Empowering Online Public Service in Asia: The Digital Frontier

Edited by

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Foreword

The global economic landscape is undergoing rapid evolution, demanding swift adaptation from ASEAN to remain relevant and effective amidst challenging developments and trends. Emphasising the urgency to address digital poverty and inequality, there is a compelling need for an accelerated digital transformation, incorporating the adoption of new technologies and the new mindset of development. The COVID-19 pandemic has notably accelerated the shift towards increased utilisation of online facilities, spanning e-commerce, e-healthcare, remote education, and access to public services facilitated by digital government.

The impact of digital government extends far beyond, significantly influencing the pace and nature of digital transformation. The digitisation of public services not only saves costs but also enhances government operations' efficiency, promoting transparency and improving the convenience and quality of services for citizens and businesses. This transformative process can contribute to more inclusive and democratic governance, a crucial aspect for the Asian region grappling with socio-economic disparities and democratic challenges. Furthermore, by enhancing the efficiency of public administration and services, digital government can heighten a nation's appeal to foreign investors and stimulate economic growth.

In ASEAN and East Asia, the digital transformation of governments must be integral to national digitalisation strategies. This entails more than mere digital adoption in the public sector; it aims to foster a digital-driven, people-centered public service system in the long run. To maximise the positive impacts and mitigate potential risks of digital government, meticulous planning is essential, grounded in a profound understanding of the diverse challenges and opportunities specific to the Asian context. The current volume, edited by Dr Lurong Chen, ERIA Senior Economist, and Prof. Fukunari Kimura, ERIA Chief Economist, presents the principal findings from ERIA's recent study on Asian digital transformation. Offering insights into Asian countries' endeavours to unlock the potential of digital government, it sheds light on policy instruments aimed at enhancing the coverage and quality of region-wide online public services.

Tetsuya Watanabe

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The President of ERIA

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Digital government serves not only as a pivotal element in the realm of digital transformation but also as a decisive factor influencing its trajectory. Within the context of ASEAN, digital government should be regarded as an essential facet of digital connectivity. From an economic perspective, the implementation of digital government fosters a development-friendly environment conducive to digital innovation and entrepreneurship. Furthermore, it facilitates the delivery of government services with increased efficiency, transparency, and accessibility, particularly to those residing in remote or underserved areas. This, in turn, promotes inclusive development within the rapidly growing yet diverse digital landscape of the ASEAN region. Additionally, the digitisation of public services can enhance policy coordination amongst member states and streamline the harmoniation of regulations and standards across the region.

Research on digital government plays a crucial role in providing policymakers with a comprehensive understanding of the implications of technological changes. It sheds light on how to effectively integrate new technologies into government functions tailored to address specific needs and challenges.

This book presents the outcomes of the Phase One study of the ERIA research project on digital government. It stands as a collaborative achievement, and we extend our sincere gratitude to all contributors for their unwavering enthusiasm and engagement in the project. Special thanks are owed to Tetsuya Watanabe, President of ERIA; Koji Hachiyama, Chief Operating Officer of ERIA; and Shujiro Urata, Senior Research Advisor to the President of ERIA, for their invaluable advice and generous support throughout the research project and the compilation of this book.

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Lurong Chen and Fukunari Kimura

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List of Abbreviations and Acronyms

ACE	ASEAN Centre for Energy
AEO	ASEAN Energy Outlook
AHEAD	Advanced Hydrogen Energy Chain Association for Technology Development
AMS	ASEAN Member States
APAEC	ASEAN Plan of Action for Energy Cooperation
APS	Announced Pledges Scenario
ASEAN	Association of Southeast Asian Nation
ATR	Autothermal Reforming
ATS	AMS Targets Scenario
BAU	Business-As-Usual
BECCS	Bioenergy with Carbon Capture and Storage
BEV	Battery Electric Vehicle
BF-BOF	Blast Furnace–Basic Oxygen Furnace
CAGR	Cumulative Annual Growth Rate
CCS	Carbon Capture and Storage
CCUS	Carbon Capture Utilisation and Storage
CN	Carbon Neutral
CO2	Carbon Dioxide
COP	Conference of the Parties
COVID	Novel Coronavirus Disease
DAC	Direct Air Capture
DACCS	Direct Air Capture with Carbon Capture and Storage

DNV	Det Norske Veritas
DRI	Direct Reduced Iron
DRI-EAF	Direct Reduced Iron-Electric Arc Furnace
EE	Energy Efficiency
EJ	Exajoule
ERIA	Economic Research Institute for ASEAN and East Asia
EUR	Euro
EV	Electric Vehicle
FCEV	Fuel Cell Electric Vehicle
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GW	Gigawatt
HBI	Hot Briquetted Iron
HDF	Hydrogene De France
IEA	International Energy Agency
IEEJ	Institute of Energy Economics Japan
IESR	Institute for Essential Services Reform
IISIA	Indonesian Iron and Steel Industry Association
INDC	Intended Nationally Determined Contribution
IRENA	International Renewable Energy Agency
ISOM	Isomerisation
JETP	Just Energy Transition Partnership
KBPD	Thousand Barrels per Day
KTPA	Kilo Tons per Annum

Lao PDR	Lao People's Democratic Republic
LCOE	Levelized Cost of Electricity
LED	Light Emitting Diode
LNG	Liquefied Natural Gas
LS	Likely Scenario
MEA	Mono-ethanolamine
MEMR	Ministry of Energy and Mineral Resources
METI	Ministry of Economy, Trade and Industry
MOU	Memorandum of Understanding
MT	Million Tons
MTBE	Methyl Tertiary Butyl Ether
MTPA	Million Tons per Annum
MW	Megawatt
NDC	Nationally Determined Contribution
NZE	Net-Zero Emissions
OGJ	Oil and Gas Journal
PEM	Proton Exchange Membrane
PLN	PT Perusahaan Listrik Negara
PNOC	Philippine National Oil Company
PT	Perseroan Terbatas
PTT	Petroleum Authority of Thailand
PV	Photovoltaic
RE	Renewable Energy

SDG	Sustainable Development Goals
SDS	Sustainable Development Scenario
SEA	Southeast Asia
SEAISI	Southeast Asia Iron & Steel Institute
SMR	Steam Methane Reforming
STEPS	Stated Policies Scenario
TPA	Tons per Annum
TWh	Terawatt Hour
US	United States
USD	United States Dollar
USGS	United States Geological Survey
VRE	Variable Renewable Energy
WEO	World Energy Outlook

Introduction

Digital Government in ASEAN Digital Transformation

Lurong Chen
Fukunari Kimura

1. Background

The use of digital technologies and digital-enabled solutions in socio-economic activities is driving the world to be better connected than ever before, especially when data are penetrating all aspects of people's lives. As digital tools and new services have emerged in an endless stream – leading to profound changes in the way we work, live, and experience leisure and entertainment – digital government is beginning to increase the efficiency of online public services and administration. More importantly, it is accelerating the adoption of information and communication technologies (ICTs) in providing public services to its citizens and businesses and thus facilitating their interaction with stakeholders and involvement in decision-making. Digital government should be seen as not only a compulsory component of digital transformation, but also one of the factors that can determine its direction and the pace of progress. It consists of multilayer interactions and transactions, including government-to-people (G2P), government-to-business (G2B), and government-to-government (G2G) initiatives.

Digitalisation in the domain of the public sector tends to transform citizens' conceptions of civil and political interactions with their governments. Providing effective access to large collections of public information for citizens and officials, and making them usable by a large community of users, can generate significant economic and social benefits despite the associated technical and regulatory challenges. As Singapore's Digital Government Blueprint states 'A Digital Government will be able to build stakeholder-centric services that cater to citizens' and businesses' needs' (Government Technology Agency, n.d.-a). It will upskill government workers and improve the efficiency of their work by accelerating digital adoption in public services.

The coronavirus disease (COVID-19) pandemic has accelerated the digitisation of government services and brought digital inclusion to the fore as digital services become increasingly important for full engagement with society (ASEAN, 2021b). During the COVID-19 pandemic, COVID-19 mobile apps permitted people to continue their activities outside the home by allowing the government to perform digital contact tracing. Amidst government restrictions on social distancing, e-commerce, e-payment, e-learning, and teleconferences provided alternatives to direct face-to-face contact and empowered people to maintain economic and social operations. The success story of such apps in bringing COVID-19 under control shows how digital adoption in public administration can formalise the state–citizen partnership and facilitate people's participation in social and economic activities in the digital age.

In the strict sense, the concept of digital government has wider connotations and higher requirements on data, from both the public and private sides, than e-government's focus on increasing transparency and establishing ICT-enabled procedures in public services.[1] Digital government emphasises open and user-driven approaches and operational transformation, which extends beyond e-government's efforts at increasing transparency and establishing ICT-enabled procedures in public services. The advancement of digital government and that of a digital economy can mutually enhance each other.

[1] e-Government refers to access to large collections of public information for individuals, firms, and government officials; and making them usable by a large community of users.

While the former can drive enablers to shape a digital society, the latter can build industry capability and generate new market drivers to support the digitalisation of government service delivery (Smart Nation and Digital Government Office, 2018: 10).

In the context of this book, the two concepts are used interchangeably. Both refer to digitalisation that aims to optimise public services according to socio-economic needs by enabling/facilitating access to large amounts of well-managed data.

2. ASEAN's Progress in Developing Digital Government

In the Association of Southeast Asian Nations (ASEAN), digital government has been a new frontier for regional cooperation. On the one hand, e-participation helps increase awareness of policies and regulations and facilitate their implementation and enforcement. On the other hand, prompt feedback from the wider public helps policymakers take decisions and action more quickly in response to public needs. The consequent improvement in public services could increase the efficiency of regional supply chains and make the region more competitive in the global market.

ASEAN Member States (AMS) have included digital government in their national digitalisation strategies, motivated by policy imperative to accelerate digital adoption in the public sector as well as strategic ambitions to create digital-enabled, user-driven public online services for supporting the digital economy. The ASEAN Digital Masterplan 2025 points out that 'Digitalisation can significantly improve government services and make government departments more productive. ASEAN should therefore create best practice guidance on the digital transformation of internal government functions and data handling…' (ASEAN, 2021b: 86).

Actions have been taken on digital transformation at both the national and regional levels. The regional policy response can be traced back to 2000 when ASEAN leaders initiated the e-ASEAN project and signed the e-ASEAN Framework Agreement, aiming to promote a productive ASEAN 'e-space' by (i) enhancing the ICT sector's competitiveness, (ii) reducing the digital divide within and amongst AMS, (iii) promoting partnership between the public and private sectors, and (iv) undertaking trade and investment liberalisation in ICT goods and services (ASEAN, 2000: 3). e-Government and e-society are amongst the six main areas[2] covered by the agreement. The importance of the E-ASEAN Framework Agreement was underscored by ASEAN Telecommunications Ministers during the First ASEAN Telecommunications and IT Ministers Meeting (TELMIN) held in 2001.[3]

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[2] The framework covers (i) ASEAN information infrastructure, (ii) e-commerce, (iii) trade and investment liberalisation in ICT goods and services, (iv) trade facilitation in ICT products, (v) e-society, and (vi) e-government.

[3] The Ministers acknowledged that e-ASEAN can effectively promote economic growth, social development, and better governance; enhance access to information and news; enlarge employment opportunities; increase economic output; provide more efficient access to a range of governmental services; make distance education and training more effective; and improve the delivery of health services, including the application of telemedicine, amongst others (ASEAN, 2021c).

TELMIN was established as the main body for advancing ASEAN cooperation in the telecommunications and IT sectors in the region. Since 2001, ASEAN Ministers have held annual meetings to discuss the ICT development strategy in the region. In 2011, the 10th TELMIN adopted The ASEAN ICT Masterplan 2015 (AIM2015) to chart the development of ICT in the region. Under AIM2015, an ASEAN e-government strategic action plan was developed in 2011. The content on digital government was included in the strategic thrust of people engagement and empowerment, in which e-government, e-education, and e-health were identified as the key e-services for development.

The follow-up to AIM2015, the ASEAN ICT Masterplan 2020 (AIM2020), highlighted ASEAN's desire to apply new technologies to enhance the quality of life of its citizens. It re-emphasised the importance of e-services that will (i) make the internal operations of government departments more efficient, (ii) facilitate use by consumers and businesses, and (iii) increase services interoperability to support regional economic and social cohesion. Accordingly, AIM2020 launched a project to develop 'a framework of expected minimum levels of e-services delivery…including best practices and recommendations guidelines for (a) Improvement of quality of service for common e-government applications, and (b) Cross-leveraging existing successes within AMS…' (ASEAN, 2015: 25).

The Master Plan on ASEAN Connectivity 2025, which was concluded in 2016 at the 28th ASEAN Summit, also highlighted the significance of government-level open data in the region and urged ASEAN leaders to make government and private sector data public, for 'its potential to empower peoples, change how government works, and improve the delivery of public services' (ASEAN, 2016: 50). During the 19th TELMIN in 2019, ASEAN Ministers agreed to consider the development of sustainable e-service delivery platforms and e-government applications as the means to support the building of smart connectivity for ASEAN digital transformation.

TELMIN was subsequently renamed the ASEAN Digital Ministers' Meeting, and the ASEAN Digital Masterplan 2025 was adopted at its first meeting in 2021. The master plan set out the vision of ASEAN as 'a leading digital community and economic bloc, powered by secure and transformative digital services, technologies and ecosystem' (ASEAN, 2021b), which required the improvement of e-government services. It also aimed to increase the quality and use of online public services through better e-government services and open data for end users.

In general, promoting digital government and online public services is becoming an integral part of ASEAN's development strategy. Related issues have been covered in a wide variety of regional initiatives or strategic plans, such as the ASEAN Declaration on Industrial Transformation to Industry 4.0, the ASEAN Framework for Next Generation Universal Service Obligation, and the ASEAN Comprehensive Recovery Framework and Its Implementation Plan.[4]

By 2021, ASEAN had established well-structured Digital Sectoral Meetings as a functional institution to facilitate collaboration amongst AMS and support the regional development of digital government (Figure 1).

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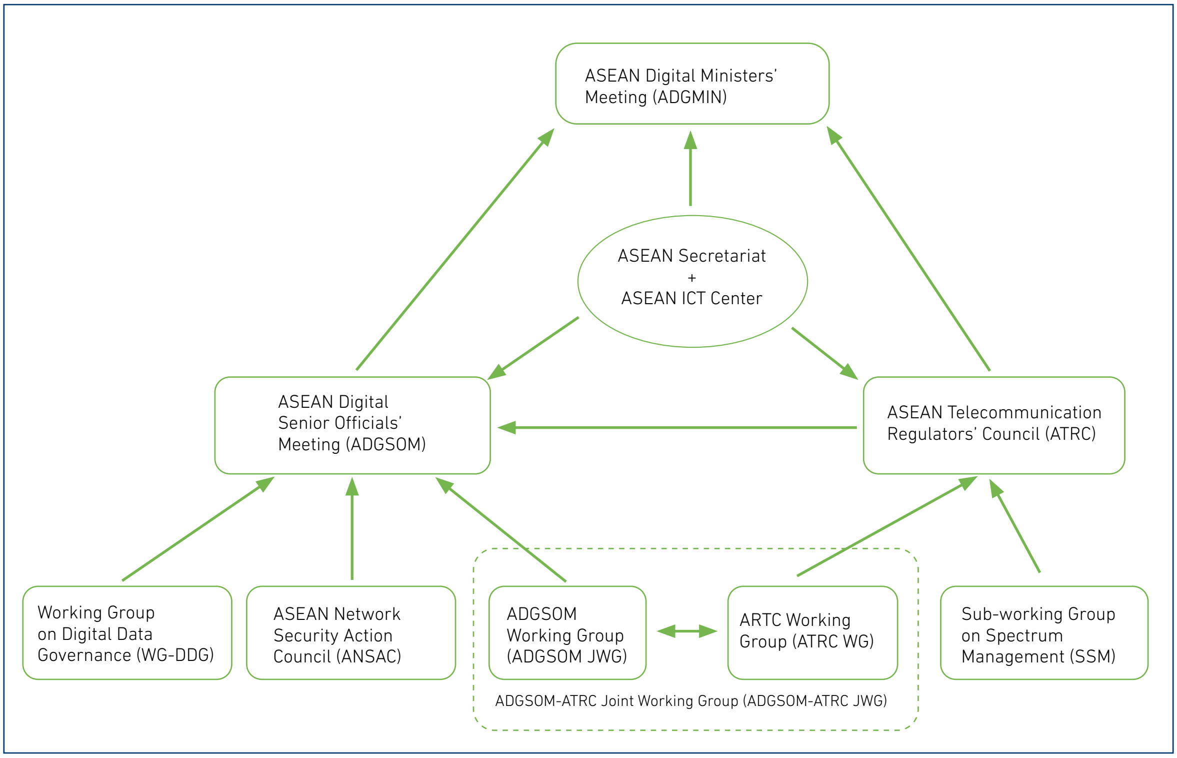
[4] For instance, the ASEAN Declaration on Industrial Transformation to Industry 4.0 set out e-government; start-ups; micro, small, and medium-sized enterprises (MSMEs); smart cities; and vocational education, as the five policy focuses for exploring the possibility of establishing new mechanisms and open platforms to support regional transformation to Industry 4.0. Aiming to boost ICT development, the ASEAN Framework for Next Generation Universal Service Obligation called for regional collaboration to introduce e-government services. Promoting e-government and e-services is also one of the key priorities of the ASEAN Comprehensive Recovery Framework.

Figure 1. ASEAN Digital Sectoral Meetings Structure



ASEAN = Association of Southeast Asian Nations, ICT = information and communication technology.

Source: Authors. Based on information retrieved from https://asean.org/our-communities/economic-community/asean-digital-sector/major-sectoral-bodies-committees/

Individual AMS have also made substantial efforts towards promoting digital government in the past 3 decades. Table 1 summarises some ASEAN national ICT strategies that cover the promotion of digital government.

Table 1. National ICT Institution

Country	Ministry/Regulatory authority	Key plan/regulations
Brunei	• Ministry of Communications • Authority for Info-communications Technology Industry • Brunei Darussalam National IT Council	• National Broadband Blueprint (2014) • National ICT Manpower Masterplan (2016) • Digital Economy Masterplan 2025 (2019) • Wawasan Brunei 2035 (2023)

Country	Ministry/Regulatory authority	Key plan/regulations
Cambodia	• Ministry of Posts and Telecommunications • Telecommunication Regulator of Cambodia	• Law on Telecommunications (2015) • E-commerce Law and Consumer Protection Law (2019) • ICT Development Policy (2020)
Indonesia	• Ministry of Communication and Information Technology • Indonesian Telecommunication Regulatory Authority	• Indonesia Broadband Plan (2014) • Long-Term National Development Plan, 2005–2025 (2015) • Presidential Regulation No. 95/2018 on SPBE (PR95/2018)
Lao PDR	• Ministry of Posts and Telecommunications • Lao Telecommunication Regulatory Authority	• Telecommunication Law (2011) • E-Transaction Law (2012) • e-Government Development Plan 2013-2020 (2013) • Decree on Online Information Management (2014) • Second 5-Year Development Plan of Posts and Telecommunications Sector, 2016–2020 (2016) • National ICT Policy 2015-2025 (2016) • National Broadband Plan 2021-2025 (2021) • ICT Vision 2030 (2022)
Malaysia	• Ministry of Communications and Multimedia • Malaysia Digital Economy Corporation	• National Broadband Implementation Strategy (National Broadband Initiative) (2010) • Malaysian Public Sector ICT Strategic Plan, 2016–2020 (2016) • National Fiberisation and Connectivity Plan, 2019¬–2023 (2019) • Malaysia Digital Economy Blueprint (2021) • Public Sector Digitalization Strategic Plan 2021-2025 (2021)
Myanmar	• Ministry of Transport and Communications • Myanmar Communications Regulatory Commission	• Telecommunications Law (2013) • Telecommunications Master Plan (2015) • Universal Service Strategy for Myanmar, 2018–2022 (2018) • Myanmar e-Governance Master Plan, 2021–2025 (2021) • Myanmar Economic Resilience and Reform Plan (2020)
Philippines	• Department of Information and Communications Technology • National Telecommunications Commission	• RA 10894: Department of Information and Communications Technology Act of 2015 • RA 10929: Free Internet Access in Public Places Act • The Philippine Digital Strategy – Transformation 2.0 (2011–2016) • National Broadband Plan (2017) • E-Government Masterplan 2.0 (2022)

Country	Ministry/Regulatory authority	Key plan/regulations
Singapore	• Infocomm Media Development Authority • Smart Nation and Digital Government Office • Government Technology Agency (GovTech)	• Telecommunications Act, 2000 • Smart Nation (2014) • Infocomm Media 2025 (2015) • Digital Government Blueprint (2018, 2020)
Thailand	• Ministry of Digital Economy and Society • National Broadcasting and Telecommunications Commission	• National Broadband Policy (2010) • National Digital Economy Policy and Plan, 2016–2020 (2016) • Thailand Digital Government Development Plan 2017–2021 (2017) • Digital Government Development Plan, 2020–2022 (2020) • Thailand Digital Economy and Society Devel-opment Plan (2016) • The Digital Master Plan 2022-2027 (2022)
Viet Nam	• Ministry of Information and Communication • Authority of Telecommunications	• National Telecommunications Development Plan (2009) • Master Plan of Broadband Infrastructure Development to 2020 (2017) • *Vietnam's digital infrastructure* plan for 2021-2030 (2024)

ICT = information and communication technology, IT = information technology, SPBE = The Design of Indonesia e-Government.

Source: Authors.

In many Asian countries, the ICT development plan is under the responsibility of the ministry in charge of telecommunications development.[5] The issues covered, and the details under discussion, vary depending on the country's circumstances and priorities. But in general, they all highlight the importance of digital infrastructure building and regulatory reform, and the related contents are compulsory parts of the nation's long-term development strategy. Accordingly, the special authorisation unit in charge of regulating ICT development is normally established under the ministry to facilitate direct partnerships amongst countries and increase the efficiency of cooperation in various areas related to the improvement of cross-border digital connectivity, from physical and institutional connection to people-to-people connections.

[5] Normally, it is titled "the Ministry of Post and Communication". But the names of the ministries vary across countries.

Using the United Nations E-Government Development Index (EGDI), Table 2 presents a comparative view of AMS' progress in using digital tools to improve online public services. Horizontally, wide gaps persist across AMS. The 10 AMS can be categorised into three groups – Group 1 has only one country, Singapore, which is in the world's top 10 in terms of e-government development; Group 2 consists of Brunei, Malaysia, the Philippines, Thailand, and Viet Nam, countries with global rankings between 11 and 100; and Group 3 is composed of the remaining four, whose rankings are below 100.

Table 2. ASEAN E-Government Index

Country	2010	2014	2018	2020	2022
Brunei Darussalam	0.48 (68)	0.5 (86)	0.69 (59)	0.74 (60)	0.73 (68)
Cambodia	0.29 (140)	0.3 (139)	0.38 (145)	0.51 (124)	0.51 (127)
Indonesia	0.4 (109)	0.45 (106)	0.53 (107)	0.66 (88)	0.72 (77)
Lao PDR	0.26 (151)	0.27 (152)	0.31 (162)	0.33 (167)	0.38 (159)
Malaysia	0.61 (32)	0.61 (52)	0.72 (48)	0.79 (47)	0.77 (53)
Myanmar	0.28 (141)	0.19 (175)	0.33 (157)	0.43 (146)	0.50 (134)
Philippines	0.46 (78)	0.48 (95)	0.65 (75)	0.69 (77)	0.65 (89)
Singapore	0.75 (11)	0.91 (3)	0.88 (7)	0.92 (11)	0.91 (12)
Thailand	0.47 (76)	0.46 (102)	0.65 (73)	0.76 (57)	0.77 (55)
Viet Nam	0.45 (90)	0.47 (99)	0.59 (88)	0.67 (86)	0.68 (86)
Republic of Korea	0.88 (1)	0.95 (1)			
Denmark			0.92 (1)	0.98 (1)	0.97 (1)

ASEAN = Association of Southeast Asian Nations, EGDI = E-Government Development Index.

Notes:

1. The value of the EGDI score is the simple average of three component indices: (i) Online Service Index, (ii) Human Capital Index, and (iii) Telecommunication Infrastructure Index. The value of each component index ranges between 0 and 1. The country with the best performance will get the highest normalised value of the index '1', and the scores of the other countries will be relative to this benchmark value.
2. The figure in the cell represents the country's EGDI score for the year.
3. The figure in parentheses represents the country's global ranking for the year.

Source: Author. Raw data retrieved from United Nations (n.d.), UN E-Government Knowledgebase. Country Data. https://publicadministration.un.org/egovkb/en-us/Data (accessed 15 December 2023).

Over time, AMS have made substantial progress in embracing digital solutions for government services. During 2010–2022, the EGDI scores of all AMS increased. In most cases, especially Indonesia and Thailand, their global ranking also shifted up significantly, indicating their progress in promoting digital government in general as well as narrowing the relative gaps between ASEAN and the rest of the world.

In some cases, such as the Philippines and Malaysia, the EGDI scores increased but global rankings dropped. This could be a warning sign for the region to accelerate digital transformation in government, as countries in other regions are progressing at a faster pace in the 'race'. This should particularly urge Cambodia, the Lao People's Democratic Republic (Lao PDR), and Myanmar (the CLM countries), which are lagging in promoting online public services and citizen engagement, to speed up the catch-up process and to dedicated more efforts towards providing information to their citizens, interacting with stakeholders, and engaging in decision-making processes (United Nations, 2020).[6] For them, changing the mindsets of both the government and the public will be the first step (Chen and Ruddy, 2020). In this regard, it is worth noting the approach and achievements of Singapore, which ranked 12th in the world and first in the region in advancing e-government development. The ASEAN Digital Integration Index Report 2021 concluded that '[t]he efforts made by the Singapore government are evident through Singapore's digital government process', and the mindset shift towards updating its procurement process to enable and encourage the use of government cloud services 'has been adopted by a number of agencies to date' (ASEAN, 2021a: 58).

