ministry COVID-19 taskforce to consolidate information and make necessary policy decisions at the national level.

**Table 3.4. Responding to COVID-19 Using Digital Tools**

Digital tool	Description
TraceTogether	Contact tracing mobile application developed by GovTech that uses Bluetooth technology to conduct proximity contact tracing
SafeEntry	National digital 'check-in' system installed at all public locations
GoWhere Suite (e.g. MaskGoWhere, TokenGoWhere)	List of websites that provides the public with the most updated information on government schemes such as COVID-19 support grants, mask collection, and other COVID-19 government programmes
Gov.sg WhatsApp channel (through Postman)	Tool used to send the latest updates about the pandemic to the public
FormSG (Vaccine.gov.sg)	Created to give the public the latest information about Singapore's mass inoculation exercise and allow residents to register their vaccination appointments
HealthCerts	Set of digital standards and schema for issuing digital COVID-19 test result certificates that is in line with international standards and the Singapore Government's requirements

COVID-19 = coronavirus disease.

Source: GovTech (2021b).

The use of digital tools empowered the government's data collection for contact tracing and quarantine management. This also helped to reduce oversight by using technology rather than labour to keep track of people's movements. Overall, this helped to save on labour and increase the speed at which the identification and isolation of COVID-19 infections could be done.

The SGTS allows new applications to be created within a shorter time frame compared with building an app from scratch. During the early stages of the pandemic, the MaskGoWhere website, which informed the public where masks were available, was set up within a day because the backend domain was already available (GovTech, 2020a). To minimise the labour-intensive process of contact tracing, GovTech developed the TraceTogether app within 2 months of the start of the pandemic. The app uses Bluetooth technology to detect if a person has come into contact with a confirmed COVID-19 case (GovTech, 2020c). TraceTogether was made mandatory for all Singapore residents from May 2020 when visiting public sites such as malls, places of worship, workplaces, and gyms (Low, 2021). According to the Ministry of Health, the app helped identify 25,000 close contacts, of which 160 cases tested positive for the infection, as of November 2020 (MOH, 2020). The TraceTogether app, alongside other contract tracing applications, reduced the time taken to identify close contacts from 4 days to less than 1.5 days, according to Singapore's SNDGO (Smart Nation Singapore, 2021).

### 4.3. Responding to the evolving crisis

With new variants emerging and the public health crisis evolving, Singapore's approach to dealing with COVID-19 has evolved as well. At the onset of the pandemic, the government was focused on containing the spread of the infection. The tools developed at this time, such as TraceTogether and SafeEntry, mainly aided contact tracing efforts. As the government moved towards treating COVID-19 as endemic from late 2021, the use of digital tools changed as well. For example, as vaccine-differentiated measures were introduced in late 2021, which allowed fully vaccinated individuals to dine out at restaurants and visit public sites, the TraceTogether app was updated to reflect residents' vaccination status. The updated version of the TraceTogether app by GovTech allowed for quicker entry into malls and restaurants, preventing long lines (Mohan, 2021). Furthermore, an animated otter was introduced to the app so that people could not present manipulated or altered static screenshot images, thus discouraging fraudulent use (Mohan, 2021).

## 4.4. Digitalisation accelerated, businesses transformed

While Singapore may have been advanced in its digital economy growth, the COVID-19 restrictions on face-to-face interactions hastened the adoption of digital technology. According to the Singapore Business Federation's National Business Survey, 2021/2022, 94% of companies recognise the importance of business transformation to maintain competitiveness, with the willingness to adopt technology remaining consistently high in recent years (SBF, 2021). Companies recognised how digitalisation and investment in new technologies would optimise operations and reduce operating costs but were wary about the high cost of new technology adoption and upskilling of staff. Some 43% of businesses surveyed said that assistance in digitalisation is the top area of government support required (SBF, 2021).

Online shopping and the use of online media also surged during the pandemic. According to the *e-Conomy SEA 2021* report (Google, Temasek, and Bain, 2021), Singapore saw half a million new digital consumers since the start of the pandemic (up to the first half of 2021). Furthermore, 38% of digital merchants believed that they would not have survived the pandemic if not for digital platforms.

In the interviews with private sector stakeholders, industry players shared that digitalisation is increasingly intertwined with business transformation and concerns a fundamental evolution of the business model and processes. In turn, a change in mindset to accompany this business transformation, along with education and upskilling, are all necessary.

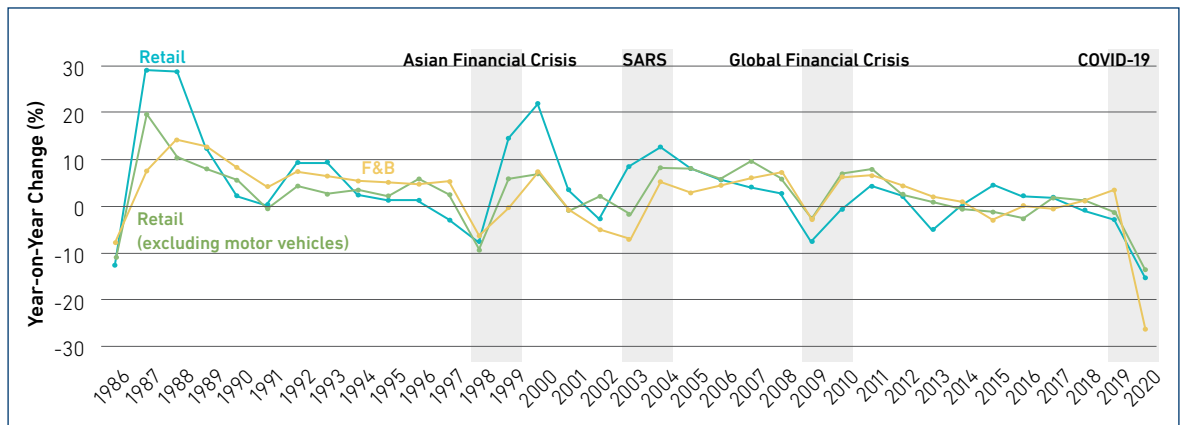
## 4.5. Digital inclusion a priority

The COVID-19 pandemic not only accelerated the pace of digital adoption but served to highlight inequalities in society. Lower-income households were more affected by adjustments to work from home, and e-learning disadvantaged these families (Tan, 2021). Although Singapore has robust internet infrastructure, the space, bandwidth, and digital equipment within households became constrained. Laptops had to be crowdsourced by charity organisations to support the shift to home-based learning (Goh, 2020). While Singapore acknowledges the importance of 'digital society' in its Smart Nation vision and has pursued a human-centric approach to digitalisation, the pandemic posed a challenge to digital inclusion efforts. According to the Boston Consulting Group, Singapore's lowest-income households experienced 50% more problems than the highest income group in accessing services online (Poh, 2021).

SMEs were also hard hit by the pandemic if they could not digitalise fast enough (Carandang and Canaveral, 2022). SMEs employ two-thirds of Singapore's workforce and contribute nearly half of Singapore's GDP (IMDA, 2022). A study by the Association of Small and Medium Enterprises and Microsoft revealed that SMEs were pushing for digital transformation strategies, yet only two in five perceived their efforts to be successful (ASME and Microsoft, 2020). Some 54% of SMEs surveyed blamed the pandemic for slowing digital transformation plans while 56% said it was too expensive to digitalise (Baharudin, 2020). This may be why in June 2020 the government launched the SG Digital Office to reach out to community groups and small businesses, with digital ambassadors recruited to conduct engagement programmes.

Many of the small businesses in Singapore are in the food and beverage industry. According to the Singapore Department of Statistics, the food and beverage sector saw its worst sales performance in 2020, declining 26% year on year (Figure 3.3) (Qua et al., 2021). The impact was greater during the 'circuit breaker' period or Singapore's most severe lockdown (Figure 3.4). This led to the government creating a working group to enable food hawkers to utilise food delivery platforms.