Indeed, Singapore was one of the first countries to engage in digital transformation. In the Digital Government Blueprint, the Singaporean government stated its 'ambition to better leverage data and harness new technologies, and to drive broader efforts to build a digital economy and digital society, in support of Smart Nation' (Government of Singapore, 2020: 2). Singapore's IT2000 Master Plan, can be seen as the country's first attempt to include the promotion of e-government in its national development plan. In 2014, Singapore launched Smart Nation as a national strategic plan, of which digital government, the digital economy, and a digital society are the three pillars. Accordingly, the Government Technology Agency (GovTech) was established 'to develop and deliver innovative citizen-centric products and services across the whole-of-government' (GovTech, n.d.).

The Key Performance Indicators (KPI) review of the implementation of the Digital Government Blueprint showed that by the end of 2021, 20,000 government workers had been trained in data analytics and data science. All 20 government ministries had submitted plans to use artificial intelligence. (GovTech 2020) Nearly all government services can be conducted digitally end to end, and most of them provide e-payment options. Satisfaction with digital government services increased significantly from 2018 to 2022 – from 78% to 84% for citizens and from 69% to 79% for businesses (Table 3).

[6] According to United Nations (2020), e-participation consists of enabling participation by providing citizens with public information and access to information without or upon demand (e-information), engaging citizens in contributions to and deliberation on public policies and services (e-consultation), and empowering citizens through co-design of policy options and coproduction of service components and delivery modalities (e-decision-making).

Table 3. **Singapore's Improvement in Digital Government Services, 2018 vs. 2022**

Item	2018	2022
Citizen satisfaction with government digital services	78%	84%
Business satisfaction with government digital services	69%	79%
Government services that are completed digitally from end to end	87%	99%*
Services that provide e-payment options	81%	98%*

* As of 2021.

Source: Smart Nation Singapore (n.d.), Digital Government. https://www.smartnation.gov.sg/about-smart-nation/digital-government/

According to the first report of the ASEAN Digital Integration Index, AMS have been 'making good progress in deploying e-government services' (ASEAN, 2021a: 11). In general, ASEAN's scores in Pillar 6 (Institutional & Infrastructural Readiness)[7] are competitive with the other benchmark countries (ASEAN, 2021a). The Singaporean experience is representative of the region's advance in developing digital government. It can serve as a good example for other AMS to demonstrate the importance of digital transformation and digital integration. Looking forward, in addition to continued efforts on improving national institutional and infrastructure, it is vital to accelerate the pace of technology adoption and promote digital innovation in the public sector. From the regional perspective, enhancing collaboration amongst AMS in digital government is a crucial part of ASEAN's progress towards regional digital integration.

3. Chapter Synopsis

Including the development of digital government in the national and regional strategies of digitalisation is not only about digital adoption in the public sector, but also about creating digital-enabled, user-driven public online services to support the development of the digital economy in the long run. This is quite a challenge for all countries, as the digital revolution is new to everyone, and there is no ready-to-use model to follow. The best method is for countries to learn from each other and share good practices and experience. The rest of the book is organised into two parts. The first part (Chapters 2–8) consists of six country case studies (New Zealand, Japan, the Republic of Korea, Singapore, India, and Viet Nam) and a general comparative study on the effectiveness of online public services in ASEAN. The second part (Chapters 9–13) provides insights on the implications of digital government for economic development, based on economic analysis from the aspect of firms' performance, exports, global value chains (GVCs), and economic resilience, respectively. It also contains a study on the economic implications of data sharing, using the healthcare sector as an example.

[7] Pillar 6 assesses the availability of digital infrastructure and the adoption of technology across public sector institutions to drive and coordinate digital integration in ASEAN.

Derek Gill's chapter, 'Government as a Standard Bearer and Digital Platform Provider: The Case of New Zealand', explores the role of the New Zealand Government in promoting the digital economy through the uptake of digital platforms and standards. It uses three short case studies of digital services provided by the New Zealand government – the New Zealand Business Number (NZBN), Business Connect, and Beneficial Ownership – to highlight the important role of bottom–up emergent developments and digital initiatives, and the limited role of top–down digital strategies. While the government's role is constrained, the state has a crucial supporting role if the potential of the digital economy is to be realised.

The analysis of the impact of GS1 global data standards shows that the socio-economic significance of the standardisation of global data could be equivalent to, if not more than, that of standardised barcodes and container sizes. It is therefore critical for the government to adopt and promote the use of global data standards proactively in completing a regulatory framework to support the growth of the digital economy.

While much has been achieved from applying digital technologies to government services in New Zealand, these improvements have been patchy and often incremental rather than transformative. For the government, a challenge is to find the 'Goldilocks zone' – a balanced approach that neither leads nor lags but keeps its main roles in creating the legal framework. This means actively tracking and building on the lead that others have taken rather than acting alone or proactively picking winners. An active supportive role will be critical in achieving network effects and accelerating important initiatives such as paperless cross-border trade.

In the next chapter, 'Digital-Empowered Online Public Services: Japan's Experience During the COVID-19 Pandemic', **Hiroki Yoshida** states that the lack of policy priority and insufficient resource allocation could hinder the process of digitalising public services. He uses Japan's policy reactions in bringing public services online during the COVID-19 pandemic as a real-world example showing the importance of (i) open application programming interface (API) and open-source software (OSS) in facilitating collaboration amongst stakeholders to enable public digital services, (ii) data standardisation and database integration in increasing the efficiency of government operations, and (iii) the adoption of digital IDs in service distribution to citizens and businesses.

Above all, integrated digital infrastructure and standardised data can increase the efficiency of operations for government services. In the case of Japan, the most recent institutional effort on promoting digital government is the establishment of Digital Agency, which aims to make the administrative services provided by the central and local governments uniform; and to support private sector involvement in the digitalisation of public services by creating digital infrastructure for government services, bridging multiple stakeholders for better service delivery, and nurturing information technology capabilities to create a GovTech ecosystem in the government.

The chapter prepared by **Inkyo Cheong** and **Jungran Cho**, 'Digital Government in the Republic of Korea: Evaluation and Challenges', shares insights into Korea, a country that is well regarded internationally in the field of digital government, thanks to its fast adoption of automation, ICT, and the associated legal guidelines on public administration. According to the Digital Government Index 2019 results of the Organisation for Economic Co-operation and Development (OECD, 2020), Korea received the highest score of 0.742 on a scale of 1, ranked first amongst the 33 countries under study. In the 2020 E-Government Service Usage Survey, over 98% of people expressed their satisfaction on digital public services. (United Nations 2020)

Relatively speaking, the digitalisation of enterprises, especially small and medium-sized enterprises (SMEs), seems to be on the slow side. Korean SMEs are generally less knowledge intensive. There is a wide gap between large enterprises and SMEs in the adoption of sophisticated digital technologies. Similarly, SMEs in the service sector seem less prone to innovation than those in manufacturing. On the government side, a next step is to improve information-sharing via further cooperation with users (residents, visitors, and businesses) and suppliers (ICT companies) and coordination amongst various data generation and management organisations.

Jessica Wa'u and **Rohini Nambiar** introduce some of Singapore's successful experiences in digital transformation in their chapter on 'Digital Government to Counter the Effects of COVID-19: The Case of Singapore'. They state that under the government's leadership, the country managed to ride the wave of Industry 4.0 with emphasis on new product development, infrastructure upgrades, and aligning with technological advancements. These policy efforts helped turn the country's small size into first-mover advantages in digital transformation. Factors that have contributed to Singapore's digital transformation include (i) the whole-of-government approach with enhanced inter-agency coordination, (ii) the periodic upskilling of public service, (iii) balancing regulatory restrictions and the flexibility of innovation, and (iv) the government's partnership and consultation with the private sector.

The Government of Singapore identified e-government and e-society development as the core themes[8] of national digital policies at an early stage, and consistently updates the relevant policies and regulations. Such institutional readiness allowed the Singaporean government to undertake policy interventions with digital initiatives to handle the socio-economic instability caused by the COVID-19 pandemic. When facing challenges from IT labour shortages and SME inclusion in digitalisation, there is a shifting focus from the government-led approach to one motivated by private sector digitalisation and skills development.

In his chapter titled 'Digital Government as a Business Enabler: An Analysis of Business Processes in India', **Sanjay Kumar Mangla** interprets India's digital story as a successful one that is led by ICT development. In India, the digitalisation of government services has revolutionised interactions and brought significant changes to the way it engages with the public (G2P), businesses (G2B), other governments (G2G), and foreign entities.

It is evident that with the G2B initiatives to make government services available online – including SPICe+, MCA21, eBiz, India's G2B portal, Udyog Aadhaar, PSB Loans in 59 Minutes, Parivesh, Shram Suvidha, GST, and e-Trade – a business-friendly digital ecosystem is forming. Despite this substantial progress, India still seems to lag developed countries in providing digital government services to businesses, especially when considering the inclusivity of digital services for SMEs. A policy focus is to continually expand digital services across the country, with improvements to and monitoring of existing digital services. The government should also put more effort into developing and managing public data sources that businesses can use in generating value added.

[8] The other identified themes include the ICT economy, labour development, and infrastructure building.

John Walsh states in his study on 'Digitalising Public Services in Supporting Economic Development: The Case of Viet Nam' that the plans and discourse surrounding the national digital strategy tend to be developed at a high level and imposed on lower levels of society, which can create contradictions between what is imagined in official documents and the lived experience of people. For instance, investments in databases and systems that align with ambitious policy goals may lead to some unintended consequences, such as restrictions on freedoms, limited personal mobility, and unequal distribution of opportunities.

In the case of Viet Nam, some existing gaps may exacerbate inequality in Vietnamese society, despite the government's ongoing pursuit of digital initiatives for economic growth. John's study shows that in the agriculture sector, digitalising public services tends to facilitate the integration of farmers and their organisations in GVCs and increase the efficiency and specialisation in Viet Nam's production. But the consequences in the informal sector seem to vary across different regions and industries despite the general heterogeneity. There is a need for skill-based digital education to extend services effectively. Digital government has also helped the Government of Viet Nam reduce poverty across the country, leveraging location-specific economic zones. Given that the implementation of smart city development in Viet Nam may cause increased inequality, the government should pursue broader societal impacts when devising an emergency response plan.

Saurabh Kumar's study on 'The Effectiveness of Online Public Services: A Comparison of ASEAN Member States and the Way Forward' provides some third-party observations on the key factors that influence the adoption, implementation, and success of e-government programmes in ASEAN. The results of a survey on the 10 AMS highlight the significance of standardisation and regulation of online public services in the ASEAN context. Almost 90% of respondents believe that the adoption of open standards in e-government can help improve the efficiency of public services by increasing interoperability amongst various government branches and agencies. Generally, AMS regulations on technology procurement for digital government are strict.

Region-wide, international standardisation and mutual recognition of regulations, such as the adoption of open-source solutions (OSS) and open standards, tend to enhance interconnectivity and interoperability between countries. Regional data-sharing agreements, with practicable terms of implementation, could play a significant role in facilitating intergovernmental coordination amongst AMS.

Duc Anh Dang in his chapter, 'Do Online Public Services Improve Firm Performance? Evidence from Viet Nam', shows evidence of the potential economic return on countries' investment in e-government development. Using provincial level data from the Vietnam Enterprise Survey and the Provincial Competitiveness Index, this empirical study tests a hypothesis on whether better online public services can increase business performance and encourage firms to invest more and hire more workers.

The findings reveal that better quality websites and a higher percentage of firms accessing provincial government websites are associated with a higher level of investment and employment. These relationships are more profound for foreign firms, firms in industrial zones, and large firms. At the same time, state-owned enterprises invest and employ more when budget documents are published in a timely manner.

Part of the reason is that e-government and online public services may reduce the costs of finding information and administrative procedures for businesses and individuals. Moreover, digitalising government services can increase public awareness of government policies and regulations. The increased policy transparency facilitates firms' decisions on long-term strategy setting, risk management, and investment. For that reason, local governments may consider stimulating greater investment by elevating the standard of online public services, facilitating government service delivery, simplifying citizens' compliance with legal requirements, and fostering citizen engagement and public trust.

The next chapter, 'Digital Government in Promoting Trade: The Cambodia Case', investigates possible links between digital government and international trade based on a panel data analysis on bilateral trade flows between Cambodia and its trading partners during 2003 and 2018. The study by **Reth Soeng** and **Thach Kao** reveals the positive effect of digital government in facilitating Cambodia's exports. Increasing the value of the readiness index of digital government by 1 percentage point could lead to an increase of more than 4% in Cambodian exports to the rest of the world. All else being equal, Cambodia tends to trade more with countries that have higher levels of digital government building.

This empirical result, supplemented by the key findings from a case study on the country's Bakong (a blockchain-based payment system), CamDX (an intra-governmental data exchange platform), and a digital integration programme of single-branch specialised bank undertaken by the Agricultural and Rural Development Bank, suggests that digital government efforts can be seen as part of trade facilitation that reduces trade costs and increases ease of doing business. Providing digital public services can improve the effectiveness, efficiency, transparency, and accountability of the government. This will enhance foreign investment and therefore increase the productivity of the Cambodian economy, especially in the export sector.

Shifting the perspective from national to international, **Nobuaki Yamashita** in his chapter titled 'Digital Government in Facilitating GVC Participation' assesses how government digital support can facilitate firms' GVC participation. It views digital government as part of government efforts to provide a digitally inclusive environment for SMEs to participate in GVCs, especially for SMEs that encounter productivity and capacity constraints in facing global competition. Services targeting SMEs – such as a marketing platform promoting companies, products, and brands, with some matching facility functions and an official website promoting products and brands, allowing buyers (importers) to purchase products directly (and a payment facility) – seem beneficial even to firms that are not directly involved with GVCs.

Li, Tong, and **Kong** attempt to provide answers to a research question: 'Can Digital Government Improve Economic Resilience?' Their findings support the viewpoint that the development of digital government can be a pro-growth factor that has a positive effect on improving economic performance and enhancing resilience against external shocks. The experience during the COVID-19 pandemic showed that increasing e-government could effectively discount some negative impacts brought by the pandemic to the economy. Normally, countries with better digitalised government are more responsive to shocks and better prepared to implement stronger stringency policies in controlling the spread of a virus.

However, the development of digital government, especially the construction of the related ICT infrastructure, places high demands on capital inputs. This tends to divert government resources that would otherwise have been allocated to other economic activities, and therefore slows down economic development in the short term. Promoting public awareness and the utility of digital government can mitigate such negative impacts by increasing economies of scale.

Another hot topic in the digital government literature is data sharing. In the chapter on 'Investigating the Growth Effects of Sharing Health Data in ASEAN Member States', **Kling, Guntupalli**, and **Uddin** attempt to identifying the possible impacts of enhanced data sharing in healthcare on economic growth using different methods. The growth accounting analysis reveals that AMS derive greater benefits from ICT capital, a crucial component for data sharing in healthcare. The panel Vector autoregressive (VAR) model considers feedback effects, illustrating how changes in health expenditure can influence capital accumulation and overall economic activity. Causality tests indicate that past health expenditure positively impacts current economic growth. Although digitalisation technically has the potential to facilitate data sharing, realising these benefits require not only continuous investment in ICT infrastructure, but also trust building and regulatory measures addressing security concerns related to privacy and data protection.

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Chapter 1

Government as a Standard Bearer and Digital Platform Provider: The Case of New Zealand

Derek Gill

1. Introduction

> Digital technologies have transformed nearly every aspect of daily interactions between households, firms and governments … The efficiency and effectiveness of interactions with government agencies – from registering a motor vehicle to completing a tax return – have been improved using digital technologies. But 'digital government' remains far from a reality (Australian Productivity Commission and New Zealand Productivity Commission, 2019: 1–3).

The big idea we explore in this chapter is the role of government in promoting the digital economy through the uptake of digital platforms and standards. In the late 20th century, the introduction of barcodes revolutionised logistics, including retail and wholesale trade (Ellickson, 2016), and the impact of standardised containers has been more important for the growth of world trade than successive rounds of tariff reductions since World War II (Levinson, 2006). In the 21st century, will digital platforms and standards play a similar role in enabling economic development in the information age?

The main chapter is structured into five sections. Section 1 provides an introduction, section 2 provides a summary of the case studies, section 3 explores the role of global data standards, section 4 develops the themes that emerged from the research, and section 5 sets out the policy implications and draws out conclusions. The appendixes cover the details of three platform case studies – the New Zealand Business Number, Business Connect, and Beneficial Ownership – as well as exploring the role of global standards, using bar codes and containerisation as examples.

1.1. Research Approach

The research uses three short case studies of new government digital services and the impact of the GS1 data standards architecture to explore the role the government plays through its digital government initiatives in enabling the growth of the digital economy.

Our research has three main phases:

- A scan of the relevant literature on digital government and the digital economy, focused on New Zealand. We have drawn on the joint Australian and New Zealand Productivity Commission study (2019) of the digital economies of New Zealand and Australia as well as relevant overseas research (OECD, 2019).

- An analysis of three platform case studies[1] – the New Zealand Business Number (NBZN), Business Connect, and ownership authentication for companies and limited partnerships – and GS1[2] as an exemplar of global data standards. The case studies were based on semi-structured interviews and a review of available documents. Interviews were on a non-attribution basis, so material in single quotes reports respondent comments while protecting anonymity.
- Development and testing the insights and conclusions that emerged from the research, culminating in the production of this chapter.

The case studies were selected to explore the potential role of digital platforms and standards in contributing to economic development and greater regional economic integration. We looked to see if digital government initiatives, such as adopting data standards or providing common trusted platforms, enabled network effects (Katz and Shapiro, 1994) that promoted the digital economy. The gains from network effects are far wider than simply improving customer experience and reducing transactions costs – they encourage new uses and draw in new users that benefit from the network.

The null hypothesis is that there were no network effects or transformative impacts. In this case, the impact of digital government is limited to providing digital channels for existing processes and systems. Put simply, this enables 'doing things differently' rather than 'doing different things' (O'Neil, 2009).

Our secondary hypothesis was to explore the proposition that common digital platforms and standards in the 21st century are equivalent to the standardised barcodes and container sizes in the late 20th century.

The policy question we will address is the optimal role for government in the digital platforms and standards space. Is there an equivalent to the Goldilocks zone – neither too hot nor too cold – for digital platforms and standards?

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1 For details of the NZBN, see New Zealand Intellectual Property Office (n.d.). For Business Connect, see Ministry of Business, Innovation & Employment (n.d.-a). For ownership authentication, see Ministry of Business, Innovation & Employment (n.d.-b) and New Zealand Government (2022a).

2 See GS1 (n.d.-c).

1.2. Country Context – The Case of New Zealand

New Zealand provides a useful comparator for other countries in the region because, while slightly behind pacesetters like the Republic of Korea (henceforth, Korea), Denmark, and Estonia, it ranks reasonably high in world surveys on digital government and the digital economy.[3] Indeed, one 2017 survey ranked New Zealand's digital economy a 'standout among standouts', meaning a country that it is both highly digitally advanced and exhibiting high momentum but without being in the top group of countries on either dimension.[4]

The box discusses the development of institutional arrangements and strategies to support the development of digital government in New Zealand. It is an open question how much these arrangements contributed to the development of digital government in the country. Arguably, the most important drivers arose from the wide-ranging public management reforms of the 1980s and 1990s, which enabled individual public agencies to adopt information and communication technology (ICT) more readily in their business models.

Chronology of the Main Digital Government Initiatives in New Zealand

2000: e-Government strategy adopted, and a special unit established in the State Services Commission

2005: National Digital Strategy adopted (updated in 2008)

2009–2017: Better Public Services goals include two result areas focused on digital government (updated in 2017):
- (i) Result 9: Business gains value from easy and seamless dealings with government
- (ii) Result 10: People have easy access to public services, which are designed around them, when they need them

2010: Role of Government Chief Information Officer created as the functional leader of the ICT Strategy, based in the Department of Internal Affairs

2013: (i) Government ICT Strategy and Action Plan for New Zealand approved by the government (updated in 2015)
(ii) New Zealand Data Futures Forum established (phased out 2018)

[3] The United Nations (UN) survey ranks New Zealand 4th on e-participation and 8th on e-government out of 193 countries (UN, n.d.). The Organisation for Economic Co-operation and Development (OECD) ranks New Zealand 12th out of 37 countries on its Digital Government Index (OECD, 2019).

[4] The 2017 Digital Planet report from Tufts University. See New Zealand Government (2017).

2015: (i) Four functional leads created: Government Chief Digital Officer, Government Chief Data Steward, Government Chief Information Security Officer, and Government Chief Privacy Officer
(ii) Digital Government Partnership established, with stakeholders from government agencies (disestablished in 2019)
2016: ICT Strategy updated, replacing the Action Plan with an integrated work programme
2019: Strategy for a Digital Public Service released
2022: Digital Strategy for Aotearoa released

ICT = information and communication technology.
Source: Author.

A recent joint study of digital government and the digital economy in New Zealand and Australia (Australian Productivity Commission and New Zealand Productivity Commission, 2019) concluded that:

- New Zealand (and Australia) has been an active and rapid adopter of ICT[5] – but as a technology taker, not a technology maker.
- Access to and uptake of rapid broadband is high by international standards (although digital exclusion remains a concern).
- A sequence of e-government and digital strategies have been developed and new roles and institutions have been created (Box).
- ICT has been extensively applied at the individual government organisation level, with examples of transformation changes.[6]

In summary, the Australian Productivity Commission and New Zealand Productivity Commission (2019: 63) concluded:

> Despite the plethora of government policies and bodies in this space, the process of digitalising government services has not kept up with technological developments, nor with firm and consumer use of digital technology… digital government on both sides of the Tasman is something of a patchwork – some government services are highly digitalised, integrated and provide a good user experience, while others are confusing, siloed and still partly paper-based.

[5] NZTech (2016) estimated that the technology sector (defined as ICT plus high-tech manufacturing) produces NZ$32 billion of goods and services, contributes NZ$16.2 billion or 14.6% of gross domestic product (GDP), employs almost 100,000 people, and generates NZ$6.3 billion or 19% of exports.

[6] Prominent early examples, such as Companies Office online and removing most citizens' obligation to file income tax returns, predate any e-government or digital government strategies. Recent examples include Inland Revenue's payday filing and myIR. See Office of the Auditor-General (2012) for a discussion of the critical success factors for ICT projects in government.

The New Zealand case is something of a paradox. The country's digital economy is thriving ¬– many games producers have become successful, a number of software providers (such as Xero) have gone global, and Trade Me is the only instance (outside China) where eBay has been beaten by a local product. In the public sector, the power of information technology has been successfully harnessed in a number of applications. Despite these developments, it does not seem able to scale up these innovations across the public sector. New Zealand's digital government approaches have not been enduring – changes of government result in new strategies being developed. Furthermore, despite digitisation's obvious 'network' effects and clear association with economies of scale, there was little obvious central leadership, with responsibilities spread across a range of agencies and roles.

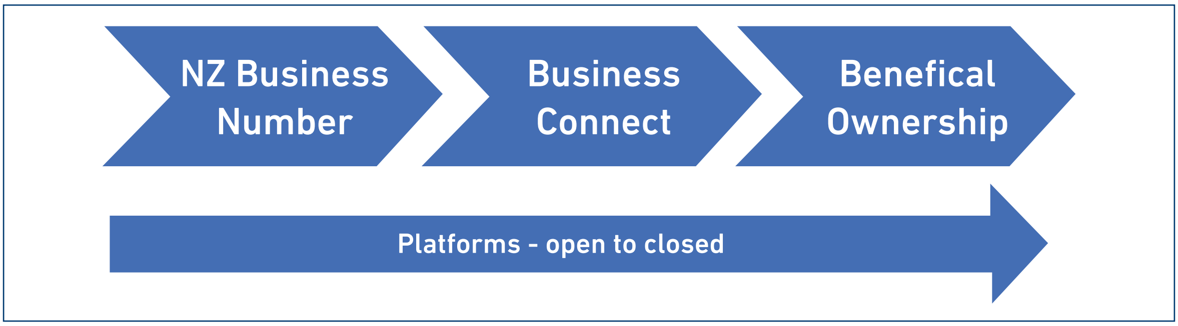
As the executive summary of the Australia and New Zealand Productivity Commission study observes, while there have been significant improvements from digital use in a range of public domains, '"digital government" remains far from a reality' in New Zealand and Australia.

2. The Platform Case Studies – What Did We Find?

In this chapter, we focus on the role of the state by using three case studies of newly developed digital platforms to explore the notion of government as a platform (O'Reilly, 2011). The appendixes provide details on the three government digital platforms: the NZBN (a public platform that is open to business) is reviewed in Appendix 1; Business Connect (a government-to-business (G2B) platform to reduce regulatory compliance costs) is discussed in Appendix 2; and Beneficial Ownership (a G2B platform that will be mainly used by enforcement agencies) is covered in Appendix 3.

We found that the openness to the wider public of platforms can be arrayed across a spectrum, as shown in the figure.

Figure 1.1. Continuum of Platform Openness



NZ = New Zealand.

Source: Author.

At the open end is the NZBN, an archetypal platform where the government provides trusted curated data in readily available formats, including application programming interfaces (APIs), which enable the private sector to develop value-added processes. In the middle is Business Connect, a G2B platform that takes a user-centric approach – bringing related regulatory processes into one place without making the information in the platform available to the wider public. At the other extreme is the new Beneficial Ownership platform, which will systematically make ownership information available, but the facility will largely be limited to enforcement agencies.

The government has a pivotal role in society. Its monopoly on the exercise of coercive powers makes it uniquely well placed in the digital space to develop platforms based on data sets with universal coverage, but the use of that coercive power is a double-edged sword. There are restrictions on how that information can be used because of other policy objectives, such as privacy and the need to protect against reidentification. Data reidentification or de-anonymisation involves matching anonymised or de-identified data with other data to identify the individual concerned. Reidentification is a problem because government-held data on citizens and business data can be used for unintended purposes, including for criminal use.

O'Reilly (2011) suggested the government has a key role by providing open platforms that anyone can build on. Platforms provide open government data and decision rules for others to use beyond single login/digital identity. This approach appears to assume a degree of routinisation and decision making, without the exercise of discretion, i.e. the exception rather than the rule in the modern state.[7] The case studies highlighted constraints such as privacy concerns and risks of reidentification, which limit the government's role in providing open platforms that anyone can build on.

The cases also show varying degrees of transformative change. The NZBN is transformative by enabling new products and services. The impact of digital government with Business Connect and Beneficial Ownership is more limited, as they provide digital channels for existing processes and systems. Incremental changes that enable dramatic reductions in compliance and transaction costs improve both productivity and living standards. As Krugman (1994: 2) observed in *The Age of Diminished Expectations*, 'Productivity isn't everything, but in the long run it is almost everything. A country's ability to improve its standard of living over time depends almost entirely on its ability to raise its output per worker'.

In the next section, we turn to a discussion of standards. New Zealand is largely a technology taker, not a technology maker, and is generally more of an adopter (and adapter) of standards rather than an initiator. The research therefore focuses on global data standards using GS1 as an example. GS1 has already been discussed, as it provided the data architecture on which the NZBN was built.

[7] See the discussion of discretion in Wilson (1989, Chapter 4).

3. Global Data Standards – The 21st Century Equivalent of Barcodes or Standardised Container Sizes?

3.1. What is a standard?

In this section, we discuss technical standards,[8] by which we mean published documents setting out technical specifications for products, systems, or services that are typically backed by systematic testing. It is important to distinguish standardisation from the broader and vaguer concept of harmonisation, which includes interoperability as well as the adoption of common standards.

Technical standards take four main forms: they can be international or domestic, and they can be public or private.

Public standards developed by intergovernmental organisations can influence national policymaking both directly, when the government adopts standards such as CODEX, and indirectly, through the standards development process. A national standards body either adopts standards developed by international bodies such as the International Organization for Standardization (ISO) or develops domestic standards using a formal process involving explicit communication and negotiation to reach agreement.

Private standards do not have a standard development path, but proprietary standards are generally developed through unilateral action. Some – like Bluetooth – involve a hybrid approach with both communication and unilateral commitment.

It is important to distinguish technical standards from the legal thresholds established by regulations (Table). Standards are generally voluntary unless they are incorporated directly into regulations or indirectly by reference.

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8 The International Organization for Standardization (ISO) definition is: 'A standard is a document that provides requirements, specifications, guidelines or characteristics that can be used consistently to ensure that materials, products, processes and services are fit for their purpose'. In the World Trade Organization (WTO) Technical Barriers to Trade (TBT) Agreement (Annex 1.1), standards are defined as a 'document approved by a recognized body, that provides, for common and repeated use, rules, guidelines or characteristics for products or related processes and production methods, with which compliance is not mandatory. It may also include or deal exclusively with terminology, symbols, packaging, marking or labelling requirements as they apply to a product, process or production method.'

Table 1.1. Regulations and Standards

Regulation/Standard	Developed by public agencies	Privately developed
Mandatory regulations	Public regulations, e.g. the Building Code	Co-regulation, i.e. legally mandated privately developed rules and standards
Voluntary standards	Public standards developed by national standards bodies or international organisations	Private standards, e.g. Bluetooth or Fair Trade

Source: Author.

3.2. Why are standards important?

Standards can be a double-edged sword. They can be hugely beneficial by reducing switching costs to consumers and enabling producers to achieve economies of scale. As Swann (2010: i) observed:

> Several detailed econometric studies have established a clear connection at a macroeconomic level between standardisation in the economy, productivity growth and overall economic growth… Estimates vary somewhat from study to study, but overall, the growth of the standards catalogue over recent years may account for between one eighth and one quarter of productivity growth over the period.

The benefits of standards extend beyond cost savings and productivity gains to include building competencies, reducing barriers to entry, building network effects, and increasing trust between trading partners (Swann, 2020).

However, standards can have a downside if they are not set well,[9] particularly if they are derived with a specific technology in mind. Standards development is often very path dependent (e.g. VHR vs Betamax videos, Phillips vs Robertson flathead screws). The potential for lock-in is particularly high with the use of proprietary solutions based on one technology or business model.

Private standards, even though they are voluntary, can have similar effects to non-tariff measures introduced by governments in creating non-tariff barriers. Research in the food sector commissioned by the Asia-Pacific Economic Cooperation (APEC) Business Advisory Council (2016: 66–7) discussed how private standards mimic non-tariff measures introduced by regulation. For example, the requirement by some businesses for standardised package sizes for fresh fruit precluded trade in pineapples.

[9] Swann's (2010: i) survey of standards concluded that, while standards are often prompted by exports and imports, the exception was for 'standards concerned with Sanitary and Phyto-Sanitary factors (e.g. food safety), however, the pattern is different: here standards are more likely to block imports'.

Becoming compliant with a standard's infrastructure involves costs. These are generally low, but are mainly fixed costs. This can pose a particular barrier to small businesses, as the costs tend to constitute a higher proportion of their budgets than for larger companies.

Recent world economic history provides two examples of transformational change brought about by standardisation: barcodes and container sizes. These are discussed in more detail in Appendix 4.

3.3. Barcodes had significant direct and indirect effects

Since the 1960s, the introduction of barcodes and associated data standards have affected labour productivity in two ways:

- They increased labour productivity by accelerating throughput – an improvement in labour productivity.
- They generated labour cost savings through a combination of automation, eliminating tasks, reducing errors, and removing duplication.

Barcodes' transformational change involved more than cost reductions, as they profoundly affected the supply and logistics sector and enabled the growth of market research through improved visibility of consumer behaviour.

3.4. Containerisation – the long road to international standardised sizes

The use of containers started in the 19th century and developed slowly thereafter, but the breakthrough came in 1956 with the introduction of standardised containers. Containers provided more than just a better means of shipping goods from one port to another – they transformed the whole logistics chain from factory to destination. The growth in containerisation led to dramatic reductions in transport costs, which transformed production through allowing global value chains. Containerisation is one of the major drivers of globalisation, and the impact of international standardised containers was more important for the growth of world trade since World War II than successive rounds of tariff reductions (Levinson, 2006).

3.5. Global data standards

In the digital space, both public and private standards are important. While New Zealand has a significant high-tech sector (NZTech, 2016), it is largely a technology taker, so the relevant private standards are largely developed offshore. New Zealand has been active in contributing to the development of a number of global public digital standards, but is generally more of an adopter (and adapter) of public standards rather than an initiator.

Public global digital standards are dominated by the International Electrotechnical Commission (IEC), a network of national standards institutes that produces standards for a range of electrical, electronic, and related technologies. The IEC has more than 6,300 published standards-type documents. Amongst the many other public standard setting bodies related to ICT are the ISO,[10] the International Telecommunication Union, the Institute for Electrical and Electronics Engineers, the World Wide Web Consortium, and the Cloud Security Alliance.

Microsoft has more than 100 standards solely related to cloud-based computing, which includes a mix of global, regional, and national standards (Microsoft, n.d.). Shapiro and Varian (1998: 237) observed that 'there are hundreds of official standard setting bodies throughout the world... on top of these we have any number of unofficial groups...such as the thirty six groups operating under the auspices of the Association for Computing Machinery'.

There is also a plethora of competing private standards. ICT development is led from the private sector, and this has produced a wide array of both proprietary and open standards. Bluetooth is a classic example of an open standard. Apple is an example of an ecosystem of proprietary private standards.

The government has an important role to play in supporting the adoption of global data standards that can be readily adapted to a range of applications. In the case of the NZBN, it is based on the GS1 Global Location Number – a globally unique digital identifier that can potentially be linked in global supply chains. In the next section, we discuss the contribution of GS1 to the New Zealand economy.

3.6. GS1 – the contribution of a global digital standard architecture

GS1 is a key part of a global ecosystem of public and private standards, along with domain-specific regimes such as the International Standard Book Number (ISBN), GPS for geospatial data, and SWIFT in international finance.[11]

GS1 provides global data standards that can be applied to the global supply chain by regulators, public border agencies, exporters, logistics providers, wholesalers, retailers, and consumers. The aim is to have standards created by industry for industry, with GS1 acting to facilitate dialogue amongst business and technical experts. These standards are developed through a Global Standards Management Process, which is a community-based forum for businesses to work together and develop standards-based solutions (GS1, n.d.-a).

The New Zealand Institute of Economic Research (NZIER, 2019) identified a number of applications of GS1:

- E-commerce: GS1 data standards support e-commerce through the accurate representation of product characteristics such as specifications, location, and origin. For example, Amazon requires a unique product identifier known as a Global Trade Item Number (GTIN) to create new listings (Amazon, n.d.), while Google adopted the GTIN in 2015 (Google, n.d.).
- e-Invoicing: A joint 2018 study by the Australian Taxation Office and New Zealand Government estimated that e-invoicing using standards could result in cost savings for the Australian economy of A$28 billion over 10 years (Australian Taxation Office and New Zealand Business Number, 2018).
- Product compliance: A scoping study of electronic tracking of construction materials showed a reduction in the incidence and cost of non-compliance, saving the industry NZ$23 million annually (Dowdell, Page, and Curtis, 2017).
- Exporting: Automated information in the export supply chain using GS1 standards reduced manual entry errors, resulting in Australian meat exporters saving an estimated A$14 million each year (GS1, n.d.-c).[12]
- Traceability: GS1 data standards can be used to trace the origins of imported food. Some consumers are willing to pay more for traceable food compared with food that is not traceable. Koreans indicated that they were willing to pay 39% more for traceable imported beef products than for non-traceable products (Lee et al., 2011).

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[10] An example is the joint ISO/IEC 2015 standard on good corporate governance of information technology, which sets out six principles: responsibility, strategy, acquisition, performance, conformance, and human behaviour.

[11] Incoterms or International Commercial Terms, a series of predefined commercial terms published by the International Chamber of Commerce (ICC) relating to international commercial law, is another example of standardisation.

[12] https://www.gs1au.org/download/gs1au-case-study-Traceability-Meat.pdf/file

- Authenticity: standards can also be used to protect against counterfeiting (GS1, n.d.-b).
- Product recall: GS1 standards provide a platform for product recall.[13]

NZIER (2019) undertook a study of the impact of GS1, focusing on the effect of these data standards on labour costs and labour productivity with existing penetration of the wholesale and retail industries (non-traded sector). It found that the impact of the labour productivity gains of using the GS1 data standards had directly increased gross domestic product (GDP) by NZ$417 million or 0.15% annually. These estimates are a conservative indication of the contribution of GS1 to the New Zealand economy because it only focuses on the impacts of labour productivity. Additional contributions include:

- connectivity by making further connections easier
- credibility gains by having one source of truth – the source documents – for all accredited parties in the supply chain
- insights gained by generating more granular data to support better data analytics

While the 2019 study focused on a non-tradeable sector, a more recent NZIER study looked at deploying digital applications in the external trade sector (NZIER, 2020). Specifically, it looked at the costs and benefits of deploying digital trade products and processes based on TradeWindow – a proprietary software solution based on the GS1 digital architecture.

NZIER (2020: iv–v) found that digital trade products:

> have the potential to fundamentally change the supply chain for specific products by providing automated services that make it much easier and faster to trade legitimate products... We estimate that the benefits for all of APEC would be between $9 billion and $18 billion over 10 years. To put this into context, New Zealand's annual export trade is about $61.5 billion. Benefits of this size suggest that pursuing digital trading initiatives should be made a priority.

Other studies cited by NZIER (2019) found significant gains from the application of GS1. GS1 conducted a pilot project to streamline beef exports from Australia to the United States, and the results of this case study showed that the use of GS1 standards led to significant cost savings and greater visibility in the supply chain, from 43% to 93% (GS1 n.d.-c).

Similarly, APEC (2017) found that the GS1 global data standards increased visibility in the supply chain for commodity exporters to 100%. The benefits of improved visibility included:

- cost savings from a reduction in the time searching for information
- a 20%–50% reduction in the time spent approving loading of cargo
- the elimination of delays approving the release of cargo on arrival due to incomplete or inconsistent provision of information
- overall reduction in fruit spoilage due to delays in exporting

[13] The GS1 classification code GPC is used in the OECD Global Portal on Product Recalls as a mandatory attribute (OECD, n.d.).

- improved compliance
- improved cold supply chain integrity
- improved detection of fraudulent information
- accelerated delivery times

The value of using end-to-end supply visibility technology is highlighted by Elphick-Darling et al. (2017). In that study, pilot projects were conducted on the adoption of GS1 global data standards in Australia to identify and share information on various activities of the supply chain, including freight pick-up, storage and locations, traffic congestion, and other delays. The results of the study showed that the benefits in terms of efficiency, visibility, and innovation to the various actors of the supply chain (manufacturers, producers, and traders) justified the adoption of a strategy to implement these standards more widely.

Several multi-country initiatives are under way to promote the adoption of international standards: the European Union (EU) Strategy on Standardisation (European Commission, 2022) and the International Chamber of Commerce (ICC) Digital Standards Initiative (ICC, n.d.). The ICC Digital Standards Initiative aims to address the fragmentation in current attempts to digitise the global trading system by mapping out what standards already exist (and how they coexist), explore how they can best be leveraged to help drive wider adoption, and create new frameworks to unify digital trade processes.

3.7. Are global standards the next big thing?

Container sizes and barcodes, discussed in Appendix 4, both provide historical examples of how standardisation generated significant, indeed transformational, change. These examples highlight the potential for further transformational change from the widespread adoption of global standards generally. The discussion of GS1 standards highlighted the significant impact on both tradeable and non-tradeable sectors from more widespread adoption of global data standards. Government has a crucial supporting role to play by proactively supporting common standards and not acting alone by developing bespoke stand-alone regimes for public data services or regulations.

History also teaches us that the standardisation process faces considerable obstacles. For example, the discussion in Appendix 4 highlights how standardising container sizes was highly path dependent and how switching costs were a major obstacle. While major network effects and spillover benefits were achieved, these were often dissipated rather than concentrated on the actors that faced the switching costs. The containerisation case also highlights the crucial supporting role that the government must play if the potential of standards is to be realised.

Establishing a single dominant standard is far harder in an established domain, which often has multiple and overlapping standards, and much easier in a greenfield domain such as Bluetooth wireless communication, which starts with a clean slate. Once standards are established, switching costs are higher and vested interests (including accreditation and certification agencies) have an interest in the continuation of competing standards. History provides numerous examples of 'standards wars' in which technically inferior standards end up dominating standards with superior performance – such as QWERTY over Dvorak keyboards, VHS over Betamax video format, and Phillips over Robertson screw heads.

Providing an official public standard is not enough to overturn existing private standards. For example, in the case of organics in New Zealand, there were two competing private standards as well as a government regulatory threshold. The introduction of an official public standard merely resulted in creating a fourth competing standard and essentially had no impact on the continued use of the existing private standards.[14]

Shapiro and Varian's seminal *Information Rules* (Shapiro and Varian, 1998) discussed how, in general, in the face of competing standards, collective switching costs and network effects are critical in determining which standard emerges as the winner from 'standards wars'. Collective switching costs refer to the cost to all players in migrating from one platform and standard to another. Network effects refer to any situation in which the value of a product, service, or platform depends on the number of buyers, sellers, or users who leverage it. These effects are illustrated by Metcalf's law, which states that a network's value is proportional to the square of the number of nodes in the network.

While Shapiro and Varian (1998) focused on private actors, the state has a particularly important role to play in the response to these network effects. The history of regulation is replete with examples of the state's failure in 'picking winners' from competing standards. However, the state has a particularly important role to play as a 'fast follower' or 'standard bearer', where regulatory approvals such as safety checks and customs clearance are an integral part of value chains. The relevant regulatory agencies need to take an active role as members of the network, as such regulatory approvals are an integral part of the trail of trusted documents.

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[14] New Zealand has two private organic standards: BioGro (a home grown standard) and AsureQuality (based on the Ministry of Primary Industry Technical Rules and GLOBALG.A.P.). In addition, the Ministry of Primary Industry has Technical Rules that regulate the export of organics. A public standard (NZS 8410) was developed for organics in New Zealand, but it has failed to displace the competing private standards or gain international acceptance (equivalence).

4. Key Themes – What Can We Conclude?

In advanced economies with high digital uptake, such as New Zealand (and Australia), digital technology is highly dispersed and virtually ubiquitous, so it is hard to distinguish digital government from the rest of government or differentiate the digital economy from the broader economy. The joint Australian and New Zealand Productivity Commission study observed that 'the digital economy is the economy' (Australian Productivity Commission and New Zealand Productivity Commission, 2019: 1), and one respondent commented that 'digital is everything and it is nothing – it is hard to unpack'.

In this chapter, we narrow down our study by using three case studies of newly developed digital platforms to explore the notion of government as a platform (O'Reilly, 2011). The NZBN provides a model example of how the government can play a key role by providing open platforms that anyone can build on. The business case recognises the spillover benefits accruing to all members of the network, which go far beyond the direct benefits to individual members. By requiring all public agencies to adopt the NZBN platform, the government is playing an important role in enabling the uptake of digital approaches. However, the other cases highlight the limitations of platforms where conflicting policy considerations meant that a platform was not freely available to all.

Turning to standards, we explore the role of global data standards. While domestic standards can be used to restrict competition and introduce non-tariff barriers to imports, these risks are lessened with global data standards, so they offer considerable potential. For a small open economy such as New Zealand, global standards are becoming increasingly important.

Studies of the impact of GS1, a global data standards architecture, on both non-tradeables and the trade sector in New Zealand show that while GS1 has yielded significant gains, considerable potential gains have yet to be realised.

GS1 is an interesting case because it is a particular type of public good – a club good that is non-rival but excludable. GS1 provides an excellent example of how a standards architecture has network effects – the more businesses adopt the architecture, the more valuable it is to everyone in the club. Metcalfe's law, which states that gains raise exponentially with increased uptake, highlights the potential opportunity. The state has a particularly important role to play as a standard bearer, where regulatory approvals such as safety checks and customs clearance are an integral part of value chains.

Looking across all the case studies, while the extent of openness to the wider public and transformational change varied across the platforms, three key cross-cutting themes emerged: the importance of bottom–up developments relative to top–down strategies, the impact on small business, and the impact of the coronavirus disease (COVID-19).

The first theme is the role of bottom–up emergent developments and initiatives. The formal top–down government digital strategies and lead institutions in central government played a limited role in driving the cases forward. Interestingly, more impetus came from government public administration reform – the so-called Better Public Services. This provided a kick-start for the bottom–up drive to deliver a range of new digital services. The New Zealand experience suggests that it is possible to achieve high rankings for digital government and the digital economy from bottom–up initiatives without significant contribution from top–down digital strategies.

The limited impact of government strategies is not unique to digital government in New Zealand. Government strategies often have a limited life and do not survive a change in government or even sometimes a change in minister. A review of New Zealand Government strategy documents conducted by the McGuinness Institute (2019) concluded that:

- they often failed to document lessons learnt from past strategies or from the wider public service
- assumptions were not well articulated
- a good structure sometimes masked bad strategy content
- a number of strategies read as though they reflected a decision and were then backfilled

The second cross-cutting theme is the impact on small business. The New Zealand economy is overwhelmingly composed of small businesses, with a limited number of medium-sized enterprises and relatively few large businesses by world standards. The challenges presented by COVID-19 revealed the digital skill and knowledge gaps in small and medium-sized enterprises (SMEs). The original research, which was the impetus for several of the cases, showed that the impact of regulatory compliance costs fell disproportionately on SMEs. However, achieving compliance with the requirement of a standard's infrastructure also involves costs. While these are generally low, they are mainly fixed costs, which poses a particular barrier to small businesses.

The third unexpected theme is the impact of COVID-19 on digital developments.[15] While much of New Zealand was free of COVID-19 for most of 2020–2022, the policy response to COVID-19 had a significant effect. COVID-19 presented an opportunity for business and government to accelerate moving services online and create new digital services. Of the three cases, COVID-19 provided a significant boost to Business Connect and slowed the development of beneficial ownership due to competing policy priorities, while the NZBN was already online when COVID-19 arrived. However, the NZBN provided valuable infrastructure for the provision of COVID-19 identifiers. New Zealand is not unusual in the impetus provided by COVID-19. McKinsey & Company (2020) suggested that the pandemic pushed digital transformation forward by at least 3 years.

5. Policy Implications – What are the Wider Implications and What is to be done?

In this chapter, we have used New Zealand case studies to explore the role of government in promoting the digital economy through the uptake of digital platforms and standards. Is there a sweet spot that is equivalent to the Goldilocks zone – neither too hot nor too cold – for digital platforms and standards?

[15] For a review of the impact of COVID-19 on the development of digital government, see Lips and Eppel (2021) and New Zealand Government (2021a).

The platform cases suggest that the state can play an important but ultimately limited role in supporting the development of the digital economy. The discussion of standards highlighted the importance of the adoption of global standards rather than acting alone with stand-alone domestic standards. Cross-country standards initiatives – the EU Strategy on Standardisation and the ICC Digital Standards Initiative – provide a window of opportunity to expand the role of standards globally. In addition, the state has a crucial role to play in providing the overall legal framework to support the growth of the digital economy.

The NZBN provides an interesting case study of the use of government-mandated adoption of a platform, based on GS1's global data standards across the public sector. This is an interesting precedent for the wider adoption within the New Zealand Government of global data standards. For example, studies have suggested significant (15%–45%) cost savings from moving to paperless cross-border trading.[16] Achieving the potential benefits of moving to paperless cross-border trade will require full participation by all relevant public agencies, as regulatory approvals are a key part of the trail of trusted documents. It is important to emphasise that the government's main roles are to establish the overall legal framework and then to be a fast follower and standard bearer, contributing to the lead that others have taken rather than acting alone. This involves acting as a regulatory steward to ensure that a fit-for-purpose legal regime is in place.

Industry sources expressed frustration at government agencies for acting alone. Rather than seeking to build on existing standards architecture, government agencies tend to start from scratch on the assumption that relevant standards do not exist. Leveraging existing digital infrastructure enables network effects to be realised and locked in. In addition, New Zealand is largely a technology taker and standard adopter, not a technology maker and standard initiator. Therefore, rather than acting alone, it needs to use international standards where possible to increase potential network effects.

The government has the power to pick winners, and this gives it influence over outcomes associated with digital government. However, just because the government can select a particular platform or standard does not automatically mean that the government will be good at comparing options and understanding market trends. Historical examples of the difficulty of picking winners include the New Zealand Government's failed attempt to apply the New Zealand E-government Interoperability Framework (NZ e-GIF 2008), which had a short 2-year shelf life, and the failure of the government interoperability standard (GOSIP)[17] when the private sector was rapidly innovating with new desktop software such as email, spreadsheets, and word processing.

In response, governments interested in the potential of digital government can equip themselves with two sources of sectoral knowledge. Firstly, governments need a quality trusting relationship with business leaders at the forefront of standards and platforms so that they have access to the latest trends and emerging themes. This access to emerging areas of interest is particularly important in the high-tech sector, where new platforms or technologies can disrupt and displace others.

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[16] Estimates range from 15% to 45%, depending on the implementation stage a country has reached (UNESCAP, 2014; UNCTAD, 2020; WTO, 2015).

[17] The Government Open Systems Interconnection Profile was a technical standard for open networking products used by governments in the late 1980s and early 1990s. In practice, it went out of use, apart from the odd specialised security application, with the arrival of the internet.

Secondly, access to private sector knowledge needs to be balanced by having the capability within the bureaucracy to act as an independent and impartial interpreter. Currently, that capability is spread across a number of different agencies with four distinct roles: the Government Chief Digital Officer, Government Chief Data Steward, Government Chief Information Security Officer, and Government Chief Privacy Officer.

The New Zealand experience also emphasises the importance of bottom–up initiatives in securing potential gains from adopting digital technologies. That is not to say that top–down initiatives are not important. Digital strategies are useful for lending legitimacy and support to digital government initiatives through general direction setting and articulating a shared narrative. More importantly, top–down initiatives can be required to provide some of the prerequisites needed to achieve the full potential of digital technology. These initiatives need to focus where there are significant network effects and credible private solutions are not readily available. Electronic Identity (E-ID) is a good example of such a prerequisite, as there are significant network effects but the market for identity solutions is fragmented, with many competing technologies being used. The NZBN provides an example of a platform that meets that prerequisite by providing a single accepted form of standardised digital identity for corporate entities.

This research has focused on platforms and standards. That is not to say that the government is limited to a supporting role in the wider digital space. The joint Productivity Commissions' 2019 report highlighted a wide range of policy issues where the government must take a lead, including consumer protection, competition policy, taxation, and cybersecurity. Digital exclusion – lacking the capability, opportunity, and motivation to use the internet to realise meaningful benefits – also needs to be addressed.

To achieve the potential offered by digital approaches for enhanced international integration, many public policy issues need to be resolved. Small countries cannot afford to act alone, as any domestic requirements need to be nested in wider international agreements. The Digital Economy Partnership Agreement is a new type of trade agreement with a series of modules open to all countries. It is intended to assist in the development of an international architecture for digital trade.[18] The agreement includes Singapore, New Zealand, and Chile, while several other countries (including Korea, Canada, and most recently China) have also asked to join.