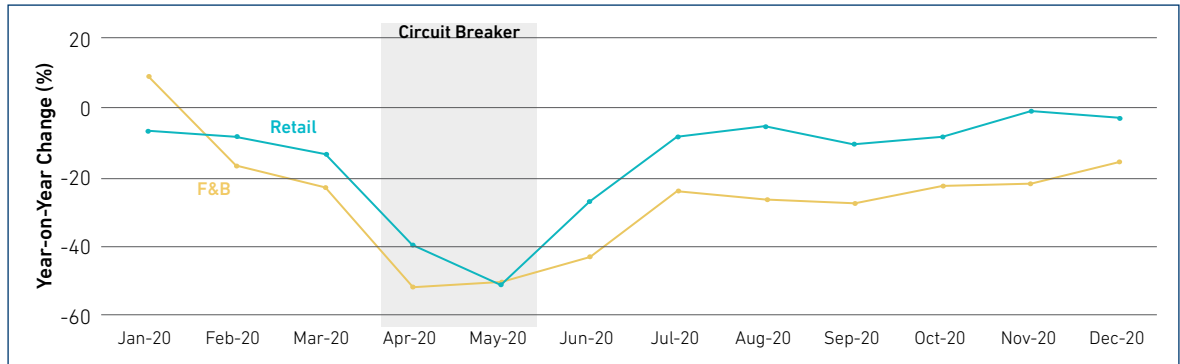
**Figure 3.3. Year-on-Year Change in Retail Sales and F&B Services Indices in Singapore (at current prices), 1986–2020**



COVID-19 = coronavirus disease, F&B = food and beverage, SARS = severe acute respiratory syndrome.

Source: Singapore Department of Statistics (Qua et al., 2021).

**Figure 3.4. Year-on-Year Change in Retail Sales and F&B Services Indices in Singapore (at current prices), Jan–Dec 2020**



F&B = food and beverage.

Source: Singapore Department of Statistics (Qua et al. 2021).

By February 2021, e-transactions for more than half of the hawker stalls in Singapore had grown by four times from the year before. Around 10,000 hawker stalls could now offer e-payments (CNA, 2021a). Stallholders were encouraged to go 'cashless', with monetary incentives of S\$1,500 if they could demonstrate the use of digital payments by 31 May 2021 (SG Digital Office, 2021).

Another group threatened by the digital divide is older persons, as Singapore comes to terms with an ageing population. According to the Asian Development Bank, 14.4% of Singapore's population in 2019 was aged 65 years or older. By 2030, this figure will likely rise to 25% because of rising life expectancy and lower fertility rates (ADB, 2020). Amid the pandemic in late 2020, a digital initiative targeting older persons was launched. The 'Seniors Go Digital' programme used digital ambassadors to help older persons learn basic digital skills, including using their smartphones to use WhatsApp, scan QR codes, make e-payments, and navigate important government platforms (IMDA, 2020). Studies also began to show how seniors feared technological advances and the need for social influencers to motivate them to use online event platforms (Perdana and Mokhtar, 2022). Table 3.5 provides a snapshot of the government's initiatives to encourage digital inclusion.

**Table 3.5. Singapore's Initiatives to Ensure Digital Inclusion**

Initiative	Description	Implementation effect	Launch period
SG Digital Office	To drive the government's push to accelerate digital adoption in the community by recruiting digital ambassadors, comprising both full-time staff and volunteers	<ul style="list-style-type: none"> <li>About 1,000 digital ambassadors were recruited to teach digital skills 4 months into programme launch (CNA, 2020)</li> <li>46 SG Digital community hubs launched where digital ambassadors are stationed (Yeoh, 2020)</li> </ul>	During COVID-19, May 2020