A number of features of the digital domain make designing robust public interventions difficult, including the speed of technological development, the presence of competing and often proprietary standards, privacy (including data disaggregation), and competing data realms (the United States, the EU, and great firewall of China) (Aaronson and Leblond, 2018). Digital developments are not unambiguously positive, as victims of cybercrime and cyberbullying can attest. Appendix 3 discusses how the success of the New Zealand Companies Office in harnessing information technology to transform the company registration process made New Zealand an attractive destination for money from criminal and other illicit sources. As Holt (2017) commented in the context of big data, 'embrace it but proceed with caution'. Working in the digital space is particularly challenging for government, which tends to be slower, less agile, and more risk-averse that private sector ICT companies in the industry.

[18] See Asian Trade Centre (2020).

Looking at digital government more broadly, the state still has an important role to play through general policy settings (Australian Productivity Commission and New Zealand Productivity Commission, 2019: 29). Specific digital interventions include:

- enabling – providing regulatory regimes to support the growth of the digital economy, such as the EU's Data Act
- fostering – open government and the use of global data standards
- leading by example – using procurement and regulatory process to encourage the adoption of global standards
- aligning – international standards and conformance infrastructure and consumer protection rules
- including – reducing the digital divide by promoting digital access, affordability, and ability
- building capability – encouraging ongoing skill acquisition and supporting life-long learning
- protecting – data privacy (including right to forget)
- securing – promoting a resilient infrastructure
- learning – funding research and communities of practice
- clarifying – demystifying by countering mis- and dis-information[19]

In undertaking these roles, careful policy scrutiny will be required to ensure that the proposed public policy intervention addresses a genuine public policy problem – a market failure, externality, or public good problem – not merely imposing a public policy intervention that displaces private initiatives. In a domain as dynamic as digital economy, the risk of government failure is as real as market failure risk.

6. Conclusion

This chapter has explored the role of the New Zealand Government in promoting the digital economy through the uptake of digital platforms and standards. It used three short case studies of new government digital services along with an analysis of the impact of GS1 global data standards. The cases studies highlight the important role that bottom–up emergent developments and digital initiatives can play in attaining high levels of digital government performance. However, achieving the full potential of digital technology requires complimentary top–down initiatives, such as a single accepted form of standardised digital identity.

The analysis suggests that, while the government's role is constrained in the platforms and standards space, the state has a crucial supporting role if the potential of the digital economy is to be realised. The discussion of standards brings out the importance of not acting alone or picking winners, but the government proactively adopting and promoting the use of global data standards backed by a regulatory regime to support the growth of the digital economy. The government has adopted this general fast follower approach in the case of cloud computing, with its 'cloud first' policy (New Zealand Government, 2016).

[19] In New Zealand's case, this includes funding public interest journalism (NZ On Air, n.d.).

The New Zealand Government does not appear to have a sustained focus on the potential role of global data standards and global standards more generally. The approach to digital government has focused on technical standards such as web access to support the Government Enterprise Architecture (part of the Government Chief Digital Officer's mandate) rather than the digital transformation of New Zealand (for which the mandate lies with the Ministry of Business, Innovation & Employment (MBIE)). Global data standards could fall under the Digital Strategy for Aotearoa. The final strategy has no sustained discussion of data standards and one passing mention of ISO standards (New Zealand Government, 2022b). While the issue of global data standards and standards generally is on the radar of the MBIE officials involved, no substantive policy analysis or work is under way (in 2022) to address the issue and move it forward.

COVID-19 had a mixed impact on digital developments, slowing one case down and speeding up another, but the digital platforms in place proved very useful in responding to COVID-19 and have accelerated interest in paperless trading based on global data standards.

While much has been achieved from applying digital technologies to government services in New Zealand, these improvements have been patchy and often incremental rather than transformative. In the platforms and standards space, the government's main role has been as a fast follower, not a leader. This approach requires actively tracking and building on the lead that others have taken rather than acting alone or proactively picking winners. An active supportive role will be critical in achieving network effects and accelerating important initiatives such as paperless cross-border trade.

This chapter has explored the proposition that the role of global data standards in the 21st century is similar to the role that standardised barcodes and container sizes played in the late 20th century. The key challenge in the digital platforms and standards space is for government to find a sweet spot that is the equivalent of the Goldilocks zone – neither too hot nor too cold. In summary, the key lesson for other countries from New Zealand's experience with digital platforms and standards is the sweet spot where the government acts as a standard bearer – establishing the overall regulatory regime and then acting as an agile fast follower but not the leader getting out in front or acting alone.

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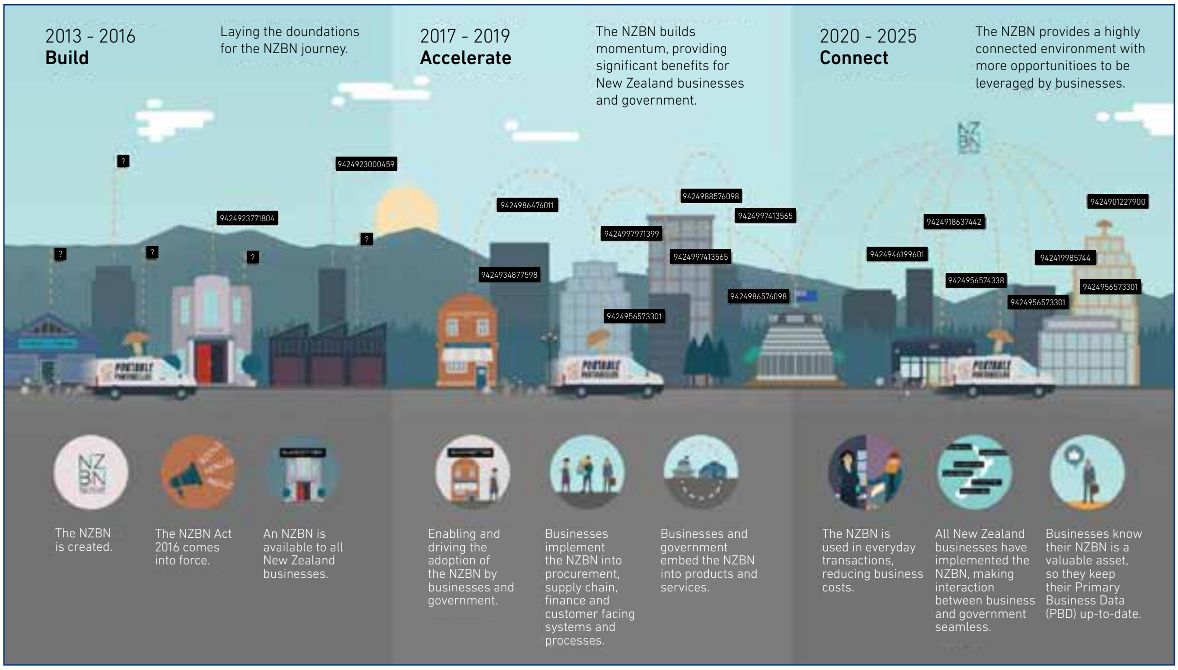
Appendix 1: New Zealand Business Number – a critical piece of the digital architecture

The New Zealand Business Number (NZBN) provides a good example of government as a platform – where the state provides a trusted digital infrastructure platform that enterprises can leverage to make business processes more effective. The NZBN has been created to enable improved electronic delivery of services by providing a trusted platform that is available to all New Zealand businesses and provides access to core commonly used business information such as the business name, phone number, address, and website. Participation by businesses is voluntary, so they opt in to using the NZBN as a register.

It was introduced in 2016 and is a globally unique 13-digit identifier that covers all New Zealand businesses regardless of legal form, so it includes companies, sole traders, and nongovernment organisations, as well as government agencies. Figure A1.1 illustrates the NZBN journey. The NZBN is based on the GS1 system, using a Global Location Number which links to international standards and supply chain logistics. The website and application programming interfaces (APIs) can supply trusted business data such as the legal and trading name, contact details, and (optionally) industry classification and goods and services tax (GST) number. In early 2022, the NZBN register included nearly 700,000 companies and 140,000 unincorporated entities.

The infrastructure to allow the sharing of core information has been in place for over 7 years, as shown in the Figure, and the understanding of the value proposition has evolved over that time. The original NZBN business case focused on the benefits of fewer duplicated transactions when registering an entity or updating primary business data. Using a central register was estimated to create annual savings of NZ$60 million for businesses. Subsequent programme updates as part of the 2017 budget process highlighted that the network effects to all government agencies and businesses from the NZBN were far more significant than the savings identified in the original business case. This was because of the scope to use the NZBN to improve business processes and introduce new services (MBIE, 2017).

Figure A1.1. NZBN – The Journey from Concept to Trusted Valuable Platform



NZBN = New Zealand Business Number.

Source: New Zealand Ministry of Business, Innovation & Employment.

The central government has committed itself to fully using the NZBN in its day-to-day transactions with business. A formal whole-of-government direction was approved that binds arm's-length central government bodies as well as departments of state. All public agencies are required to prioritise implementing electronic systems over paper-based systems, including the use of APIs, and any new or replacement systems must be fully compliant with the NZBN system. That includes an agency's systems being able to identify a counterpart entity's NZBN (without requiring an additional identifier), and the public entity's NZBN must be included in any outward written communications (New Zealand Cabinet Office, 2018).

For businesses, the NZBN offers free access to a trusted repository of curated business information that is integrated into the wider GS1 ecosystem. An information updating service is provided via email alerts or APIs so that changes in core information can be updated on their systems. The trusted information provided through APIs enables organisations to automate the import of the updated data directly into their systems and process it with consequential savings, reduced risk, and great accuracy.

The NZBN ecosystem is being enlarged, so core information is extended to include sub-entity geospatial data. Using the NZBN Organisation Parts, business can assign identifiers to different physical locations (such as depot delivery addresses) or organisational components parts (branches or departments). This enables messages and physical transactions to be directed to the right place.

'The NZBN allows the New Zealand economy to adopt game-changing automation such as universal electronic invoicing' (New Zealand Government, 2019: 36). It also underpins new services such as Business Connect (Appendix 2). An unexpected use came with New Zealand's response to the coronavirus disease (COVID-19). The NZBN provides the platform for the QR codes used on posters to enable New Zealanders to sign into locations and enable contact tracing using the NZ COVID Tracer app.

The impetus for the creation of the platform came from the previous administration's Better Public Services programme, 2012–2017 (New Zealand Government, 2012). Better for Business (Result 9) targeted a 25% reduction in the cost to businesses of dealing with the government by 2017. Creating the NZBN required the commitment of both funding and legal backing. The New Zealand Business Number Act took effect in 2016 and initially applied to companies. Funding became available as part of the Better Public Services programme.

Looking ahead, challenges remain, including:
- expanding the coverage of unincorporated traders in the NZBN, as not all small businesses are on the register;
- ensuring all the data fields are complete or shareable through the APIs; and
- increasing awareness of the NZBN, as this is much higher for government transactions than for enabling business-to-business transactions.

Appendix 2: Business Connect – a joined-up government-to-business platform

The Business Connect initiative builds on the foundation provided by the New Zealand Business Number (NZBN). It is developing a digital platform that aims to transform the way firms apply for regulatory permissions to operate (licences, permits, and other approvals), and spans both central and local government. It has a user-centric design philosophy focusing on 'putting business in charge of its information' by 'bringing all related regulatory processes into one place'.[1]

Like the NZBN case, the impetus for the platform came from the previous administration's target to reduce the cost to businesses of dealing with the government, as part of the Better Public Services programme. Research conducted by the New Zealand Institute of Economic Research (NZIER, 2015) found that the administrative costs of complying with regulatory and tax requirements were around NZ$5 billion or 2.4% of gross domestic product (GDP). Follow-up qualitative research focused on identifying businesses' 'pain points' to be addressed.

The proof-of-concept pilot projects started in 2019 and focus on the hospitality sector (liquor and food licences) and subsequently exporting (customs deferred payment). The trials found that considerable productivity gains were possible (up to 90% reductions in compliance costs) while improving the accuracy of the information reported. This is because licence renewals were pre-populated with data from the previous applications, eliminating the need for repeated data entry.

The second wave of the coronavirus disease (COVID-19) in New Zealand in 2020, which was limited to Auckland, provided an opportunity to demonstrate the platform's capabilities. Staff were able to spin up a system for producing business travel permits for businesses wishing to cross the new internal border around Auckland.

In 2020, the programme was able to secure ongoing baseline funding to underpin the programme and scale up to full production. The platform was aligned with an election manifesto commitment to reduce compliance costs for small business.

With funding secured and looking ahead, the next phase focuses on the transitions from proof of concept to scaling up the platform. Priority areas for development include international trade, hospitality, and business administration, along with building consents.

1 See Eppel (2019) for a summary of a similar 'life events' approach that focuses on putting all public information together for key transitions such as birth, marriage, and death.

Interlocutors highlighted a number of challenges:

- Funding: The Better Public Services programme provided the mandate but without funding, so finances had to be secured from other sources. The Government Chief Digital Officer funded the original proof-of-concept pilot project, but other one-off sources had to be located to keep the programme running.
- Mandate: The Better Public Services programme, and subsequently an election manifesto, provided a broad political mandate. Interestingly, the wider digital government strategy provided a limited role in the development of the platform beyond funding the original proof-of-concept pilot project.
- Organisational buy-in: It was difficult to get agencies to engage in the programme despite the broad mandate. Agencies were reluctant to take part in a platform that ‘was not invented here’ as it was perceived as ceding control.

Appendix 3: Beneficial Ownership – an enforcement tool to follow the money

New Zealand has been an early adopter of digitisation in the government business services space. For example, the Intellectual Property Office is fully digitised, and the Companies Office was the first in the world to make company registration fully online. However, the ease of registration had a downside as it is attractive to both legitimate and illegitimate businesses. For the latter, there is currently limited visibility in New Zealand of individuals who ultimately own or control companies and limited partnerships.

There are a number of reasons why people might not want the effective owners of businesses to be known, and many of these are not good reasons. Criminals use the opacity of corporate vehicles to hide their identity and to hide the proceeds of crime such as money laundering, bribery, and corruption. It is also a vehicle for tax avoidance purposes and potentially for the financing of terrorism.

The Financial Action Task Force, an international body that sets standards for anti-money laundering and combatting the financing of terrorism, has issued guidance for countries on beneficial ownership. These include that details about persons and legal arrangements should be sufficiently transparent, and that accurate and up-to-date basic and beneficial ownership information is readily available to the relevant public enforcement agencies. A Financial Action Task Force review of New Zealand conducted in 2020[2] was critical of the lack of ownership disclosure of beneficial corporate entities.

Following three rounds of public consultation starting in 2018, in December 2021, the cabinet decided to establish a unique identifier for individuals who are beneficial owners, directors, and general partners and to require companies and limited partnerships to disclose details of their beneficial owners to the Companies Office:

> Companies and limited partnerships [are] to provide information on their beneficial owners, which the Registrar will hold on a database. Some of this information – such as the individual's name – will be made publicly available on the companies and limited partnerships registers. Other more sensitive details – such as date of birth and residential address – will not, but will be made available under certain conditions to certain government agencies and anti-money laundering reporting entities (New Zealand Government, 2022a: 1).

Information is currently made available on corporate office holders, but cross holdings or unique identity are difficult to establish. The creation of a unique digital identifier in a registry of corporate role-holder identifiers has a number of advantages. It will be easier for businesses to undertake due diligence on other entities, reducing risks to creditors from phoenix companies, for example. It will also assist enforcement agencies to detect potential unlawful activities.

[2] https://www.fatf-gafi.org/en/publications/Mutualevaluations/Mer-new-zealand-2021.html

The next stage in the process is the release an exposure draft of the Bill for consultation, planned for 2023. The go-live date for the reforms will depend on when Parliament passes the legislation.

Several key points emerge from this case study:

- Actions have indirect consequences: New Zealand ranks first in the world on the ease of doing business, but this has made New Zealand attractive to illegitimate businesses as well as legitimate ones.
- Improved openness raises issues of privacy: While information on beneficial owners will be made available to enforcement agencies, only very limited information will be publicly available. Indeed, the Privacy Commissioner opposed any inclusion of beneficial owners' information on the companies and limited partnerships registers (but not the creation of unique identifiers).
- Elapsed time: Lack of information about beneficial ownership and difficulties with identifying office holders have long been recognised by key policy advisers. This has not been held back by any technical issues associated with designing the platforms required – the key challenge has been getting and keeping this development on the busy policy agenda and (with more than one budget bid failing) sourcing appropriate funding for the not insignificant establishment costs ($7.8 million). Unlike other cases in this chapter, in this case, the coronavirus disease (COVID-19) has slowed development.
- Priority and resourcing: Getting this development over the line and ready for execution will require two scarce things – sitting time in the legislature to consider legal amendments and operation funding to support the function over its life.

Appendix 4: Global standards – the role of bar codes and containerisation

What is a standard?

In this appendix, we discuss technical standards,[1] by which we mean published documents setting out technical specifications for products, systems, or services that are typically backed by systematic testing. It is important to distinguish standardisation from the broader and vaguer concept of harmonisation, which includes interoperability as well as the adoption of common standards. The use of standards involves an agreement to do things in the same way, normally based on a written standard that has gone through a standards development process and backed by a conformance infrastructure of testing by accredited agencies.

Technical standards take four main forms: they can be international or domestic, and they can be public or private. Standards developed by intergovernmental organisations can influence national policymaking, both directly when the government adopts standards such as CODEX or indirectly through the standards development process. The national standards body either adopts standards developed by international bodies like the International Organization for Standardization (ISO) or develops domestic standards using a formal process involving explicit communication and negotiation to reach agreement. Private standards do not have a standard development path, but proprietary standards are generally developed by unilateral action. Some – like Bluetooth – involve a hybrid approach with both communications and unilateral commitment.[2]

Standards are diverse, as they can focus on physical attributes such as container and pallet sizes or intangible attributes such as sustainability, labour conditions, ethical treatment, or organic production. There are four main types of standards:

- Proprietary standards (business to business (B2B) or business to consumer (B2C)) – typically private standards – where one firm seeks market dominance by developing incompatible technologies, both tangible and intangible (e.g. Apple vs Android).
- Physical tangible attributes (B2B) – public and private standards that reduce common costs (e.g. pallet or container sizes).

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1 The International Organization for Standardization (ISO) definition is: 'A standard is a document that provides requirements, specifications, guidelines or characteristics that can be used consistently to ensure that materials, products, processes and services are fit for their purpose'. https://www.iso.org/deliverables-all.html#IS
In the World Trade Organization (WTO) Technical Barriers to Trade (TBT) Agreement (Annex 1.1), standards are defined as a 'document approved by a recognized body, that provides, for common and repeated use, rules, guidelines or characteristics for products or related processes and production methods, with which compliance is not mandatory. It may also include or deal exclusively with terminology, symbols, packaging, marking or labelling requirements as they apply to a product, process or production method'.

2 An ongoing unresolved debate is under way within the WTO about how private standards fit within the WTO system and whether private standards are covered. The debate has been ongoing since Saint Vincent and the Grenadines raised the issue of private standards at the WTO Committee on Sanitary and Phytosanitary Measures in 2005. See the discussion in McDaniels and Wijkström (2013).

- Value chain integration (B2B) – public and private standards that combine both tangible and intangible attributes (e.g. GS1).
- Intangible credence goods (B2C) – free range eggs, organics which can be private or public standards.

Recent world economic history provides two examples of transformational change brought about by standardisation: barcodes and container sizes.

Barcodes had significant direct and indirect effects

Since the 1960s, the introduction of barcodes and associated data standards have affected labour productivity in two ways:

- They increased labour productivity by accelerating worker throughput – an improvement in labour productivity.
- They generated labour cost savings from a combination of automation, eliminating tasks, reducing errors, and removing duplication.

Basker (2011) found that the introduction of barcode scanners to automate supermarket checkout systems from 1972 to 1982 raised a store's labour productivity by 4.5% on average, following the first few years of adoption.

The barcode's transformational change involves more than cost reductions.[3] Ellickson (2016) found that the scanner also supported four additional effects:

- An increase in the number of products sold in supermarkets from 9,000 to 30,000.
- An increase in the number of products sold per worker and the number of products per metre of shop floor space.
- An increase in market research capabilities through the improved visibility of consumer behaviour.
- An expansion of the supply and logistics sector and associated technologies to manage the coordination and delivery of an increased product range.

Containerisation – the long road to international standardised sizes

The use of containers started in the 19th century and developed slowly thereafter, so it was not a new idea that shipping goods in containers was a significant improvement on the traditional break bulk system of individual items being loaded onto and stowed on ships. The breakthrough came in 1956 with the introduction of standardised containers by American entrepreneur Malcolm McLean. McLean ran a trucking business, and his big idea was that containers provided more than just a better means of shipping goods from one port to another. Containers could be intermodal and transported by truck and train as well as ship, so they could transform the whole logistics chain from factory to destination. The growth in containerisation led to dramatic reductions in transport costs, which transformed production by allowing global value chains.

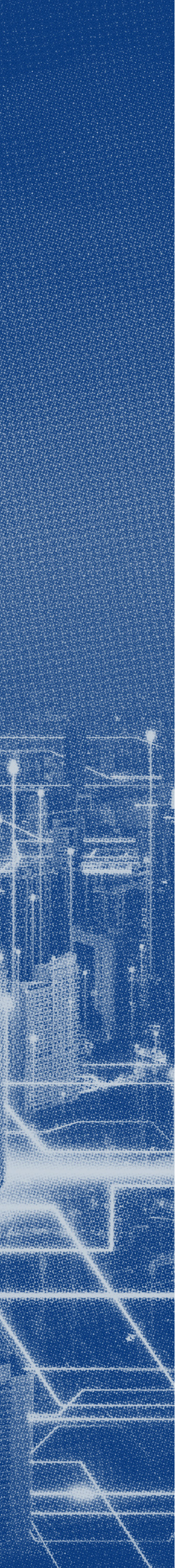
[3] See also BBC (n.d.).

While the precise impact of containerisation on shipping costs is difficult to assess, it is generally accepted that containerisation is one of the major drivers of globalisation and the impact of international standardised containers was more important for the growth of world trade since World War II than successive rounds of tariff reductions (Levinson, 2006).

While obvious in hindsight, the task of developing a common standard involved a tortuous process that lasted nearly a decade. As there are incumbent firms with existing processes, the details adopted as part of a common standard would benefit some firms over others. The container size and design selected had fundamental implications for the design of ships, cranes, and trucks. The history of developing standardised container sizes and specifications involved parallel processes dominated by competing interests. Three competing processes were established in the United States after 1958 to develop standards for containers, culminating in a common standard being adopted by the ISO in 1966.

Levinson (2006: 149) concluded that:

> in hindsight the process (of standards development) can be faulted in every particular. It led to corner fittings that were too weak and needed redesign. Several newly approved container sizes were uneconomic and were soon abandoned ... No one would declare all of the subcommittees and task forces had come up with an optimal solution. Yet after 1966 compromise were reached on issue after issue a fundamental change would be seen in the shipping world. The plethora of shapes and sizes that had blocked the development of containerisation gave way to standard sizes approved internationally.



Chapter 2

Digital-Empowered Online Public Services: Japan's Experience during the COVID-19 Pandemic

Hiroki Yoshida

1. Introduction

Since 2020, coronavirus disease (COVID-19) infections have spread around the world and many people have suffered from the virus. Given this situation, the Government of Japan undertook several measures, such as contact tracing and vaccinations, to stop the spread of the virus. It also provided economic support for citizens and businesses, as the disruption to physical activities caused by the virus severely affected business activities.

Most government administration was paper-based before the COVID-19 pandemic. Government processes generally required traditional stamps and most agencies did not have the capacity to deliver their services online. Even if they did, the quality was poor and few people used them.

This is not to suggest that the government did not recognise the importance of introducing information technology (IT) to achieve efficient government administration. The government published 'e-Japan Strategy' in 2001 (Government of Japan, 2001), and the Strategic Headquarters for the Promotion of an Advanced Information and Telecommunications Network Society (IT Strategic Headquarters) was established in the Cabinet Office to promote the digitalisation of government administration, but it had little power over other agencies. As a result, the digitalisation of government services has not advanced because of lack of leadership.

In 2016, My Number – a national identification number for social security and tax purposes – was introduced. The government released the My Number Card as an authenticator for online administrative procedures connecting with My Number. However, concerns over data leaks have prevented widespread use – in February 2020, before the pandemic, only 25% of the population had a My Number Card.

In May 2019, the Act on Use of Information and Communications Technology in Administrative Procedure was amended and it advised government agencies to deliver their services online in general. However, it was not compulsory, and most agencies did not have sufficient capacity to digitalise their processes. They had neither the capacity to develop and operate digital services by themselves nor the motivation to digitalize their services because they were busy dealing with day-to-day tasks.

In 2020, the COVID-19 pandemic forced government agencies to provide digital services to citizens and businesses. People were frustrated with some services because of the large gap between expectations and reality. People were used to convenient digital applications (apps) provided by private companies, so they were not willing to accept non-user-friendly services. Although government officers struggled to deliver public digital services, some services succeeded in meeting users' needs while others did not.

2. Key Learning from Public Digital Services during COVID-19

The government delivered several digital services during the COVID-19 pandemic in response to demand from citizens and businesses. Before that, digitalisation of government services was not a high priority and most government agencies allocated few resources for it. COVID-19 made them notice its importance. Several learnings may be learnt from the quick deployment of digital services. Some cases are outlined below, specifying the learnings for government digitalisation.

2.1. Open API and OSS for rapid deployment

Governments' open application programming interface (API) and open-source software (OSS) have significant capacity for developing collaboration amongst stakeholders to create user-centric digital services quickly during emergencies. We observed two practices during COVID-19.