Initiative	Description	Implementation effect	Launch period
Seniors Go Digital (IMDA, n.d.)	A learning programme to help seniors through three tiers of digital skills: (i) communication skills, (ii) government services and lifestyle apps, and (iii) e-payments and digital banking	<ul style="list-style-type: none"> <li>More than 100,000 seniors received one-on-one training in basic digital skills such as making e-payments</li> </ul>	During COVID-19, May 2020
(IMDA, n.d.)	A learning programme to help seniors through three tiers of digital skills: (i) communication skills, (ii) government services and lifestyle apps, and (iii) e-payments and digital banking	Wholesale trade	Real estate
Hawkers Go Digital (SG Together Alliance for Action – Online Ordering for Hawkers) (NEA, 2021)	The SG Digital Office and the National Environment Agency formed a work group comprising delivery platforms, hawkers associations, community partners, and government agencies. It helps hawkers go online, develop a sustainable commercial model, and raise consumer awareness about delivery platforms.	<ul style="list-style-type: none"> <li>4,500 stallholders engaged</li> <li>33% said they already used online platforms</li> <li>14% signed up or expressed interest in using online platforms</li> </ul>	During COVID-19, June 2020
SMEs Go Digital	Sector-specific roadmaps* for digital adoption and training for employees at different stages of growth. A Business Grants Portal is also available to help offset up to 80% of the costs of adopting these digital solutions (IMDA, 2022).	<ul style="list-style-type: none"> <li>More than 78,000 SMEs adopted digital solutions from the programme</li> </ul>	Pre-COVID-19, April 2017
Digital Access Programme	To equip 'low-income households, students, and persons with disabilities, with digital tools'. Provides subsidised devices and broadband connectivity. IMDA facilitates community donations to this programme (IMDA, n.d.)	<ul style="list-style-type: none"> <li>More than 83,000 individuals have benefitted from the Home Access programme to access broadband and the NEU PC Plus Programme in which beneficiaries own a new computer at an affordable price.</li> </ul>	During COVID-19
Digital for Life Fund (CNA, 2021b)	A fund set up by IMDA to support projects initiated by the community until 2023 and serve as a channel for public contributions. The government matches contributions dollar for dollar. The target is for the fund to grow to S\$10 million over 3 years.	<ul style="list-style-type: none"> <li>The fund is expected to support 92 agencies which promote digital inclusion.</li> <li>Seed funding of S\$2.5 million donated through a charity event called the President's Challenge</li> <li>S\$4.8 million set aside to support 21 new ground-up community projects to support persons with disabilities, including learning mobile functions and using government digital services</li> </ul>	During COVID-19, Feb 2021

Initiative	Description	Implementation effect	Launch period
SG Women in Tech Movement	Partnership between IMDA and private sector technology players such as Dell Technologies, Salesforce, and ST Engineering. Aims to reduce the gender gap in the technology space by educating girls from a young age through networking and mentorship programmes (IMDA, 2021).  In 2021, a corporate pledge was launched where private sector players can pledge their support to create a conducive working environment for women.	<ul style="list-style-type: none"> <li>51 companies pledged their support for the SG Women in Tech Corporate Pledge initiative (IMDA, 2021)</li> </ul>	During COVID-19, Feb 2021

COVID-19 = coronavirus disease, CTO = chief technology officer, IMDA = Infocomm Media Development Authority, SMEs = small and medium-sized enterprises.

\* These Industry Digital Plans are available for environmental services; food services; logistics (including air transport); media; retail; security; wholesale trade; sea transport; accountancy; hotel; construction and facilities management; training and adult education; land transport; early childhood; food manufacturing; marine and offshore engineering; energy and chemical; and precision engineering.

Source: Author's compilation from government sources.

While COVID-19 highlighted the digital divide, the uptake for digital policies also increased during this period. The Singapore Government took on a social function to bridge the digital divide for lower-income households, small businesses, and older persons. More businesses were able to go online, more homes had access to digital services, and more consumers were able to become more comfortable with e-payments.