Case 1. Search service on support for SMEs through Open API

The Small and Medium Enterprise Agency, which deals with policies for small and medium-sized enterprises (SMEs) under the Ministry of Economy, Trade, and Industry, employed several measures to support small businesses during the COVID-19 pandemic. The declaration of a state of emergency restricted people from going out, which damaged SMEs economically. Information on support for SMEs was fragmented on each government agency's website, making it difficult for businesses to find appropriate help. To improve this situation, the Small and Medium Enterprise Agency standardised the data model of support measures for businesses, created a database, and made it open data via APIs. To do so, the agency collaborated with Line, the most popular mobile messaging app in Japan, to provide a service that enables SMEs to search for support measures on their smartphones (Figure 2.1). In addition, Yahoo! Japan created a user-friendly interface on its search portal and provided search services for businesses using the APIs (Figure 2.2). Tokyo Metropolitan Government also created a database of its own support measures in the same format as the data model created by the agency, and integrated it with the central government's data to create a search site for businesses in Tokyo (Figure 2.3).

Standardisation of the data model, and open data based on it, created collaborations amongst the Small and Medium Enterprise Agency and private companies and local governments. In addition, open APIs enabled private companies and local governments to create user-centric digital services through their customised user interfaces, which expanded the touchpoints of information for SMEs.

Figure 2.1. Schematic Diagramme of Oil Refinery Process

SMEs = small and medium-sized enterprises.

Source: Ministry of Economy, Trade and Industry.

Figure 2.2. Support Search Site on Yahoo! Japan

Source: Yahoo! Japan.

Figure 2.3. Support Search Site on Tokyo Metropolitan Government Website

Source: Tokyo Metropolitan Government.

Case 2. Dashboard for COVID-19 through OSS

Tokyo Metropolitan Government created a dashboard that summarised the number of infected people, the status of hospital beds, and other information so that citizens could easily understand the changing COVID-19 situation (Figure 2.4). This website was created under commission by a civic tech organisation called Code for Japan. The development of this site was managed by GitHub, a major open software development platform. Citizens with IT skills submitted pull requests and issues, which were reflected in the development of the site. This helped ensure that the site was accessible for people with disabilities. The display of numerical values was designed to avoid biased interpretation. This site received the Good Design Award in 2020 because of its user-centric interface and the collaborative development process involving the government and citizens. As its source code was open through GitHub, civic tech organisations in other prefectures also used it to build their own dashboards and provided information in cooperation with their prefectural governments.

We can learn that collaboration between a local government and a civic tech group enabled the rapid creation of a user-centric dashboard on the infection situation. In addition, OSS enabled other civic tech groups to create dashboards rapidly in their prefectures.

Figure 2.4. Tokyo Metropolitan Government COVID-19 Dashboard

COVID-19 = coronavirus disease.

Source: Tokyo Metropolitan Government.

From these two cases, we can learn that open APIs and OSS encourage collaboration between central and local governments, governments and private companies, and governments and civic tech groups – enabling stakeholders to deliver user-centric services quickly.

For search portal and messaging service companies, providing government information increases their number of users, creating an incentive to develop services using government APIs. In addition, the services provided by private companies are more convenient for users to get information because they are more popular than the government's websites. This is consistent with the mission of government agencies to disseminate information to as many citizens as possible.

Open source public digital services are effective in enabling multiple administrative entities to provide the same services quickly through software. Furthermore, by encouraging citizen participation in the development process, it is possible to incorporate users' needs from the inception stage.

In many cases, the development of digital services by Japanese government agencies relies on outsourcing to IT vendors. Therefore, it is easy for a particular vendor to lock in the operation of the software once it has developed it. The contracted vendor usually puts the source code of the service in a black box so that other vendors cannot check and improve it. OSS is effective in avoiding such lock-in by vendors.

In the Republic of Korea, once an administrative system has been developed, it becomes open source through an 'e-government platform' and no other system related to the same procedure is allowed to be built. If we manage government systems at the source code level, efficient system development becomes possible.

2.2. Creating an integrated cloud database for better operations

Standardisation of residents' personal data and an integrated database are essential for efficient government operations nationwide, such as vaccinations.

The Ministry of Health, Labour and Welfare (MHLW) initially planned to have local governments manage citizens' vaccination records. However, each local government managed vaccination records in different data forms and databases, so the central government expected that it would be difficult to grasp up-to-date national vaccination records. In addition, the data would have to be standardised to provide digital vaccination certificates. Under these circumstances, the IT Strategic Headquarters developed a cloud-based vaccination record system (VRS) that allows each local government to upload citizens' records in the same data model (*Nikkei Asia*, 2021). Before the VRS was developed, each local government issued paper coupons and each coupon had a unique identification number. The IT Strategic Headquarters distributed tablets with an app to read the coupon number for each vaccination site (Figure 2.5). Operators at the vaccination sites uploaded the number to the VRS, linking it to other data (e.g. the name of the vaccine and the date of vaccination) to record each citizen's vaccination status in a standardised form.

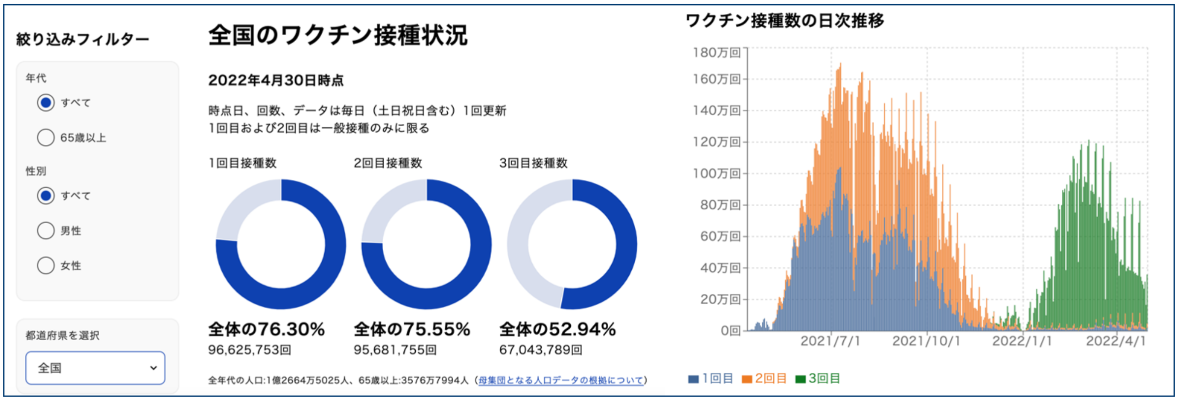
This allowed the central government to create a dashboard with the total number of vaccinations in Japan, which helped the government analyse the vaccination status and plan how many vaccines to supply throughout the country (Figure 2.6). Since December 2021, the government has issued electronic vaccination certificates on the mobile app based on the data from the VRS.

Figure 2.5. Coupon Number Reader for VRS

VRS = vaccination record system.

Source: IT Strategic Headquarters.

Figure 2.6. Digital Agency Dashboard for Vaccination Records



Source: IT Strategic Headquarters.

The VRS enabled the central government to manage vaccination records by centralising data management. It also enabled local governments to register citizens' vaccination records efficiently by using the VRS. Standardised records on the VRS were used for a variety of services, such as data visualisation, analysis of vaccination status, and issuance of vaccination certificates.

It is important that basic personal data of citizens are managed in the same data model for procedures nationwide. If the data can be shared between the central government and local governments, more efficient operations are possible. In the case of the VRS, the central government developed and maintains the system, while the local governments use the system for operations. This kind of collaboration provides more efficient public digital services to citizens.

In countries where digital government has progressed, such as Denmark, a base registry has been established and it can be used in various administrative procedures to reduce repeated inputs of the same data by citizens and businesses for administrative government processes. Digital Agency is also studying the use of a government cloud for 17 local government operations, and the Ministry of Internal Affairs and Communications (MIC) is working on developing a standardised data model for these procedures.

2.3. Distribution of digital IDs for uniform services to citizens and businesses

During the COVID-19 pandemic, not all citizens and businesses had digital IDs. This prevented government agencies from delivering services appropriately online as they could not identify all the eligible recipients.

Cash support for individuals. The central government provided cash livelihood support of ¥100,000 to each citizen from the end of April 2020. The MIC took the lead in managing this budget, but the actual operations of providing the cash were left to each local government. Citizens had to apply to the local government for the cash, and the application method was decided by each local government. The central government recommended local governments to operate the applications through the My Number Portal, an electronic application portal managed by the MIC.

However, as of May 2020, only 25% of the population had a My Number Card, which has an integrated circuit chip for citizens to get authenticated on the My Number Portal. This meant that the number of citizens who could apply for cash support online was limited.

In addition, even if local governments accepted applications from citizens via the portal, the data from the electronic applications could not be processed automatically since the residents' information database was separate from the network of the local governments' database. Officers in local governments spent a considerable amount of time ensuring that the data from the electronic applications was authentic. This caused some local governments to prefer receiving applications by post instead of electronically. Moreover, only the head of the household could apply for the cash of all the family members – even if the family had problems such as domestic violence. The electronic application process was thus frustrating and time-consuming for both public servants and citizens.

The application for citizens' cash support should have been a uniform process, but it was left to each local government to handle differently. Personal data of residents held by local governments could not be connected to their application data because it was on a separate network. This made the operational process inefficient, and many local governments stopped using the electronic My Number Portal (Figure 2.7). In addition, not all citizens could apply for the cash support electronically because of the low uptake of digital IDs for online authentication. These were the main problems facing online applications for cash support to citizens.

Figure 2.7. Applications for Cash Support to Citizens Website

Source: Ministry of Internal Affairs and Communications.

Cash support for businesses. The Small and Medium Enterprise Agency provided cash support to businesses that had sustained economic damage based on the percentage decrease in sales from 2019 to 2020. Businesses were required to apply for it through the electronic system provided by the Ministry of Economy, Trade and Industry (METI).

Corporations could be easily verified through the Corporation Number allocated by the National Tax Agency. However, it was difficult to verify the existence of individual business owners due to the lack of a unique ID number, resulting in the falsification of IDs and illegal receipt of the support. In addition, regarding the evaluation of the percentage decrease in sales, the 2019 sales could be confirmed by the certificate of tax payment but the 2020 sales were self-reported by business owners so the figure could be falsified.

As a result, many illegal applications by individual business owners were discovered and they were arrested (Iwasaki, Adachi, and Machida, 2020). The Small and Medium Enterprise Agency formed a team to investigate such illegal applications, and significant efforts were made to uncover them. The lack of unique ID numbers for individual business owners led to inadequate verification, resulting in illegal applications. The ID number and authentication system are important to verify businesses in online applications. There was no means of accurately capturing the sales of the businesses, and self-reporting led to the possibility of inaccurate sales reports. To prevent these incidents, government agencies should have had APIs to obtain such data from businesses' accounting software.

We can see that it is necessary to develop identification numbers and authentication systems for citizens and businesses to prevent identity theft and fraudulent receipt of cash support. Unlike offline processes, it is very difficult to verify and authenticate the existence of persons or businesses in online application processes. The Government of Singapore is promoting the acquisition of Singpass for citizens and Corppass for businesses to create an environment that facilitates online identification.

The Government of Japan is also promoting the acquisition of the My Number Card for citizens. As of March 2021, 43% of the population had the card. For corporations, it is promoting the use of gBizID.[1] Widespread use of digital IDs is the basis for the provision of online digital services by the government.

[1] An authentication ID service that had been widely used by 930,000 companies and individual business owners as of March 2023 (gBizID, n.d.).

2.4. IT capabilities in government

In the early stages of the spread of COVID-19 infections, a contact confirmation app on smartphones was planned in Japan as well as other countries. The app intended to enable citizens to avoid contact with infected people and to discover the infection route at an early stage. The IT Strategic Headquarters in the Cabinet Office planned the app but did not have adequate budget for development and operations or human resources. The MHLW, which became responsible for the app, proceeded with its development based on the specifications made by the IT Strategic Headquarters.

The Japanese Contact-Confirming Application (COCOA) was developed based on the API provided by Google and Apple, so that contact confirmation could work between Android smartphones and iPhones (Figure 2.8). However, the MHLW did not initially have enough administrative staff familiar with the app's development and relied on contracted vendors for its development and operation. As a result, APIs were not updated – causing problems such as contacts not being recorded due to app errors, which led to distrust amongst citizens.

Figure 2.8. Images of COCOA

COCOA = Contact-Confirming Application.

Source: Ministry of Health, Labour and Welfare.

As the IT Strategic Headquarters had no budget or in-house development team, ownership was transferred to the MHLW. However, the MHLW had not engaged with the project until it became the project owner. The MHLW's understanding of COCOA was inadequate, so it had to depend on the contracted vendors and did not know how the app functioned. The MHLW lacked ownership of the app as well as IT literacy. Because of this, it did not notice app malfunctions until citizens reported them.

In COCOA and many other cases of government system development, most government officials have lacked IT literacy and have thus been dependent on IT vendors. They have had little awareness of the need to take ownership of the project and provide digital services in a user-friendly manner. This has provoked widespread public criticism of inadequate administrative systems (*Kyodo News*, 2021).

To improve capacity for the development of digital services within the government, it is necessary to enhance the IT literacy of administrative officials. However, this requires significant medium-term investment in training. Because most civil servants are more familiar with laws and politics than IT, it takes time for them to acquire the skills related with digital services. To nurture the IT capacity of government organisations in the short term, it is necessary to hire IT professionals who have worked in the private sector, and government officials should work with them to build a team that can transform the organisational culture.

The United Kingdom's Government Digital Service is a pioneer in building such an organisation. It has not only outsourced services to IT vendors, but also promoted in-house development so that it can deliver user-centric public services. In Japan, METI and the Ministry of Agriculture, Forestry and Fisheries have tried to create such a team inside the ministries to improve their digital services since 2018 – introducing IT professionals into their team and creating a new culture for service development (Eaves and Kailasa, 2022).

In terms of local governments, Tokyo Metropolitan Government hired the ex-chair of Yahoo! Japan as a vice governor from 2019 and established the Digital Service Bureau in 2021. Kobe is taking similar initiatives. It launched a programme called Urban Innovation Kobe to collaborate with start-ups in introducing new technologies into its public services.

3. Founding Digital Agency

Digital Agency was established as a top agenda item of the Suga administration in September 2020 (Kyodo News, 2020). The cases above reveal many issues regarding the digitalisation of government services, such as online applications for cash support to citizens and businesses and COCOA. People also consider it important to enhance the IT capability of the government (Okutsu, 2020). A bill to establish Digital Agency was submitted to the Diet in 2020, the law was passed in May, and Digital Agency was launched in September 2021 (Suzuki, 2021).

3.1. Overview of Digital Agency

Digital Agency started with about 600 staff, including about 200 IT professionals from the private sector. This was an initiative of the Minister of Digital Affairs to create a new type of government organisation based on digital technology.

Digital Agency is responsible for developing and providing administrative services and processing systems that should be uniform – not only to all the central government agencies but also to local governments. It also supports the digitalisation of public services operated by private entities, such as education, medical services, and mobility services.

Its upper management includes not only government officials but also CxOs (Chief Executive Officer, Chief Design Officer, Chief Technology Officer, Chief Product Officer, and Chief Architect) from the private sector. This allows Digital Agency to introduce a new culture for product development and organisational management.

The agency has four groups:
(i) a group for citizens' services, which delivers frontline services to citizens and businesses;
(ii) a group for common digital infrastructure, which develops common functions and infrastructure for digital services;
(iii) a group for government agencies, which delivers back-office services to government agencies; and
(iv) a group for strategy and organisation, which manages the organisational operations of Digital Agency and sets the strategy for all government digitalisation.

Each group has teams for digital service products, and the teams collaborate with each other to deliver them effectively.

It also has technical units that consist of specialists such as product managers, designers, architects, and engineers. These units dispatch specialists to the product team, depending on the needs of the products.

3.2. Mission, vision, and values of Digital Agency

Unlike other government agencies, Digital Agency set its mission, vision, and values when founded. Digital Agency has substantial talent from different backgrounds. In this situation, employees within the organisation need to have shared norms for working together efficiently.

Digital Agency aims to deliver user-centric services to citizens in opposition to the poorly designed government services in the past. Its mission – human-friendly digitalisation: no one left behind – indicates the agency's belief that government services should be user-friendly for all citizens. Government services should be accessible to all because all citizens use them. Users have different levels of IT literacy, e.g. not all old people know how to use digital devices such as smartphones. Digital Agency should care about people from all kinds of backgrounds.

As well as the mission, the government-as-a-service vision indicates that Digital Agency should be like a digital service company – unlike the usual government offices. If all government operations and services are digitalised, physical windows at ministry buildings and city offices will become redundant apart from a limited number of specific needs. In such a situation, government services are like other private services. Digital Agency should close the quality gap between public and private services. This should be realised through collaboration between the government and private companies.

In Japan, government agencies have a tradition of life-long employment and rarely hire outside professionals. This makes it difficult to acquire new capacities within organisations. In this sense, Digital Agency is a kind of venture organisation within the government. The government-as-a-start-up vision indicates that Digital Agency has the spirit to challenge issues in creative ways using digital technologies.

Values are important in changing government culture. By setting values, we can share what we believe for working together in the same organisation. In many cases, people in the central government forget to think about users' experiences of their services. 'For everyone in this country' is an attempt to change such an attitude on the part of government officials. In a large organisation, such as government agencies, employees tend to forget their job purpose. 'Always with a sense of purpose' reminds them why they are working for Digital Agency. 'Across all positions' means that people in Digital Agency should collaborate with many types of stakeholders not only inside but also outside the agency. They need to understand and accept the difference between stakeholders to collaborate closely with them. Lastly, 'Continue to challenge ourselves for impact' means that the agency should create a positive impact on society by confronting challenging issues instead of ignoring them and doing routine work.

These values try to break the traditional culture of bureaucratic government organisations and create a new working environment for both public officials and IT specialists from the private sector (Box).

Digital Agency's Mission, Vision, and Values

Mission

- Human-friendly digitalisation: No one left behind
  We strive to create the future of Japan we all could take pride in and to envision a digital society where diverse forms of happiness are realised.

Vision

- Government as a service
  We offer services that maximise the value of the user experience through organic collaboration with national and local governments, the private sector, and all other stakeholders.
- Government as a start-up
  We lead the digital transformation across society in a bold and speedy way, with mutual trust and learning from a multitude of challenges through aspirational talent from the public and private sectors.

Values

- For everyone in this country
  We will prioritise delivering benefits and user-centric services to the people of Japan, while maintaining the highest ethical standards. We will listen to the voices of the silent majority and care for everyone to create a society where everyone can benefit from the digital society.
- Always with a sense of purpose
  We will challenge assumptions and the status quo in a constructive manner, actively adopt new methods and concepts, and strive to take the world's leadership positions [for government digitalisation]. We will constantly remind ourselves of our objectives, have the courage to decide to discontinue, and be productive in delivering our work.
- Across all positions
  We will collaborate as a team by respecting diversity, empathising, and learning from and complementing each other. We will act with independent minds based on mutual trust in an open, flexible, and transparent environment.
- Continue to challenge ourselves for impact

We will act with speed and seek feedback without excessively pursuing perfection. We will continue to challenge ourselves to create impact. We shall do so by growing as an organisation and giving back to society as a pioneer. As we face a multitude of challenges and setbacks, we will apply learning from these experiences and review/revise our value propositions to users.

Source: Digital Agency (n.d.).

4. Expectations for Digital Agency

The establishment of Digital Agency was motivated by the government's desire to improve the content and quality of digital services, especially when facing challenges during the COVID-19 pandemic. Drawing from learnings presented in section 2 of the paper, Digital Agency aimed to improve digital government from the following three aspects: (i) create digital infrastructure for government services, (ii) collaborate with multiple stakeholders for delivering better public services, and (iii) nurture IT capabilities and innovate the culture from within the government (Clarke, 2020).

4.1. Creating digital infrastructure for government services

Japanese government systems are so fragmented that they cannot deliver government services effectively. Most systems are on-premises and are not assumed to connect with one another for data exchange. Digital Agency should reform this situation by using APIs and cloud services.

The My Number Card for citizens and gBizID for businesses were developed for uniform authentication on government systems, but they do not cover all online applications. Moreover, these digital IDs have not experienced a high uptake in Japan. This was one of the biggest obstacles for citizens in applying for cash support during COVID-19. Digital Agency needs to accelerate the distribution of digital IDs. Improving the user experience of authentication is another issue. Digital Agency plans to develop a mobile app that embeds the functions of the My Number Card into smartphones so that citizens can log into government services more easily online.

A data exchange platform is also important to use existing data within government agencies for administrative purposes For many procedures, government agencies require citizens to fill in the same data on different applications repeatedly because of organisational silos and unconnected systems. If government systems are interconnected, citizens can avoid filling in the same data they already provided for other procedures. Digital Agency plans to develop such a data exchange layer.

As we can see in the case of the VRS, integrated cloud-based systems for local governments will make their operations simple and easy to manage. Japan has 1,741 municipalities and 47 prefectures. These local governments operate their administrations by using customised on-premises systems. Most local governments perform the same tasks, but their systems differ. This creates inefficient IT investment and prevents interoperability amongst local governments. Digital Agency has attempted to resolve this problem by introducing the Government Cloud and standardising software for local administration on it. Under the Government Cloud, Digital Agency procures cloud resources for government agencies and local governments as an aggregator and supplies them to the agencies that require the resources. By using this scheme, Digital Agency plans to change local governments' software for operations on basic services for citizens from their on-premises servers to the Government Cloud by the end of fiscal year (FY) 2025.

Digital Agency aims to create digital infrastructure for efficient government services. These ideas are coming from other countries' practices.

India Stack is a set of basic digital services for citizens to access online government services. It includes an authentication service, digital signature, payment infrastructure, and so on. These functions should be uniform because it is difficult to coordinate services that are developed separately by individual agencies (Dattani, 2019).

Estonia's X-Road is an example of a data exchange platform that enables government agencies to exchange data for efficient administration by reusing data that has already been input by users. In Estonia, this infrastructure is connected with some databases in the private sector, such as banks and utility companies. By standardising the method of connecting with this platform, each system can reduce the cost of its development (Margetts and Naumann, 2017).

Cloud.gov in the United States (US) is an inspiration for the Government Cloud in Japan. The US General Services Administration (GSA) supplies cloud resources to several government agencies. The benefit for agencies in using cloud.gov is that they do not need to check detailed specifications such as security because the GSA has already approved the cloud services. In addition, cloud.gov provides a platform for service development. This support helps government agencies shift to the cloud from an on-premises environment more easily than before.

Digital Agency should introduce these practices to its government systems to accelerate service development. However, it should adapt them to the Japanese context to maximise efficacy.

4.2. Collaborating with multiple stakeholders to deliver better public services

Digital Agency aims to deliver user-centric government services, but all services need not be developed by the agency. As we saw in section 4.1, Digital Agency supplies digital infrastructure for the development of government services. Other government agencies and local governments can use these. We can call this business model 'government to government to citizens' (G2G2C). In addition, if government agencies want to deliver their services through more familiar touchpoints for users, they can collaborate with private companies through open APIs and OSS. Government agencies can create new public–private partnerships by making their data and software open to private stakeholders. Tech companies can provide user-friendly services based on the government's APIs and software. Citizens in civic tech communities can participate in creating digital public services through the process of OSS projects. Digital Agency can also learn about user-centric digital services from such collaboration. We can term these kinds of business models 'government to business to citizens' (G2B2C) or 'government to citizen to citizen' (G2C2C).

As we saw in section 2.1, such collaboration accelerates service development and expansion. To achieve more collaboration, Digital Agency should create an ecosystem for GovTech – technologies that make government services more efficient and user-friendly. GovTech start-ups have been emerging to make government administrations efficient by using digital technologies. A movement for citizens to develop digital services for their local community has also become popular. Digital Agency should involve these players in the service development process and work together for the digitalisation of public services. Digital Agency has a lot of touchpoints with local governments and other government agencies. It already has a community with local governments on Slack, one of the most popular messaging apps. In addition, it co-develops several digital services with other agencies. Digital Agency should become a catalyst for accelerating collaborations amongst public and private stakeholders.

4.3. Nurturing IT capabilities and innovating the culture within the government

To provide efficient and user-friendly administrative services, it is crucial to enhance the IT capacity of government agencies. Government officers have been dependent on IT vendors for years and have lost ownership of their services. This has locked them into contracts with big IT vendors. Since government officers are generally not IT experts, they cannot make appropriate decisions about their investments and simply follow the guidance given by IT vendors. Introducing IT professionals inside Digital Agency attempts to fill the knowledge gap between the government and IT vendors.

Digital Agency also needs internal development teams to create user-centric services as quickly as possible when new demands for digital services arise, such as COVID-19. Internal development teams can start development more quickly than contract-based development. Hiring IT vendors for service development requires the compilation of documents for product specifications, searching for vendors, tendering for the project, and contracting with the vendor. This process does not work when software needs to be developed as soon as possible. In addition, there are a lot of different protocols inside the government from private companies. For example, government agencies' decision-making involves many stakeholders compared with a company's one. Therefore, development teams require close communication with public officers. On the other hand, internal development teams are efficient and meet the need for swift development of services.

Internal development teams can also work to create standards for service development. Government agencies have not had organised methods for developing digital services. Government systems should be interconnected for efficient operations and delivery. If they want to realise this, they need to have their own architecture for government systems and methods of development. Each tech company has its own rules for service development to keep deployment efficient and maintain the quality of its software. The government also requires such mechanisms. Internal development teams can create them while developing their own services and sharing the knowledge with other product teams inside Digital Agency. The development standards nurtured inside Digital Agency will also contribute to the standards of all government agencies and local governments. By sharing the same standards with the whole public sector, the government systems developed based on them will also be standardised and become interoperable.

Decision-making by government agencies is usually slow because of bureaucracy. Digital Agency is attempting to change this by reducing the layers. As mentioned, Digital Agency has talent from both government agencies and private companies, so its working style is different. Digital Agency needs to create a new culture to harmonise these people and make them function smoothly. Both government officers and IT professionals should respect each other and develop and operate digital services effectively. By doing so, product teams can create ownership, improving digital services in agile ways.

Few government officers have a user-centric mindset for their services because most concentrate on policymaking rather than how the policies should be delivered. In this sense, government employees can learn a lot from IT professionals in Digital Agency. In the software industry, usability is one of the most crucial competitive edges. If software is difficult to use, its sales will not increase and it will lose market share. As the mission of Digital Agency says, 'human-friendly digitalisation' will be required if a software company wants to survive in the market. During COVID-19, the core issue of public policy was about how fast and easily citizens could access government support, rather than about the content of such support. The government has been criticised by citizens about the slowness and difficulty of access to its services. In short, the government's service delivery is a more important issue than ever, and requires prompt remediation. For this reason, government officers should learn attitudes and skills from IT professionals.

Most government agencies have customs and cannot transform themselves from scratch. However, Digital Agency can design its organisation and culture with less limitations. Therefore, Digital Agency should become a test bed for government transformation. If it can find good ways to adapt to the digital era, other government agencies and local governments can replicate it. This would create a new working culture in the public sector, indicating how government agencies can transform themselves from traditional models.

5. Conclusion

The spread of COVID-19 has taught us many lessons about how the government should deliver digital public services. The Small and Medium Enterprise Agency and Tokyo Metropolitan Government realised quick deployment and expansion of digital services by utilising open APIs and OSS in the emergent situation. These cases taught us how important government agencies can share their resources with other stakeholders for collaboration.

We also learned that integrated digital infrastructure and standardised data make operations for government services efficient. The cloud database for the VRS indicated that central government agencies and local governments could improve their workflow and reduce tasks by using digital technologies.

On the other hand, we learned that the low level of distribution of digital IDs for citizens and businesses prevented government agencies from delivering their services uniformly. If government agencies want to deliver their services to everyone, they need to verify that users exist. Digital IDs are like passports for the online world, so it is very important to shift the strategy for distributing them online from a paper-based system.

In addition, central and local government systems were fragmented and not interconnected, so digital operations were not efficient. This was another issue in online applications for cash support. Not only citizens but also local government officials had problems with application processes.

One of the most crucial issues in delivering digital services is lack of IT capacity inside the government. The case of COCOA shows that dependence on contracted IT vendors made the MHLW lose its sense of ownership of the digital service.

Digital Agency was established in 2021 based on the lessons learnt from prior experience through a Suga administration initiative. The agency's mission, vision, and values aim to deliver user-centric digital services. Digital Agency has embraced IT professionals from the private sector in METI and is attempting to create a new organisational culture for effective administration in the digital era. The agency is expected to develop digital infrastructure for other agencies and local governments to deliver digital services quickly and make them interoperable. In addition, it should become a catalyst for the public and private sectors to create a GovTech ecosystem, which consists of not only the public sector but also the private sector – such as IT start-ups, civic tech groups, and like-minded people who want to innovate the government by using new technologies. Government services should be connected with private services via open APIs and OSS for effective delivery to users.

One of the reasons why the Japanese government sector is behind other governments on digitalisation is that Japanese citizens are concerned about the control of personal information by the central government. Therefore, citizens' personal data are managed by each local government in different formats and operations, making the data use and information exchange inefficiency. Digital Agency tries to overcome this issue by providing a cloud infrastructure called Government Cloud for local governments. This allows citizens' personal data to be managed by each local government in a standardised format on the same cloud infrastructure. Digital Agency is also concerned about the exchange of personal data amongst government agencies and local governments. It cooperates with the Personal Information Protection Commission to protect the personal data of citizens based on the 2003 Act on the Protection of Personal Information.

Government Cloud also deals with security issues. Each government agency and local government has different a level of capability on data management. The security levels of their servers are also different. If agencies lack the capacity to manage their data properly, they risk data leaks. Under Government Cloud, each government agency and local government can manage its data with the same level of security, using a standardised data management system.

Digital Agency can be a new model of government organisation because it challenges many ways of working in traditional government organisations. Government officers in Digital Agency find it difficult to adapt to a new environment where employees predominantly use online tools and aim to deliver user-first services. On the other hand, IT professionals who joined Digital Agency may also feel awkward about the government's bureaucracy and rules. However, both should respect one other and create a new working culture.

Considering that the Government Digital Service in the United Kingdom was established in 2011, Japan's government digitalisation seems to be lagging far behind that of other countries. The Government of Japan is only at the starting point of serious digitalisation. Digital Agency will play an important role in advancing digitalisation and innovating the government. The speed at which the government can deliver accessible and convenient services to users depends on Digital Agency. In addition, the agency should overcome the traditional government culture and become like a tech company, focusing on developing and delivering digital services. Digital transformation of the government will be realised when Digital Agency has an environment in which both government officers and IT professionals cooperate with one another and work towards the same vision. It will take time to harmonise the working environment for both. Digital Agency employees should have ownership of their organisation and cooperate with one another to create a new culture.

Digital Agency appointed an ex-chief design officer as a new CEO in April 2022 (*Nikkei Asia*, 2022). This is a strong message to the public that Digital Agency cares about service design more than ever. The combination of digital technology and the design of applications is important to improve the experience for both citizens and government officers. The government already knows what does and does not work well in government services, and how it can fix them, through lessons from digitalisation in other countries. Now, it is time for Digital Agency to achieve its vision.

Most civil servants in the Japanese government have recognised the importance of digitalisation in terms of efficient operations and user-centric services through COVID-19. However, it is still difficult to convince them to promote digitalisation because they are busy with day-to-day tasks. To address this situation, other government agencies will need to enhance their current management system and adopt a model similar to that of Digital Agency. The top management of each agency should introduce a hybrid workforce of civil servants and tech professionals, and create a new organisational culture where both types of employees can cooperate to deliver user-centric digital services. This will also be applicable to other governments that plan to transform themselves for delivering digital services effectively, especially in developing countries.

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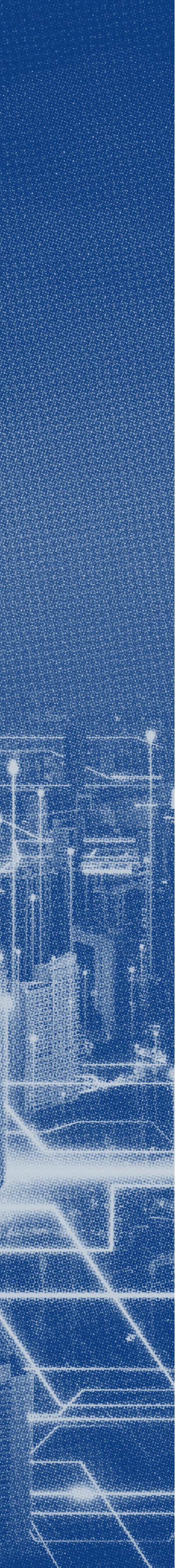


Chapter 3

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

Jessica Wa'u
Rohini Nambiar

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?

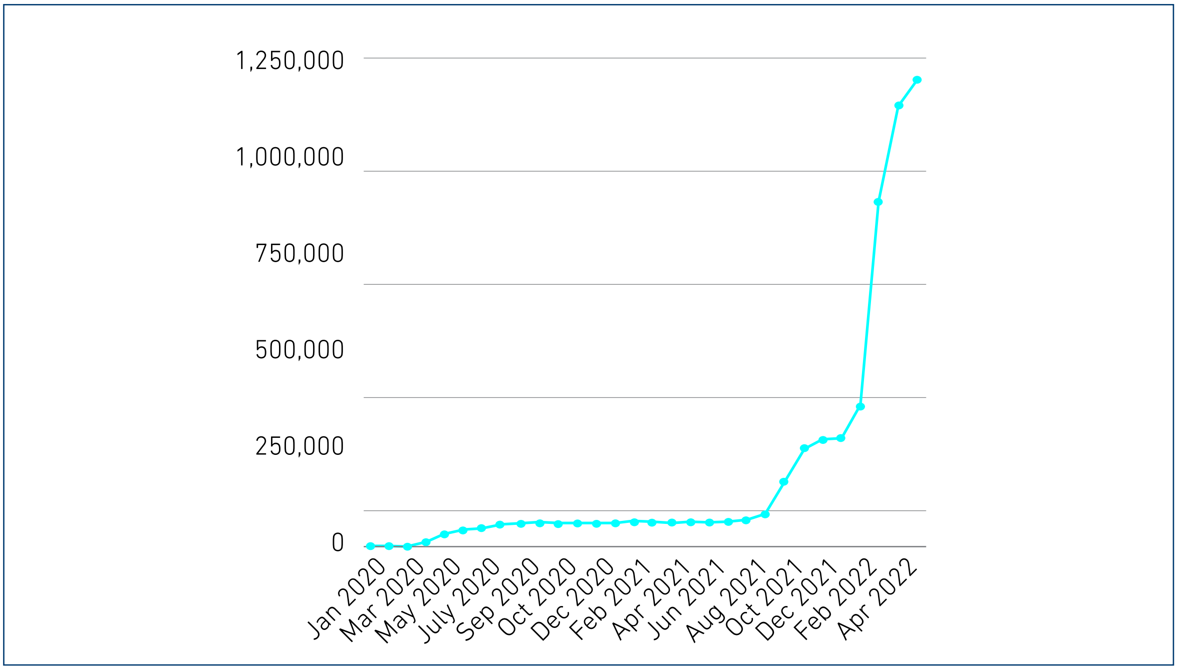
The chapter will observe the strengths of Singapore's policies, including a whole-of-government approach, inter-agency coordination, engagement with the private sector, business and social welfare support, and the effect of long-term investments. It will also observe areas that need to be improved, including 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.

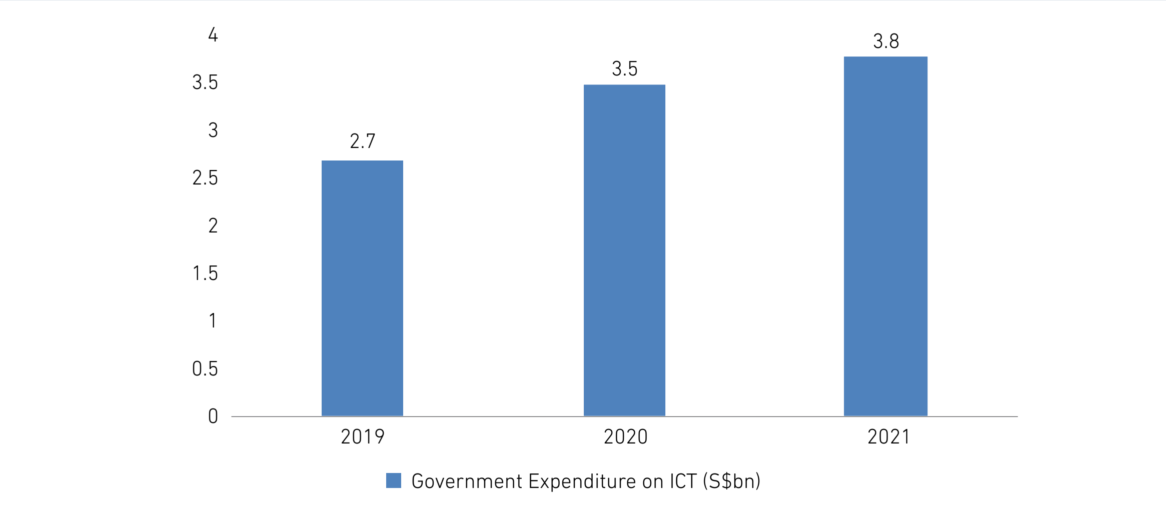
2.3. Singapore's digital policy framework: Smart Nation initiative

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.

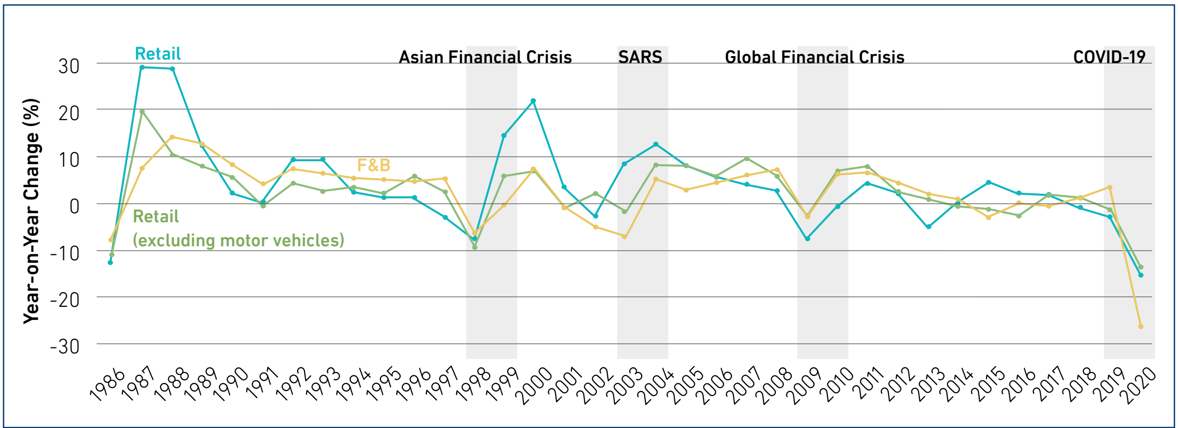
4.5. Digital inclusion a priority

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.

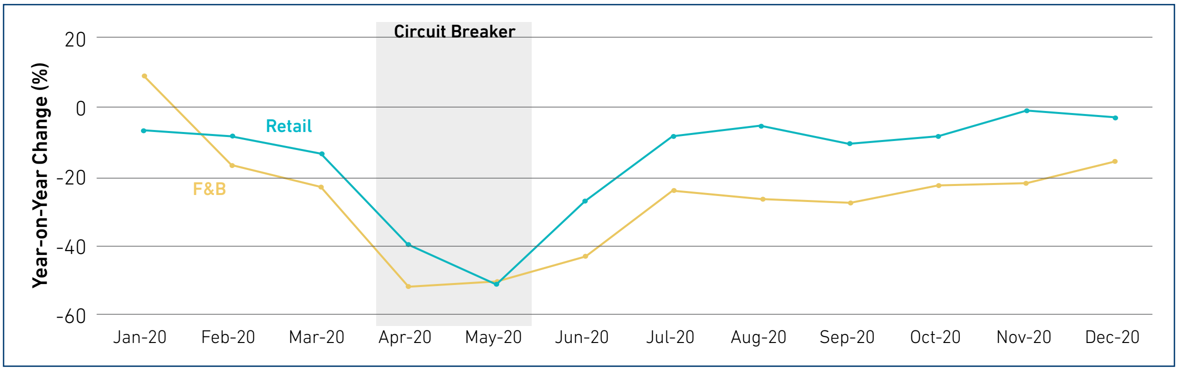
Figure 3.3. Year-on-Year Change in Retail Sales and F&B Services Indices in Singapore (at current prices), 1986–2020



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	• About 1,000 digital ambassadors were recruited to teach digital skills 4 months into programme launch (CNA, 2020) • 46 SG Digital community hubs launched where digital ambassadors are stationed (Yeoh, 2020)	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	• More than 100,000 seniors received one-on-one training in basic digital skills such as making e-payments	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.	• 4,500 stallholders engaged • 33% said they already used online platforms • 14% signed up or expressed interest in using online platforms	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).	• More than 78,000 SMEs adopted digital solutions from the programme	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.)	• 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.	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.	• The fund is expected to support 92 agencies which promote digital inclusion. • Seed funding of S$2.5 million donated through a charity event called the President's Challenge • 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	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.	• 51 companies pledged their support for the SG Women in Tech Corporate Pledge initiative (IMDA, 2021)	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)

Chapter 4

Digital Government as a Business Enabler: An Analysis of Business Processes in India

Sanjay Kumar Mangla

1. Introduction

Government services are the foundation of every functioning economy as they support the operations of all stakeholders – households, businesses, government, and the foreign sector.[1] Previously, many government services in India were only accessible through physical means. However, following the launch of Digital India[2] in 2015, the majority of these services have been made available electronically to a diverse group of stakeholders. Now, the governments worldwide are adopting digital ways of providing services to their stakeholders, including administrative functions. The coronavirus disease (COVID-19) pandemic has further accelerated the digitisation of government services across the globe, including in Asia-Pacific nations.

Successful digital transformation would allow public sector organisations to function more efficiently and effectively in the digital world, as well as provide simpler and more effective public services (Greenway et al., 2018). Today's strategic decisions to boost digital government will not only support recovery efforts, but will also lay the path for the public sector's future agility and resilience.

The COVID-19 pandemic has revealed gaps and disparities, and exacerbated challenges, where digital technologies or data were not exploited strategically or effectively. The current crisis should motivate governments to communicate significant lessons learnt about major digital enablers and critical digital flaws. The pandemic has also prompted governments to step up its digitisation efforts to aid in the development of long-term recovery strategies and initiatives, such as finding new ways to engage with communities and businesses to better understand and address their needs. Further, the Sustainable Development Goals (SDGs) emphasise the expansion of information and communication technologies (ICTs) to accelerate human progress, bridge the digital divide, and promote knowledge societies.

The utility of ICTs for governments to develop and modify public institutions, as well as the public sector environment in general, and their service delivery capacities is very well recognised globally. Early adoption of ICTs, dubbed 'e-government', aims to boost efficiency and transparency in the public sector by digitising operations. Governments are now attempting to exploit data and digital technologies to go even further – to create more participatory, inventive, and agile forms of governance. e-Government aims to increase sectoral efficiencies through the use of digital technologies, reducing the cost of and time taken for existing operations and public services (OECD, 2020a).

Digital government is a natural progression from e-government. The terms 'digital government' and 'e-government' are often used interchangeably; however, they differ in some aspects depending upon the context. In general, both terms refer to the use of digital technologies to enhance government operations and services. e-Government, which stands for electronic government, typically refers to

[1] The foreign sector includes all stakeholders associated with political and economic activities involving foreign transactions, such as international trade, investment, and foreign exchange.

[2] The Digital India initiative, launched in July 2015 by Prime Minister Narendra Modi, aims to digitally empower Indian society and transform the country into a leading knowledge economy through the infusion of digital technologies into the public service ecosystem, utilising information technology. The mission operates collaboratively with various departments under multiple ministries, with individual programs operating independently while contributing to the broader vision of a tech-enabled societal transformation in India.

the use of ICTs to improve government processes and service delivery, such as through the use of online portals and digital forms. e-Government can also encompass the use of ICTs to improve internal government operations, such as through electronic document management systems. On the other hand, digital government refers to a broader transformation of government operations and services through the use of digital technologies, including not only ICTs but also emerging technologies such as artificial intelligence and blockchain. Digital government can involve a more fundamental shift in the way government operates, with a greater emphasis on user-centred design, data-driven decision-making, and the creation of more responsive and agile government structures.

The aim of digital government is to assist various functionaries of the governments in moving away from an efficiency-focused approach to digital technology towards a more open, collaborative, and innovative approach. Digital government comprises the complete digitisation of government, allowing for the level of integration required to provide better services to citizens and businesses. The underlying principle of digital government, supported by an effective e-governance institutional framework, is to improve the internal workings of the public sector by reducing financial costs and transaction times to better integrate workflows and processes and to enable effective resource utilisation across the various public sector agencies, with the goal of achieving long-term solutions (OECD, 2020a). Figure 4.1 provides a strengths, limitations, opportunities, and threats (SLOT) analysis of digital government.

Figure 4.1. SLOT Analysis of Digital Government

Strengths	Limitations	Opportunities	Threats
• Less complex administrative functioning • Transparent public administration • Enhanced time management • High operational efficiency	• High set-up costs & technical diffilculties • Insufficient ICT infrastructure • Lack of public access • Weak confidence in online portals	• Reduction in corruption • Improved democratic processes • Equitable benefits to society • Low document processing cost	• Threat to personal information • Privacy and security • Digital divide • Financial barriers

ICT = information and communication technology; SLOT = strengths, limitations, opportunities, and threats.

Source: Author.

India's digitisation picked up speed in July 2015 with the launch of the Digital India programme, which included e-governance, mobile e-health services, and digital finance for digital inclusion, amongst others. Digital India was envisaged as a coordinated effort to bring together many projects in the fields of connectivity, skills development, and digital governance. Digital India has three main objectives: build a secure and stable digital infrastructure, provide digital services, and ensure that every citizen has access to the internet.

The Digital India programme not only helped the public to avail of e-government services but also assisted businesses to complete all government compliance requirements in the least time possible at the lowest level of cost and human effort. Governments that have succeeded in digital transformation have invested in good governance models to guide their digital government initiatives. They have explicit coordination procedures in place to oversee cross-government ICT projects, including institutional representation from several policy areas. Furthermore, all stakeholders must be involved throughout the policy cycle to ensure that the design, implementation, delivery, and monitoring of digitally connected public services are properly aligned with users' requirements, expectations, and preferences. This type of participation also enhances the legitimacy of decisions and actions. Additionally, adopting policy indicators and processes to track progress on digital transformation reforms can be effective policy tools for increasing government accountability by ensuring that digital government changes are transparent and efficient (OECD, 2020b).

The measurement of digital government has been a challenge. The Digital Government Index 2019, developed by the Organisation for Economic Co-operation and Development (OECD, 2020a) has proved quite helpful in measuring the comprehensiveness of digital government strategies and initiatives across OECD countries – by assessing the presence of a coherent and whole-of-government approach to adopt digital technologies and using data from central/federal public sector organisations.

Other indices measuring digital government include the E-Government Development Index and the E-Participation Index, which are developed by the United Nations (UN). The E-Government Development Index is a weighted average of normalised scores on the three most significant aspects of e-government: the scope and quality of online services (Online Service Index), the condition of telecommunication infrastructure development (Telecommunication Infrastructure Index), and intrinsic human capital (Human Capital Index). The E-Participation Index is a supplementary index and focuses on the use of online services to help governments provide information to citizens (e-information sharing), connect with stakeholders (e-consultation), and participate in decision-making processes.

Digital government comprises the interaction of government with four key stakeholders: households, businesses, government, and the foreign sector. This interaction happens in several ways, including issuing various certificates (e.g. birth certificates, marriage certificates, death certificates, and land and vehicle registrations); obtaining several kinds of permission (e.g. construction permits, land purchase and utilisation permits, and export–import licences); and complying with other government regulations (e.g. paying taxes, and audits).

In the context of government-to-business (G2B) interaction, there are more than 40 steps under four phases of starting and running a business in India: setting up the legal existence of the entity, starting/registering an entity/unit in the state, the pre-commissioning phase, and the post-commissioning phase. To reduce time and costs, and increase production, it is imperative to make government engagement with businesses more efficient, effective, time-saving, and cost-effective. However, the physical distance between the location of the business and government offices imposes restrictions, lengthens the time required, and adds to the expense of doing business. Performing the same interaction digitally helps to remove these constraints and save time and money.

2. Research Objective

This study attempts to identify the points of interaction between businesses and government in India in the context of setting up and running a business. It also presents significant projects implemented by the Government of India to provide its services in a digital mode, and identifies gaps where scope remains to bring government services for businesses under the purview of digital government.

3. Government Interaction with Various Sectors in India

e-Governance in India can be defined as continuous interaction between government and various stakeholders. India's digital tale is one of ICT-led growth through the application of technology that is both inexpensive and revolutionary. Since 2015, one of the most important movements in India has been digitalisation. Amongst the 17 major digital economies, it has emerged as the second-fastest digital adopter. This quick development has aided India's ascension to the forefront of digital and technical innovation, owing to the country's youthful population. Further, the COVID-19 pandemic has highlighted the significance of digital infrastructure, bringing the internet and other interconnected devices to the forefront. As remote learning and work became the norm, reliance on personal computers and cloud-based applications increased significantly, underscoring the importance of robust digital infrastructure.

India has already achieved significant progress in terms of digital adoption, with the total number of internet users exceeding that of other industrialised countries. Digital solutions have also re-engineered our economy and communities, in addition to changing the way we live. Customers, corporations, and governments all benefit from the internet's rising value offerings. However, to give access to every home, the pace of digital infrastructure creation must be quickened.

3.1. Government to public

Government-to-public (G2P) programmes (or government to consumer/citizen) aim to make it easier for individuals to interact with the government as citizens and consumers of public services. This covers contacts relating to public service delivery as well as involvement in the consultation and decision-making process. Figure 4.2 shows some of the important areas of digital G2P interaction in India.

Figure 4.2 Areas of Digital G2P Interaction in India

G2P = government-to-public.

Source: Author.

On the consumer side, India's digital revolution is already under way. The country has one of the world's largest and fastest-growing bases of digital consumers, thanks to the lowering cost and increasing availability of smartphones and high-speed internet. India is digitising faster than many mature and emerging countries. With 560 million internet customers in 2018, India is the second-largest and fastest-growing market for digital consumers, behind China. On average, Indian mobile data customers use 8.3 gigabytes (GBs) of data each month, compared with 5.5 GB in China and 8.0–8.5 GB in the Republic of Korea, a mature digital economy. In 2018, Indians had 1.2 billion mobile phone subscriptions and downloaded more than 12 billion applications.

The Jan-Dhan Yojana, a large-scale financial inclusion initiative by the Government of India, has resulted in a significant increase in the number of Indian adults with digital financial accounts. Since 2011, the percentage of Indian adults with at least one such account has risen more than fourfold, reaching 80%. The World Bank's Digital Adoption Index considers three factors: digital foundation (cost, speed, and reliability of the internet connection); digital reach (number of mobile devices, app downloads, and data consumption); and digital value (cost, speed, and dependability of internet service) (how much consumers engage online by chatting, tweeting, shopping, or streaming). Since 2014, India's score has increased by 90%.