## 4.6. Constant communication and the importance of trust

The pandemic highlighted the need for the government to keep the public abreast of the latest developments in as timely a manner as possible for strategies to contain the virus to be effective. The Singapore Government relied heavily on digital technology in its communication to the public. According to the MCI, Singapore adopted a 'multi-platform, multi-language and multi-format approach' to ascertain that key information is disseminated to the public (Humphries, 2021). This was done through messaging on traditional media platforms and official websites, as well as through social



media sites such as Facebook, Instagram, and TikTok, and messaging apps such as WhatsApp and Telegram. Furthermore, when Singapore began its vaccination drive, content creators were engaged by the government to inform and educate the public on the importance of getting inoculated and address concerns about vaccine hesitancy (Humphries, 2021).

To prevent the spread of misinformation, the government relied on messaging apps to dispel falsehoods about the pandemic. The Singapore Government also relied on the Protection from Online Falsehoods and Manipulation Act or the 'fake news' law, which was introduced in 2019, to tackle misinformation. As of the end of 2021, the Protection from Online Falsehoods and Manipulation Act law was used 19 times to redress incorrect information about the pandemic in Singapore (Chee, 2021b). Under the law, publishers must issue a 'correction direction'. This means that if a post contains inaccurate information, publishers must include a notice identifying the information as false and include a link to a government webpage with the correct information.

Singapore's roll-out of e-government services has largely been a smooth process because of the high level of public trust in digital government services. Prior to COVID-19, Singapore already experienced citizen trust in digital government because policymakers (i) put institutional trust-building measures in place, (ii) took feedback from citizens, and (iii) had the commitment of top leadership in Singapore to e-government initiatives (Srivastava and Teo, 2005). A study released by Boston Consulting Group in mid-2021 ranked Singapore fourth amongst 36 countries surveyed for citizens' satisfaction with digital government services (Tan, Teo, and Meyer, 2021). The same study showed the risk of a growing digital divide, primarily amongst age groups and income groups. Yet, despite the pandemic, citizens' satisfaction with government digital services held at 85% while businesses' satisfaction was 76% (GovTech, 2021b). Furthermore, according to the Survey on Satisfaction with Government Digital Services conducted by the SNDGO and GovTech in 2020, 98% of the respondents agreed that digital technology played a 'key role in the fight against COVID-19' while 95% of business respondents 'agreed that the government responded in a timely manner by developing digital solutions to help businesses resume operations while mitigating the risks of COVID-19' (GovTech, 2021a).

## 4.7. The role of the private sector

Another key component of Singapore's digital government is the role of the private sector. Regular communication between industry players and the government enables the seamless roll-out of new digital initiatives. The government has also worked with tech companies that have the proprietary software, experience, and expertise in this sector to accelerate Singapore's digitalisation journey. For example, when Singapore developed its e-payments system, Singapore's de facto central bank – the Monetary Authority of Singapore – established a payments council made up of payment service providers and merchants.

Private sector stakeholders play a part in aligning with the government's strategic thinking and tech solutions. Although the Singapore Government has its own implementing body for digital policy through GovTech, it recognises that ideas and talents are spread throughout the private sector. Leveraging the private sector and its large base of customers across countries enables the government to utilise solutions that have been tried and tested. In this light, the Singapore Government is working with major tech companies in Singapore to assist SMEs in their digital transformation journey. An initiative known as Chief Technology Officer-as-a Service (CTOaaS) allows SMEs to get access to a pool of experts who can address their needs in very specific ways.

Public-private collaboration was also evident in the mitigation of the pandemic. This was observed in the supply chain constraints and the surge in demand for COVID-19 related medical equipment. For example, in September 2021, pharmacy retailers experienced a sudden shortage of Antigen Rapid Test (ART) kits. E-commerce giant Lazada, which has a significant presence in Southeast Asia, collaborated with Singapore's Ministry of Health to identify potential suppliers and open new avenues to access ART kits.

## 4.8. Challenges of security and privacy

Apart from the issue of digital inclusion addressed earlier, the main challenges of Singapore's digital government and digital economy more broadly are security and privacy. Concerns from civil society about data privacy and surveillance became evident during the COVID-19 pandemic. When the mobile app TraceTogether was introduced and implemented, its purpose was claimed to be solely for contact tracing. However, months after its implementation, a debate in Parliament revealed that 'contact tracing data from TraceTogether is not exempt from the Criminal Procedure Code for criminal investigations' (Chee, 2021a). This meant that the police would be able to use TraceTogether data for its investigations, which was a deviation from the app's original purpose. A public backlash led to the minister in charge of Singapore's Smart Nation drive to convey his regrets and announce that he would take full responsibility for the anxiety caused by the government's error in not stating that the TraceTogether data were not exempt from the Criminal Procedure Code for criminal investigations (Chee, 2021c). A new bill restricting the use of these data was then passed by Parliament in February 2021 to assuage public concerns. Additional assurances of safeguards were announced, including deleting TraceTogether data for COVID-19 contact tracing from government servers when the pandemic is over.

## 4.9. Advancing digital infrastructure: Moving to the cloud

Singapore's decision in late 2018 to migrate most of its IT systems to the commercial cloud has allowed the country to cope better with the surge in demand for digital services during the COVID-19 pandemic. According to GovTech, 'Leveraging the cloud capabilities and services of commercial cloud systems also helps the government to develop applications and services for citizens in a faster and more scalable way' (GovTech, 2020a). Singapore expects to have at least 70% of eligible government systems on commercial cloud services by 2023 (GovTech, 2021c). While the chief concerns have been data security and sovereignty, the Singapore Government chooses ICT systems that are less sensitive to shift to the commercial cloud. It also emphasises partnerships with the private sector, with the government making use of Amazon Web Services, Microsoft Azure, and Google Cloud Platform (Wong, 2020).

Nearly 40% of agency systems were migrated to the Government Commercial Cloud as of March 2021. The move has helped to facilitate remote work for government employees and reduced the overhead costs of servers, hardware, and IT maintenance. Agencies on board the Government Commercial Cloud have reported up to 50% in annual cost savings, as well as significant improvements in service reliability and scalability. For countries that want to accelerate digital government services, the cloud provides access to a global ecosystem of services and talent. This was timely in response to the pandemic as the GovTech team, for example, built contact tracing applications such as TraceTogether in a matter of weeks instead of the much longer time frame it would usually take.

## 5. Policy Suggestions

The focus of this chapter has been on how the pandemic has affected the progress of Singapore's digital government. The preceding sections have examined Singapore's policy approach and the accelerated adoption of digital services due to the COVID-19 pandemic. It is noteworthy to highlight that Singapore has a particular set of circumstances that contribute to the country's relative success in adopting digital government services. Singapore has had the same ruling party helming the country since independence, which enables the country to develop long-term plans and chart the country's economic trajectory. While Singapore has many advantages, including existing digital infrastructure developed over decades, some policy recommendations can still serve as a model to other countries in the ASEAN region and beyond.

## 5.1. Whole-of-government approach

Singapore's ability to use digital tools to counter the effects of COVID-19 is partly due to the whole-of-government approach it has taken towards digitalisation. Every government agency is equipped with the necessary digital infrastructure and all public servants have basic digital literacy. A crucial aspect of the whole-of-government approach is inter-agency coordination. Government agencies in Singapore work closely with each other to support Singapore's digital transformation. The SNDGO worked with all ministries separately to produce an extensive digitalisation plan in 2018 (Ng, 2019). From 2020, digital plans were included in ministries' strategic plans for the year, which allowed for budgeting and resourcing issues to be considered when incorporating digital technology into the agencies' initiatives (Ng, 2019). Instead of relying on just the SNDGO and GovTech to deliver digital solutions, each agency is equipped with public servants trained in digital skills.