Since its launch in 2009, Aadhaar has recruited 1.2 billion individuals, making it the world's largest digital ID programme and accelerating the adoption of other digital services. By February 2018, about 870 million bank accounts have been connected to Aadhaar, up from 399 million in April 2017 and 56 million in January 2014. Similarly, the Goods and Services Tax Network, launched in 2013, consolidates the transactions of more than 10.3 million indirect tax-paying enterprises onto a single digital platform, providing a tremendous incentive for businesses to digitise their operations.

The country's rapid expansion is assisting India's poorest states in closing the digital divide with wealthy regions. Lower-income states, such as Uttar Pradesh and Jharkhand, are growing internet infrastructure, such as base tower stations, and expanding internet service penetration to new subscribers at a quicker rate than wealthier states. Between 2014 and 2018, Uttar Pradesh alone added around 36 million internet users. Ordinary Indians in many parts of the country, including small towns and rural areas, can now read the news online, order food delivery via a phone app, video chat with a friend (Indians log 50 million video-calling minutes per day on WhatsApp), shop at a virtual retailer, send money to a family member using their phone, or watch a movie streamed to a handheld device.

In agriculture, healthcare, retail, logistics, and other industries, new digital ecosystems are already emerging, altering consumer–producer relations. Data-driven loans and insurance payouts in the agricultural sector are examples of opportunities, as are digital solutions that map out the most effective routes and track freight movements on India's highways. Patients in healthcare might benefit from teleconsultations via digital voice or high-definition video, and retailers would benefit from being part of e-commerce networks.

Individual Indians are already benefiting from digitalisation as consumers, but they must be aware that it has the potential to alter their lives and work in fundamental ways. They need to understand how digitally driven automation will affect their jobs and what skills they will need to succeed in the future. Individuals will also need to learn to be data stewards and wary information consumers.

While India's public and commercial sectors have moved the nation to the forefront of global internet and digital application users in recent years, the country's digitisation journey is far from done.

3.2. Government to business

G2B transactions include payments, the sale and acquisition of products and services, and the supply of business-focused services. G2B interaction through the online mode enables the business sector to contact/work with local and central governments with the objective of exchanging information and complying with government norms to set up and run a business more quickly at a lower cost. G2B refers to the exchange of information between government agencies and commercial enterprises over the internet.

The government's contact with companies lowers the amount of time it takes for firms to complete a transaction. Digital government also supplies data that businesses require. For example, the government gathers extensive data on economic, demographic, and other trends, and makes it available to businesses helps them make vital choices. Furthermore, by offering an easy site structure with a plethora of helpful apps, e-government can assist firms in navigating government laws and regulations. One such example is the computerised filing of environmental permit applications. Figure 4.3 shows some of the major areas of digital G2B interaction in India.

Figure 4.3. Areas of Digital G2B Interaction in India

G2B = government to business, MCA = Ministry of Corporate Affairs, SPICe = Simplified Proforma for Incorporating a Company Electronically.

Source: Author.

3.3. Government to government

Government to government (G2G) refers to data sharing and electronic communications amongst government entities. This includes interactions at the national, provincial, and municipal levels, as well as intra- and inter-agency exchanges at the national level.

In this scenario, ICT is being utilised not only to reorganise the governmental procedures that are involved in the running of government institutions, but also to boost the flow of information and services inside and amongst them. This type of contact occurs solely inside the realm of government, and it might be horizontal (i.e. amongst various government agencies and functional areas within an organisation) or vertical (i.e. amongst national, provincial, and local government agencies and levels within an organisation). The major goal is to boost efficiency, productivity, and output.

Information is processed and decisions are made on a massive scale inside the government system. G2G projects aid in the improvement of internal government operations which require frequent changes dure G2P and G2B operations. The Government of India, as well as several state governments, have taken various initiatives for G2G interactions in the electronic mode.

Examples of G2G initiatives are (i) the Government of Karnataka's Khajane Initiative, a comprehensive online treasury computerisation project that resulted in the computerisation of the state government's treasury-related activities, which can trace every activity from the adoption of the state budget to the rendering of accounts to the government; and (ii) Andhra Pradesh's SmartGov, created to help the Andhra Pradesh Secretariat simplify processes and improve efficiency through workflow automation and information management.

3.4. Government to foreign

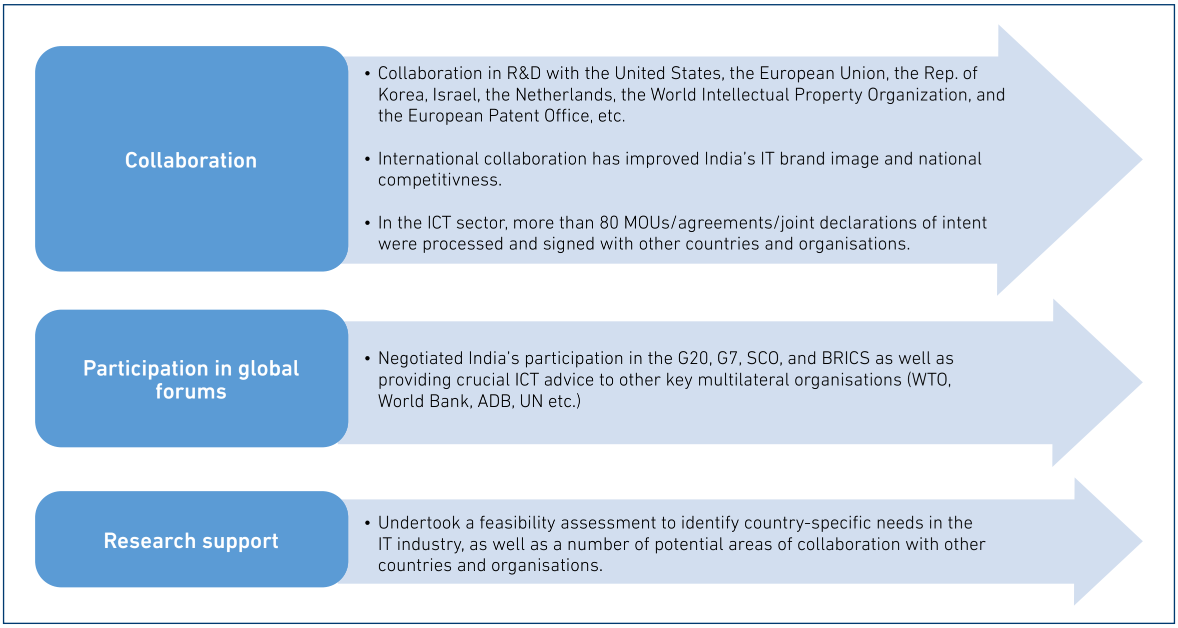
Government to foreign (G2F) includes transactions and interactions of the government with international/regional organisations (e.g. the United Nations, the World Trade Organization, the International Monetary Fund, and the Asian Development Bank); foreign investors and citizens; and the governments of other countries, etc. The Government of India relies heavily on information technology (IT) and information technology enabled services (ITeS) to engage with the foreign sector. To expand the use of IT/ITeS, the government has adopted a coordinated approach, leveraging initiatives like geographic diversification, domain expertise, and deploying highly skilled workforces to take advantage of emerging business opportunities.

International Cooperation Division

The Ministry of Electronics and Information Technology established the International Cooperation Division (ICD) to foster international cooperation in developing and frontier areas of electronics and IT through bilateral, multilateral, and regional frameworks. It is widely acknowledged that ICT may aid in society's long-term socioeconomic evolution.

The digital divide must be bridged for the advantages of ICT to reach the world's underprivileged communities. India is assisting several emerging economies by providing technical support in the areas of IT infrastructure, networking, capacity building, human resources development, and e-government, based on its significant expertise in bridging the digital gap. Moreover, various collaborative efforts have been geared up to encourage sustainable development and strengthen synergetic partnerships with other countries in the emerging and frontier areas of electronics and IT; explore ways to enhance investment; and address regulatory mechanisms to promote international cooperation in the emerging and frontier areas of electronics and IT. Figure 4.4 shows the achievements of the ICD in India.

Figure 4.4. Achievements of the International Cooperation Division in India



ADB = Asian Development Bank; BRICS = Brazil, Russia, India, China, and South Africa; ICD = International Cooperation Division; ICT = information and communication technology; IT = information technology; MOU = memorandum of understanding; R&D = research and development; SCO = Shanghai Cooperation Organisation; UN = United Nations; WTO = World Trade Organization.

Source: Author.

Immigration, Visa, and Foreigners Registration & Tracking

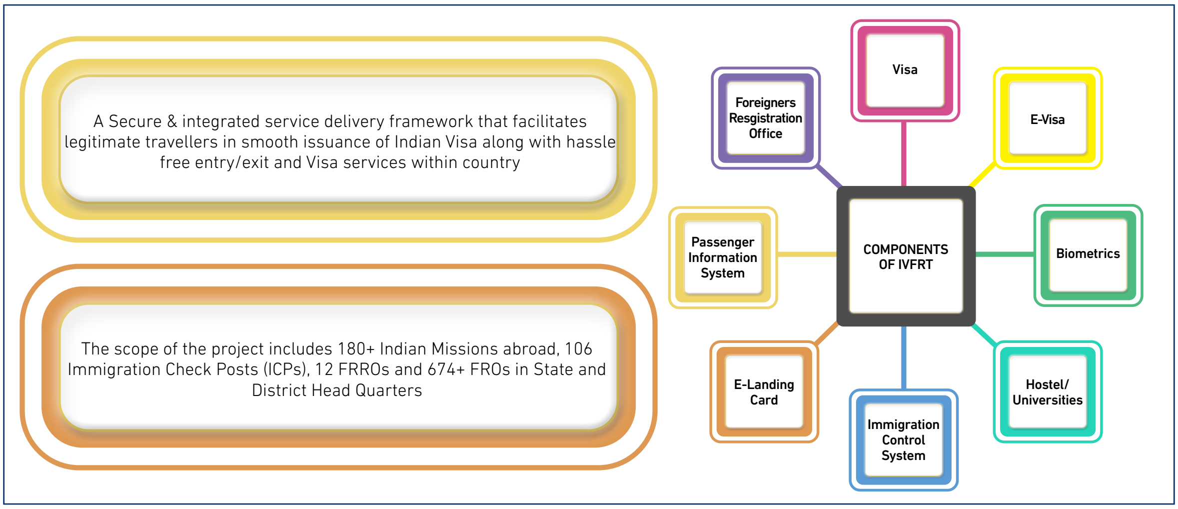
India has become a popular tourist destination as well as a significant commercial and service centre. Since the Immigration Check Post (ICP) is the initial point of contact for the public, it requires innovative technology that provides quick and user-friendly services.

The Ministry of Home Affairs has launched a mission mode project (MMP) to offer effective and efficient online immigration services, called Immigration, Visa, and Foreigners Registration & Tracking (IVFRT). The main goal of this project is to create and put into action a framework for the delivery of safe, integrated services that helps authorised travellers while enhancing security. The IVFRT project aims to optimise and interlink functions related to visa issuance, immigration, foreigner registration, and movement tracking in India. It covers 192 Indian missions worldwide, 108 Immigration Check Posts (ICPs) within India, 12 Foreigners Regional Registration Officers (FRROs), and over 700 Foreigner Registration Officers (FROs). The implementation of this mission mode project will enable the authentication of traveller's identity at missions, immigration check posts (ICPs), and foreigner registration offices (FROs) through the use of intelligent document scanners and biometrics. It will also facilitate the updating of foreigners' details at entry and exit points, as well as improved tracking of foreigners through the sharing of information captured during visa issuance at missions, immigration checks at ICPs, and registration at FRRO/FROs. The key stakeholders of the IVFRT are the Ministry of Home Affairs, Ministry of External Affairs, National Informatics Centre, State Police, Ministry of Tourism, Ministry of Civil Aviation, travellers, and customs.

The MMP will comprise 37 services, including nine core services, to streamline and integrate the visa, immigration, and foreigners registration and tracking procedures. The following are the nine core services that will be provided under this project:

- Traveller facilitation services by providing multichannel access to relevant information and form submission
- Online appointments, application status tracking, feedback, and grievance redressal
- Visa issuance service
- Document verification and authentication services to the mission, ICPs, and FRROs/FROs
- Effective targeted intervention for travellers at Immigration Check Posts (ICPs)
- Effective targeted intervention through an integrated approach to profiling, risk assessment, and watch-listing
- Integrated database for unique case files for passengers for effective collection and dissemination of traveller information
- Services for exchanging information and alerts across agencies
- Service for alert generation and distribution

Figure 4.5. **Mission Mode Project on Immigration, Visa, Foreigners Registration & Tracking**



FRO = Foreigners Registration Office; FRRO = Foreigners Regional Registration Office; ICP = Immigration Check Post; IVFRT = Immigration, Visa, Foreigners Registration & Tracking.

Source: NIC (n.d.).

4. Digital Government and Businesses in India

Businesses are considered the backbone of any economy as they mobilise an economy's resources and lead to value generation and the creation of employment. However, conducting a business requires continuous interaction with the government at various levels to obtain permits and comply with norms and regulations. As part of its efforts to create an enabling business environment, the Government of India has initiated various reforms – including launching projects to make government services available in a digital mode.

4.1. Setting up a business in India

In India, setting up a business requires the completion of four phases: setting up the legal existence of the entity, registering an entity/unit in the state, the pre-commissioning phase, and the post-commissioning phase. These four phases have 41 steps; 25 steps can be completed digitally and the rest are offline. Their description and detailed steps are given in Tables 4.1–4.4 and Figures 4.6–4.9. Figure 4.6 shows the process of setting up the legal existence of an entity in India. Figure 4.7 shows the procedure of registering an entity in the state. Figure 4.8 shows the steps adopted in the pre-commissioning phase. Figure 4.9 shows the steps followed in the post-commissioning phase.

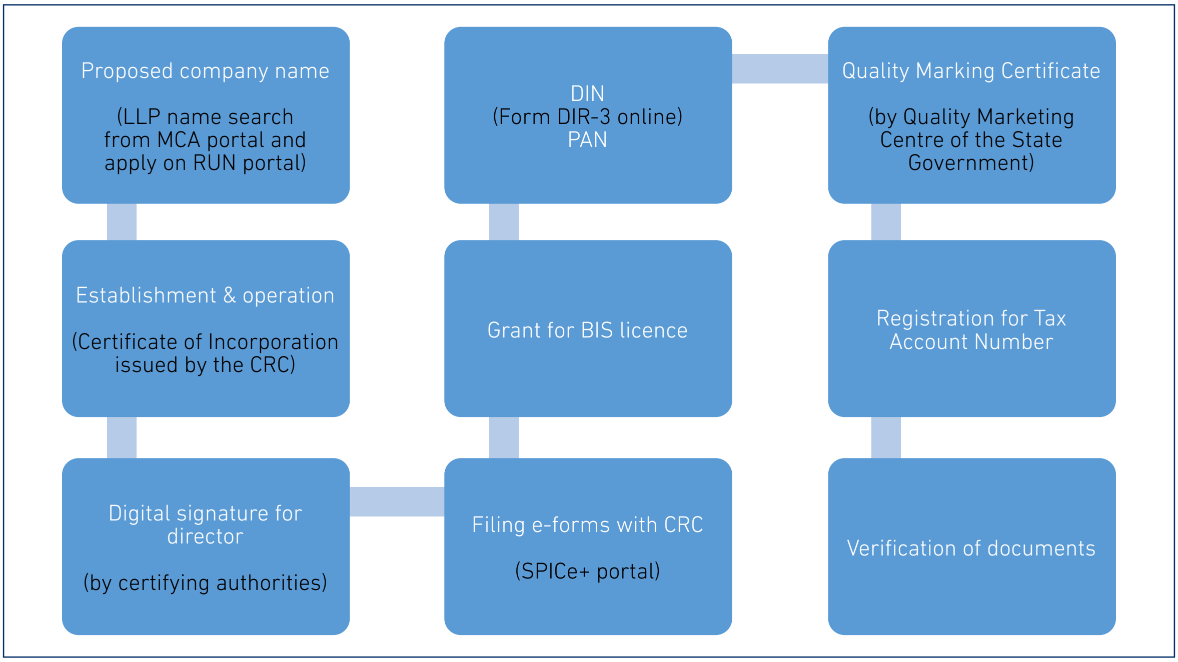
Table 4.1. Setting up the Legal Existence of the Entity

Steps	Online	Offline
1.1 Approval for proposed company name	✓	
1.2 Consent to establish and operate	✓	
1.3 Digital Signature Certificate for proposed directors	✓	
1.4 Filling e-forms with CRC and finalisation of documents	✓	
1.5 Grant for BIS licence	✓	
1.6 Obtain DIN and PAN	✓	
1.7 Quality marking certificate	✓	
1.8 Registration for Tax Account Number	✓	
1.9 Verification of documents	✓	

BIS = Bureau of Indian Standards, CRC = the Central Registration Centre, DIN = Director Identification Number, PAN = Permanent Account Number.

Source: Compiled from Government of India, Ministry of Corporate Affairs.

Figure 4.6. Setting Up the Legal Existence of the Entity



BIS = Bureau of Indian Standards, CRC = Central Registration Centre, DIN = Director Identification Number, DIR = Director, LLP = Limited Liability Partnership, MCA = Ministry of Corporate Affairs, PAN = Permanent Account Number, RUN = Reserve Unique Name, SPICe = an integrated web form offering 10 services by three Central Government Ministries & Departments.

Source: Compiled from Government of India, Ministry of Corporate Affairs.

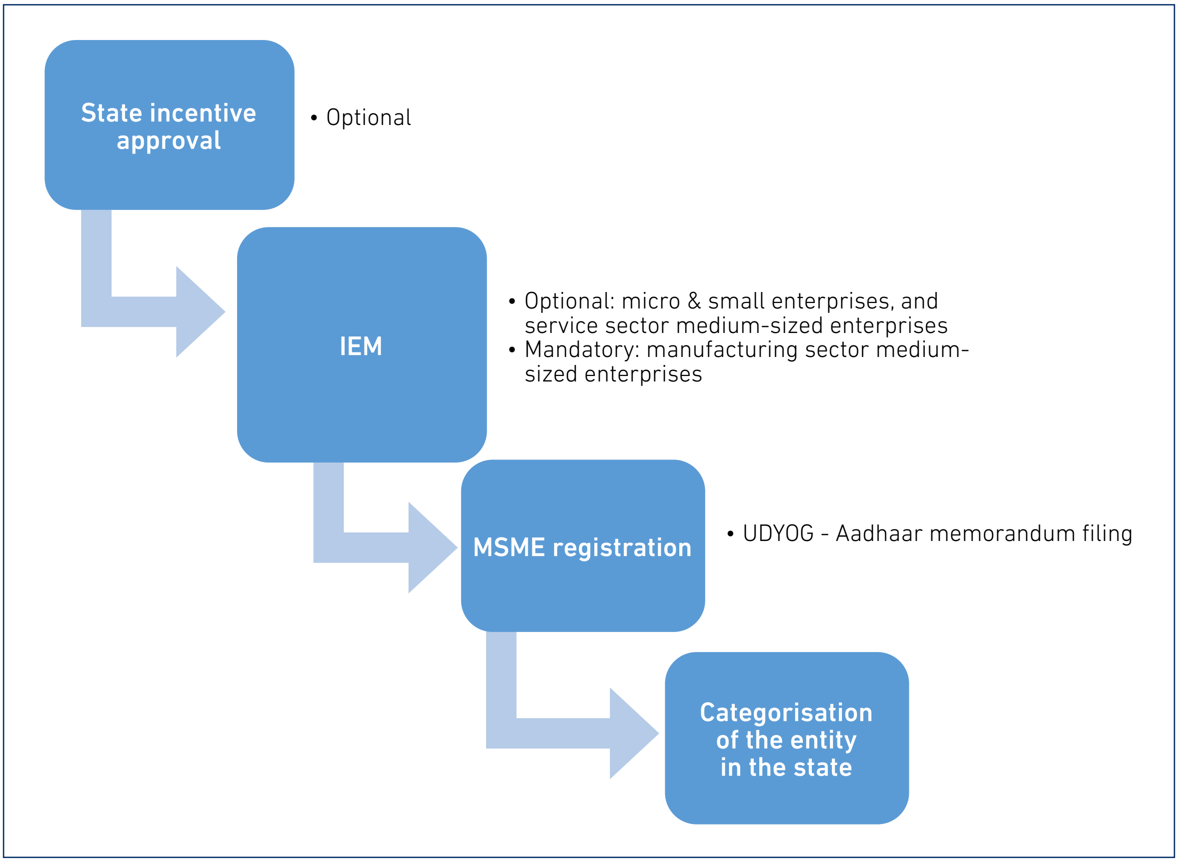
Table 4.2. Starting/Registering an Entity in the State

Steps	Online	Offline
2.1 Approval for state incentives		✔
2.2 IEM registration	✔	
2.3 MSME registration	✔	
2.4 Registering/Categorisation of an entity/unit in the state		✔

IEM = Industrial Entrepreneurs Memorandum; MSME = micro, small, and medium-sized enterprises.

Source: Compiled from Government of India, Ministry of Corporate Affairs.

Figure 4.7. Registering an Entity in the State



IEM = Industrial Entrepreneurs Memorandum; MSME = micro, small, and medium-sized enterprise.

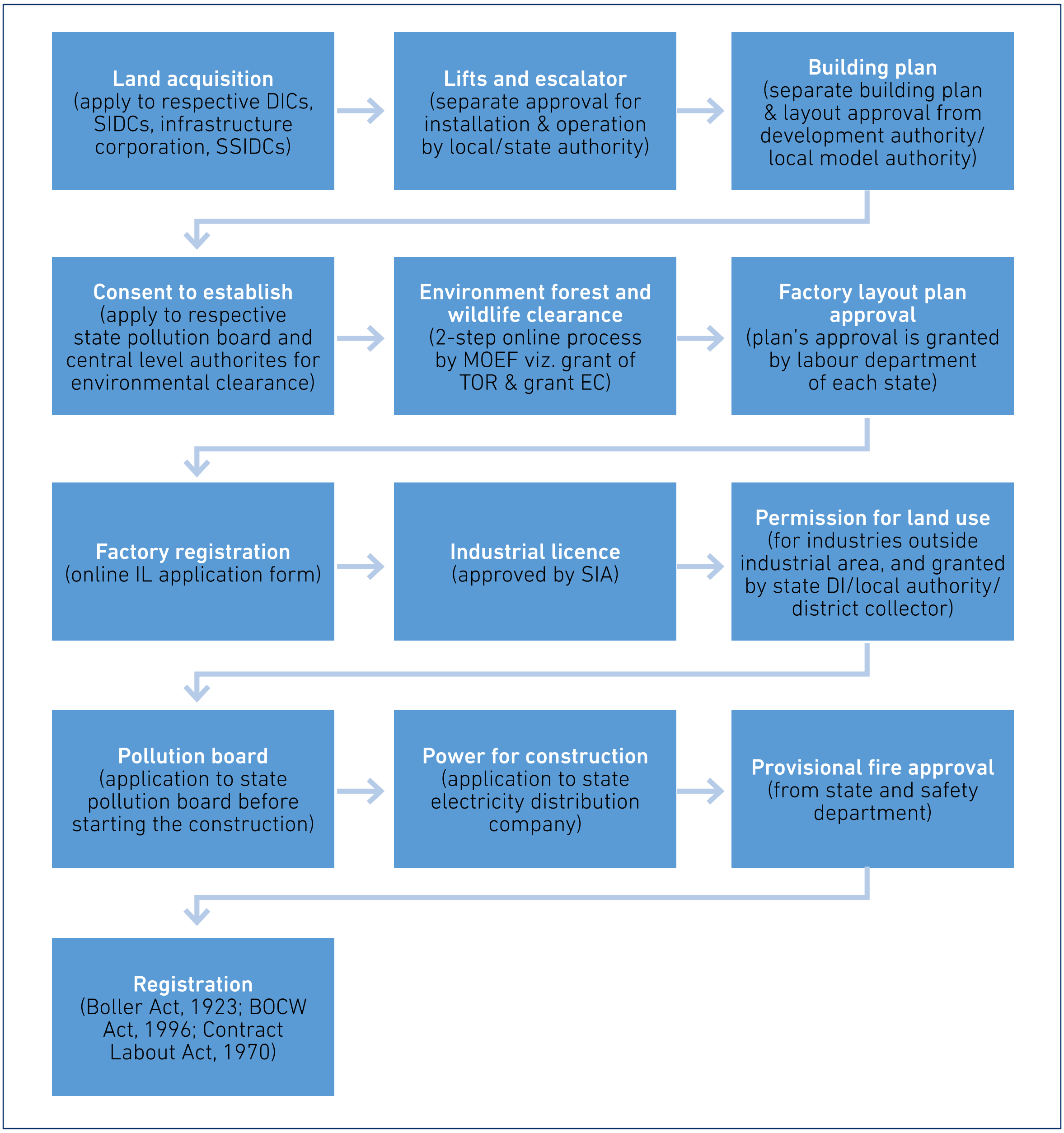
Source: Compiled from Government of India, Ministry of Corporate Affairs.

Table 4.3. Pre-Commissioning Phase

Steps		Online	Offline
3.1	Acquisition of land		✔
3.2	Approval for lifts and escalator		✔
3.3.	Building plan approval		✔
3.4	Consent to establish		✔
3.5	Environment, forest, and wildlife clearance	✔	
3.6	Factory layout plan approval		✔
3.7	Factory registration	✔	
3.8	Industrial licence	✔	
3.9	Permission for land use		✔
3.10	Pollution board		✔
3.11	Power for construction		✔
3.12	Provisional fire approval		✔
3.13	Registration under Boiler Act, BOCW Act, or Contract Labour Act	✔	

BOCW Act = the Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996.
Source: Compiled from Government of India, Ministry of Corporate Affairs.