## 5.2. Build digital competencies

The upskilling of public service has played an important role in Singapore's whole-of-government approach to centralise technological solutions to deal with the pandemic. Launched in the second quarter of 2021, the Digital Academy by GovTech offers 95 training programmes and aims to train more than 6,000 public service officers within the first year (Tang, 2021). This training is part of Singapore's Smart Nation vision to refresh tech skills as often as every 18 months. The curriculum of the Digital Academy is augmented with content from private sector partners including Amazon Web Services, Coursera, Google, Microsoft, Qlik, Secure Code Warrior, SingTel TrustWave, Tableau, and Thoughtworks (The Digital Academy and NUS, 2021). The constant updating of skills is meant to keep up with the rapid pace of digitalisation.

For countries that are not as advanced technologically, this is also an opportunity for capacity building by outside parties or through international agreements. Given the digital needs in the ASEAN region, countries can play a role to aid in transferring digital capabilities. This is also important as the demand for digital talent is particularly significant. Many large tech firms are working with institutes of higher learning to develop skills relevant to the digital age, and this can be increased.

## 5.3. Balancing regulation and innovation

The balance between regulation and innovation is a challenge facing many countries as they grow their digital economies. There is a growing need to control services and data while providing enough freedom and flexibility for countries to explore digitalisation. One of the ways is to have more clarity in system classifications such that tech companies will not be paralysed by the ambiguity in policy and err on the side of caution. Private sector players have shared that the risk-averse nature of government centres around the need for control. This includes access to physical hardware and clearance for security personnel. However, with managed services such as the cloud becoming more intangible, the realities of developing digital government will inevitably re-examine the tension between government control and partnership with the private sector.

Furthermore, with the Singapore Government taking a leading role in the country's digitalisation journey, there is a risk of government agencies encroaching and limiting innovation from the private sector. Interviews with private sector stakeholders highlight the difficulty of competing with GovTech and large multinational corporations to attract top tech talent. Roles such as cybersecurity experts, data scientists, and engineers as well as developers are highly sought after, driving up the average salaries for such roles (Heng, 2021).

## 5.4. Healthy partnerships with the private sector

An exchange of ideas is crucial for innovation and helps facilitate the rapid pace of digital transformation. The Singapore Government organises industry briefings and events such as a developer conferences, enabling the government to keep up with the latest industry trends. The government sees its role as one that builds the basic digital infrastructure (both hardware and software), providing a national framework and authoritative source of data and Application Programming Interfaces (APIs) that businesses can build on.

As mentioned previously, the Singapore Government's decision to move its systems to the commercial cloud has opened more opportunities for the private sector. Not only have companies secured contracts to support the movement to the cloud but the move itself also allows businesses to make use of government software. For example, during the COVID-19 pandemic, GovTech open-sourced its algorithm for thermal scanners, which allowed local SMEs to develop and manufacture their own equipment for sale to be used in malls. Authentication platforms making use of government software also allow forms to be auto-filled quickly yet securely. These partnerships help improve efficiencies as companies do not have to develop software from scratch each time.

In the area of cybersecurity, policymakers have shared that it is an area that the government should not handle entirely on its own. The hope is to leverage the best of industry and community expertise with the involvement of the private sector. The government has forged partnerships with the white hat community (ethical hackers) and run a bug bounty programme to find weaknesses in online systems. A vulnerability disclosure programme also opens the opportunity for anyone to report a bug or error in the government system. This reduces the risk of a cyber breach, with all parties constantly on the lookout for gaps and vulnerabilities in the system. When a data breach incident occurs, a review committee usually involves both public and private sector experts.

## 5.5. Government initiatives to mitigate the digital gap

Singapore's digital policy direction emphasises a human-centric approach. Policymakers have shared that when formulating or implementing digital policies, a key consideration is around the fundamental objectives, i.e. whether these policies aim to improve the lives of citizens, create jobs and economic opportunities, or improve social cohesion and mobility. This chapter has highlighted SMEs, lower-income households, and older persons in particular, as key risk groups facing the threat of getting left behind amid rapid digital transformation efforts. For other countries, gender or suburban living might be other groups of importance that are negatively affected as a result of the digital divide. A keen awareness of how certain groups of society may not be able to keep up with digitalisation will need to be embedded in government policy and support. In the case of Singapore, recognising and identifying these vulnerable groups was accompanied by a swathe of support, including financial and educational support.

Singapore's IMDA has been advocating digitalisation initiatives such as the 'SMEs Go Digital' and 'Seniors Go Digital' programmes. Over time, one can see how these initiatives to support digital inclusion evolve and expand. For example, the SMEs Go Digital programme launched in April 2017 has seen additional layers added. This includes the CTO-as-a-Service scheme, which allows SMEs to tap into a pool of chief technology officers for critical but potentially costly consultations.

While Singapore may have more wherewithal to support digital inclusion initiatives, other countries that adopt digitalisation may also encounter rapid economic growth and risk widening the digital divide. Constant education, training, and grant support will be needed for the proper development of digital policies.

## 6. Summary

This chapter set out to examine how Singapore's investments in digital government and online services have helped to mitigate the effects of the COVID-19 pandemic, including the health and socio-economic fallout. Singapore's Smart Nation vision has facilitated framing the necessary policy direction to deliver a pervasive digital transformation that shapes how the government operates at its core and has significant effects on citizens' lives. A human-centric approach, which takes into consideration the impact of technology on society as a whole, was especially needed during the COVID-19 pandemic. Singapore was well poised to leverage technological capabilities and infrastructure to lessen the effects of the pandemic. Investing in the country's digital infrastructure enabled Singapore to implement systems, applications, and software quickly to tackle the pandemic and remain resilient.

As countries look to advance digital government, Singapore provides leadership and a sound model for digital policies. The policy suggestions reveal the usefulness of having a whole-of-government approach and the need to build digital competencies within the government. Countries advancing their digital economies will constantly have to balance regulation and innovation, which also involves having strong and fruitful partnerships with the private sector. At the same time, the digital gap will be a pertinent challenge with the growth of the digital economy and digital government, and policymakers will need to mitigate this threatening divide proactively.

Singapore's role in advancing digitalisation will also spill over to international relationships. The country's efforts to forge Digital Economy Agreements make use of its best practices to help set benchmarks for trade. Singapore is also taking the lead in harmonising digital standards and sharing best practices with other small states under the 'FOSS for Good' initiative announced at the 76th United Nations General Assembly meeting in September 2021. Together with ASEAN digital initiatives, this encourages interoperability across the region to champion integration and support the overall growth of the digital economy.

Through this research, we have drawn out both existing and pandemic-induced digital initiatives and observed the importance of government collaboration with the private sector. However, there were also limitations to the study with the use of qualitative interviews, as some views could be seen as anecdotal. This research could be augmented with a quantitative measurement of cost savings gained through the execution of digital government.

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# Appendix

## Questionnaire for interview with stakeholders (generic)

1. How has the pandemic accelerated the roll-out of e-government digital services?
2. Who are the main players in creating and executing e-government digital services?
3. How has the government's investment in digital infrastructure helped manage the pandemic?
4. What are the government programmes, including funding opportunities, that support digitalisation of small and medium enterprises?
5. What is the rate of digital adoption of SMEs in Singapore? (business usage of internet, e-payment, cloud computing services)
6. What is the impact of the government's digital initiatives on businesses?
7. How satisfied are citizens with government digital services?
8. How has the government bridged the "digital gap" to ensure inclusion?
9. What is the role of the private sector when formulating digital policies?
10. How does the private sector complement Singapore's push to digitalise?

## Participating organisations

1. Amazon Web Services (AWS)
2. Infocomm Media Development Authority (IMDA)
3. Lazada
4. LinkedIn
5. Ministry of Communications and Information (MCI)
6. Microsoft
7. Smart Nation and Digital Government Office (SNDGO)