Figure 4.8. **Pre-Commissioning Phase**



BOWC = Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act; DIC = District Industrial Centre; EC = environmental clearance; IL = industrial licence; MOEF = Ministry of Environment, Forest and Climate Change; SIA = Secretariat for Industrial Assistance; SIDC = State Industrial Development Corporation; SSIDC = State Small Industries Development Corporation; TOR = standard terms of reference.

Source: Compiled from Government of India, Ministry of Corporate Affairs.

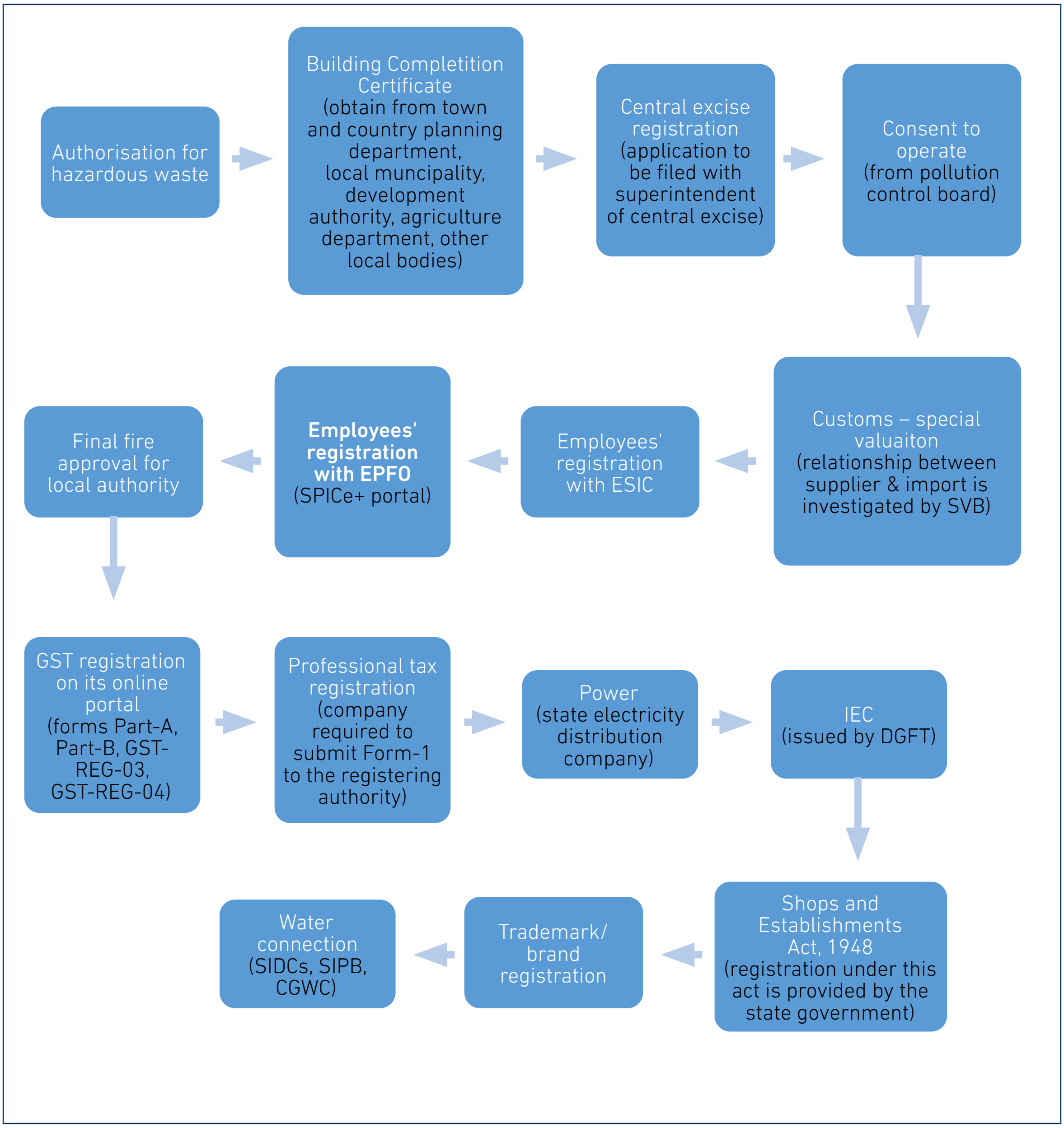
Table 4.4. Post-Commissioning Phase

Steps	Online	Offline
4.1 Authorisation for hazardous waste		✔
4.2 Building completion certificate		✔
4.3 Central excise registration	✔	
4.4 Consent to operate		✔
4.5 Customs Special Valuation Branch	✔	
4.6 Employee registration with ESIC	✔	
4.7 Employer registration with EPFO	✔	
4.8 Final Fire Approval		✔
4.9 GST registration	✔	
4.10 Professional tax registration	✔	
4.11 Power		✔
4.12 Importer–Exporter Code	✔	
4.13 Shops and Establishment Act	✔	
4.14 Trademark/Brand registration	✔	
4.15 Water connection	✔	

EPFO = Employees' Provident Fund Organisation, ESIC = Employees' State Insurance Corporation, GST = Goods and Services Tax.

Source: Compiled from Government of India, Ministry of Corporate Affairs.

Figure 4.9. Post-Commissioning Phase



CGWC = Central Ground Water Commission, DGFT = Directorate General of Foreign Trade, EPFO = Employees' Provident Fund Organisation, ESIC = Employees' State Insurance Corporation, GST = Goods and Services Tax, IEC = Importer–Exporter Code, SIDC = State Industrial Development Corporation, SIPB = State Investment Promotion Board, SPICe+ = Simplified Proforma for Incorporating a Company Electronically, SVB = Special Valuation Branch.

Source: Compiled from Government of India, Ministry of Corporate Affairs.

4.2. Selected Projects Implemented in India to Digitalise G2B Interaction

4.2.1. Simplified Proforma for Incorporating Company Electronically Plus

Enhancing the ease of doing business in the country is amongst the priority areas for the Government of India. Several initiatives have been undertaken in recent years and India's ease of doing business ranking improved from 142 in 2014 to 63 in 2020 (Times of India, 2019). One such initiative is the Simplified Proforma for Incorporating Company Electronically Plus (SPICe+), which is an integrated web platform offering 11 key services from three central government ministries and departments (the Ministry of Corporate Affairs (MCA), Ministry of Labour, and Department of Revenue under the Ministry of Finance) and three state governments (Maharashtra, Karnataka, and West Bengal) and Delhi (National Capital Territory), developed by the MCA. This platform has streamlined a number of procedures, which has led to less time and lower costs for starting a business in the country and is applicable for all new company corporations with effect from 7 July 2021.

SPICe+ is divided into two parts. Part A is used to reserve names for new businesses. Part B includes a variety of services: (i) incorporation; (ii) allotment of a Director Identification Number (DIN); (iii) mandatory issuance of a Permanent Account Number (PAN); (iv) mandatory issuance of a Tax Deduction Account Number or Tax Collection Account Number (TAN); (v) mandatory issuance of Employees' Provident Fund Organisation (EPFO) registration; (vi) mandatory issuance of Employees' State Insurance Corporation (ESIC) registration; (vii) mandatory issuance of profession tax registration (Maharashtra); (viii) mandatory opening of a bank account for the company; and (ix) allotment of the Goods and Services Tax Identification Number (GSTIN) (if applied for).

In addition, the ministry connected the MCA21[3] with the Central Board of Direct Taxes (CBDT) for the issuance of a PAN and TAN to a firm formed using the MCA21 system (SPICe). Stakeholders apply for a PAN and TAN at the same time as they apply for incorporation through SPICe+. The PAN/TAN assigned by the Income Tax Department is affixed to the company's Certificate of Incorporation. Stakeholders can apply for up to three DINs through SPICe+. As a result, the number of processes and the time it takes to start a business in the country have decreased.

[3] The MCA21 is an e-governance system of the MCA to automate all the processes related to the proactive enforcement of and compliance with the legal requirements under the Companies Act, 1956; New Companies Act, 2013; and Limited Liability Partnership Act, 2008.

4.2.2. MCA21

The MCA21 MMP was executed under the National e-Governance Plan by the MCA in September 2006 and is currently in the post-implementation phase. The initiative intends to provide corporations and other stakeholders with convenient and secure online access to all registry-related services provided by the MCA at any time and in the manner that best fits them. The project's objectives were developed with several stakeholders in mind. The MCA21 is intended to automate activities linked to proactive enforcement of and compliance with the regulatory obligations of the Companies Act, 1956.

Companies are obliged by several provisions of the Companies Act to interact with the Registrar of Companies (RoC), regional directors, and the Union Government. Prior to the adoption of MCA21, all company filings were done on paper, which meant that a stakeholder or their representative had to physically visit the relevant offices or submit the documents by mail. Large amounts of paper were a serious issue, and there were concerns about a variety of nefarious tactics such as the loss of paper papers, ante-dated filings, and the substitution of statutory documents, amongst other things.

It had become very difficult to assess the quality of the filings (for proper and comprehensive information). Various forms have been re-engineered and converted to electronic forms (e-forms) under MCA21 to make them compatible with e-government operations. The e-forms offer a built-in 'pre-fill' function, which automatically populates the appropriate fields with data from the electronic registry's database. Repetitive data input requirements have been greatly decreased. The 'pre-scrutiny' facility of the e-form is also included in the electronic filing procedure.

This is an entirely computerised procedure in which the system checks if the form is complete in terms of the required fields. However, this is restricted to the tests that the automated system can undertake. Second, as part of the process, the method for paying statutory fees has been re-engineered. Online payment technologies, including the use of digital signatures based on a DIN database, have been added to the pre-MCA21 system, in addition to the traditional challan-based offline payment system. Third, services are now accessible 24 hours a day, 7 days a week, 365 days a year. As a result, record management is automated, digital records have mostly replaced paper records, and there is no risk of ante-dated filings, document loss, or document replacement. The elements of speed, certainty, and integrity in document filing have been implemented.

Table 4.5. Impact of MCA21 on Time Spent on Various Phases of G2B Interaction

Type of service	Prior to MCA21	After MCA21
Name approval	7 days	1–2 days
Company incorporation	15 days	1–3 days
Charge creation/modification	10–15 days	2 days
Inspection of public documents	Physical appearance	Online
Increase in authorised capital	60 days	1–3 days
Change in registered office address	60 days	1–3 days
Annual return/balance sheet	60 days	Instantaneous

G2B = government to business, MCA21 = Mission Mode Project of the Ministry of Corporate Affairs under its National e-Governance Plan to automate G2B interaction.

Sources = Compiled from Government of India, Ministry of Corporate Affairs and other sources.

4.2.3. eBiz – India's G2B Portal

The eBiz Portal, also known as the e-Business Portal, is an initiative of the Ministry of Commerce and Industry's Department for Promotion of Industry and Internal Trade to provide a single-window online platform for businesses to access various government services. The portal aims to simplify the process of starting and operating a business in India by reducing the time, cost, and complexity associated with obtaining licences, permits, and registrations.

Key services available under eBiz Portal:

- Company registration and incorporation
- Obtaining licences and permits, such as industrial licences, import-export licences, and environmental clearances
- Tax registration and compliance, such as Goods and Services Tax (GST) registration and filing of returns
- Compliance with labour laws and regulations
- Registration and compliance with various industry-specific regulations

Key features of the eBiz Portal:

- Single-window platform - eBiz Portal consolidates multiple government services and departments under one platform, making it easier for businesses to access and manage various services without having to visit multiple websites or offices.
- Better access to information – the portal serves as a comprehensive source of information on various government services, policies, and regulations. This easy access to information helps businesses make informed decisions and stay updated on the latest developments.

- Online application and processing – the portal allows businesses to submit applications, make payments, and track the status of their applications online, reducing the need for physical visits to government offices. This offers a transparent system for businesses, which helps businesses plan their operations more effectively and reduces the scope for corruption.
- Reduced time and cost – by enabling online application submission, payment, and tracking, the portal significantly reduces the time and cost associated with obtaining government services.
- Integration with other government services – the portal is integrated with other government services provided by various ministries and departments such as the MCA, the Central Board of Direct Taxes (CBDT), and the Reserve Bank of India (RBI) to facilitate seamless data exchange and faster processing of applications.
- Environmentally friendly – the portal supports the use of digital signatures for secure and paperless transactions. It also provides a document management system for businesses to store and manage their documents online. This not only reduces the environmental impact of business operations but also makes the process more secure and efficient.
- Licence and permits information wizard – the portal is a centralised repository of all applicable licences, permits, and other regulatory information, as well as their applicability requirements.
- Service orchestration – the portal enables a single request from the investor to be routed through numerous government agencies in a logical sequence using the Composite Applicable Form.
- User-friendly interface – the eBiz Portal features a user-friendly interface with easy navigation, making it simple for businesses to find and access the services they need.
- Customer support – the portal offers customer support via email, phone, and chat to assist businesses with any issues or queries they may have.

By offering these benefits, the eBiz Portal plays a crucial role in promoting the ease of doing business in India and fostering a conducive environment for businesses to thrive.

4.2.4. Udyog Aadhaar Memorandum

The micro, small, and medium-sized enterprise (MSME) sector has developed into a thriving and dynamic section of the Indian economy during the past five decades. It is the second largest contributor to the economic and social growth of the country, after agriculture, as it fosters entrepreneurship and generates significant employment possibilities at a low capital cost. Data on new MSMEs reflect the favourable environment for the opening and growth of such units in an economy, as well as the high level of confidence of entrepreneurs in the macroeconomics of the economy. These are critical indicators to assess the successful development of the MSME sector in an economy.

A substantial number of businesses in India are simply not registered due to the time-consuming paperwork needed for the procedure, and hence are unable to benefit from government programmes. Before the MSME Development (MSMED) Act was passed in 2006, a system was in place for small-scale industrial companies to register with District Industrial Centres. MSMEs were required to submit an Entrepreneurs Memorandum (Part-I) at District Industrial Centres before starting a firm in accordance with the MSMED Act, 2006's regulations. After production started, the concerned entrepreneur was required to submit an Entrepreneurs Memorandum (Part-II).

This Udyog Aadhaar Memorandum filing method has been replaced with Udyam Registration on a platform created by the Ministry of Micro, Small and Medium Enterprises based on composite MSME classification criteria, as announced in a notification dated 26 June 2020. Now, both current and future business owners can submit their Udyam registrations online (https://udyamregistration.gov.in/Government-India/Ministry-MSME-registration.htm). An Aadhar number, PAN, and GST number are required to complete the Udyam Registration process. As of 18 July 2023, more than 17.56 million MSMEs had registered on Udyam.[4]

The following are the salient features and benefits of Udyam Registration:

- Udyam Registration is open to anyone, and the process is completely digitalised and paperless.
- The registration process is free; no costs or fees are paid to anyone.
- An e-certificate (Udyam Registration Certificate) is issued online on completion of the registration process. This certificate has a dynamic QR code that provides access to the web page and details on the enterprise.
- The online system is fully integrated with the income tax and GSTIN systems. Details on the investment and turnover of enterprises are taken automatically from government databases. Exports are not considered as part of the turnover calculation.
- Enterprises can only file one Udyam Registration, but any number of activities (including manufacturing or services or both) may be specified or added in one registration.
- The registration is permanent and provides a basic identification number for an enterprise.
- The registration does not need to be renewed.
- Registration may help MSMEs avail of government schemes such as the credit guarantee scheme and public procurement policy, and provide an advantage in government tenders and protection against delayed payments, etc.
- Registered enterprises are eligible for priority sector lending from banks.

[4] The Hindu Business Line. (2023, July 25). Highest number of MSME shutdowns and new registrations seen in post-Covid FY23. Retrieved from https://www.thehindubusinessline.com/economy/highest-number-of-msme-shutdowns-and-new-registrations-seen-in-post-covid-fy23/article67118594.ece

4.2.5. Public Sector Banks Loans Scheme

In the MSME credit arena, the web platform www.psbloansin59minutes.com is a game-changing venture. The Small Industries Development Bank of India (SIDBI), with more than 21 partner banks, provides in principle digital loan approval to MSMEs up to ₹50 million via the platform in 59 minutes. It is a strategic project of the SIBDI-led public sector banks (PSBs) consortium, which is incubated under the Ministry of Finance's Department of Financial Services.

A user-friendly platform has been developed that eliminates the need for MSME borrowers to submit physical documents for in principle approval. The system employs advanced algorithms to read and analyse data points from a variety of sources in less than an hour, including IT returns, GST data, bank statements, and the MCA21, while gathering the applicant's basic information utilising smart analytics from accessible documents. The solution makes it easier for a loan officer to make decisions since the final output displays a credit, valuation, and verification summary on a user-friendly dashboard in real time.
The key features of www.psbloansin59minutes.com are:

- An advanced digital platform, with services-driven architecture and high-level information security for MSME financing.
- A banker interface that covers branch-level integration (with maker-checker-approver) that is compatible with PSB systems.
- Allows bankers to construct loan products based on their authorised credit policy's scoring models and assessment processes.
- An integrated GST, income tax return, bank statement analyser, fraud check, and bureau check, as well as additional capabilities.
- Connection with the Credit Guarantee Fund Trust for Micro and Small Enterprises to verify borrower eligibility.
- Digital approval of loans in 59 minutes via a contactless and hassle-free application process from anywhere.
- A common form for all lenders on the platform.
- New standards in loan processing – cutting turnaround time from 20–25 days to 59 minutes, where loans are sanctioned and disbursed within 7–10 working days.
- Enables enterprises to connect with numerous lenders without visiting a branch and provides the option to choose preferred lender products from multiple loan offers.
- Enterprises can track loan application on a real-time basis.

4.2.6. Goods and Services Tax

Under the Goods and Services Tax (GST) regime in India, firms with a turnover exceeding ₹2 million (₹1 million in the north-eastern and hill regions) are mandated to register for GST. Additionally, businesses that are already registered under pre-GST legislations such as value-added tax (VAT), excise tax, or service tax are automatically required to register for GST.

Firms may register for the GST by filling out an application on the GST online portal or visiting a GST Seva Kendra. Part A of the form (PAN, mobile number, and email address) must be completed. The site uses a one-time password (OTP) to verify information. Paperwork must be uploaded according to the kind of business. Part B of the form should be filled out using the OTP number. The application reference number is sent via text message or email. The application/document is verified by the GST officer. If extra information/documents are requested via Form GST-REG-03, they must be provided via Form GST-REG-04 within 7 working days. Then, within 7 working days, the GST officer accepts the application and issues the GST Identification Number.

The GST common portal allows taxpayers to register for GST and satisfy GST compliance requirements, such as submitting returns and paying taxes.

GST Suvidha Providers (GSPs) were onboarded by the Goods and Services Tax Network (GSTN) following a selection process that included evaluating their financial and IT capabilities to provide the services required for taxpayers to become GST compliant under the new GST system. Businesses can use GSP services according to their requirements.

Companies in IT; ITeS; and/or banking, financial services, and insurance that are registered in India are anticipated to join up as GSPs. A pre-qualification requirement must be met by prospective GSP applicants. To become an approved GSP, GSPs that satisfy the pre-qualification requirement sign a contract with GSTN.

4.2.7. e-Trade

e-Trade, an integrated MMP, aims to promote an effective and efficient manner of doing business in the domain of overseas trade. The Department of Commerce is the nodal agency for the e-Trade project's execution. To facilitate electronic delivery of services, the different trade regulatory and facilitation organisations have built electronic interfaces amongst themselves as well as with the trading community.

e-Trade helps facilitate international commerce in India by fostering effective and efficient delivery of services in an online environment by different regulatory or facilitating bodies, and assuring 24/7 clearance of export/import goods at ports/airports/inland container depots, amongst others.

Many of the improvements envisioned by the project have been realised. The project's most important success is empowering the trade and industry community by building a transparent system for international commerce in which they may access all trade regulatory/facilitating agencies from anywhere at any time. A significant decrease in the service transaction time has been achieved, e.g. a licence application is now processed in 6 hours instead of 45 days.

Shipping invoices are now received electronically by the Directorate General of Foreign Trade from customs, and licences are delivered electronically to customs, removing the need for physical verification of the Duty Entitlement Pass Book licences – thus lowering licence submission fraud and service time. All major seaports have a single window interface with the Centralised Port System, which is being expanded to include non-major seaports. Automatic data capture technologies for freight tracing and tracking have also been developed at airports. To give the status on container locations, the Container Corporation of India has been connected with the Freight Operations Information System of Indian Railways.

4.2.8. Parivesh Portal

Parivesh is a web-based, role-based workflow programme created for the online submission and monitoring of proposals filed by proponents seeking environmental, forest, wildlife, and coastal regulatory zone clearances from central, state, and district level authorities. It automates the proposal tracking process, including online submission of new proposals, editing/updating of proposal details, and displaying the proposal status at each stage of the workflow.

Parivesh allows project proponents and people to observe, follow, and communicate with scrutiny officers, as well as create online clearance letters, online mailers, and notifications to state officials in the event of delays beyond the application's deadline.

4.2.9. Shram Suvidha Portal

The Shram Suvidha portal enables businesspeople to get all types of registrations and submit the returns needed by labour regulations via a single online portal. It also makes the inspection reports generated by enforcement agency inspectors available to them online. Procedures have been streamlined, and returns and registration forms have been combined to create a corporate climate that fosters compliance by lowering transaction costs and facilitating transactions. The Shram Suvidha portal was launched on 16 October 2014.

The portal's goal is to compile labour inspection data and ensure that they are enforced. Inspections have become more transparent and accountable as a result. Compliance is reported using a Single Harmonised Form, which makes submitting such documents simple and straightforward. Key indicators are used to track performance, making the evaluation process objective. The portal encourages all implementing agencies to use a single Labour Identification Number.

4.2.10. E-Procurement project in Andhra Pradesh: An example of government procurement from businesses

One of the biggest consumers of products and services in each economy is the government sector. The Union Government of India and several state governments have implemented an electronic form of procurement in their various ministries and departments as part of the National e-Governance Mission.

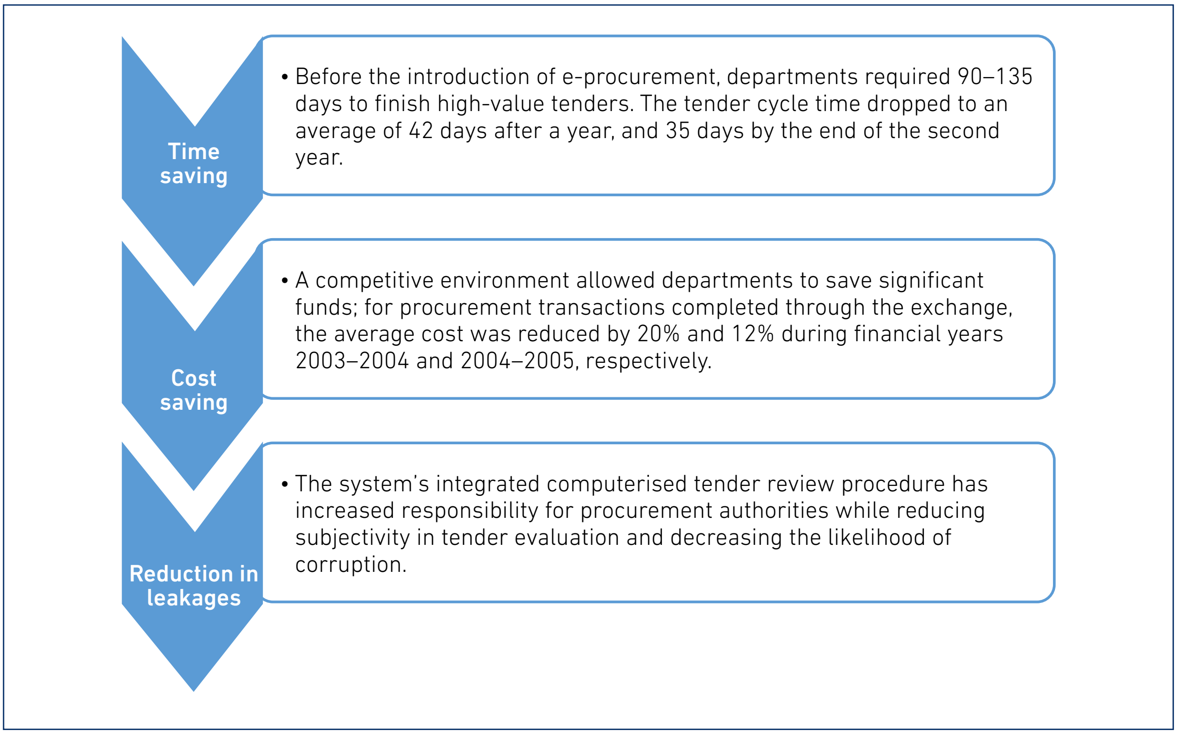
The Government e-Marketplace is one of the platforms the Union Government utilises. This is an online marketplace that makes it easier for government ministries and departments to buy products and services from authorised vendors. It strives to improve public procurement's efficiency, speed, and transparency.

At the state level, the Andhra Pradesh E-Procurement Portal has been implemented by the state government of Andhra Pradesh. Government agencies in the state utilised a manual tendering process before adopting an e-procurement system. The process required numerous trips by vendors to government offices and involved a protracted chain of internal approvals and inspections. The manual tender process has a number of issues, including unequal treatment, the emergence of cartels, delays, and lack of transparency.

The e-procurement project in Andhra Pradesh is a state government initiative to streamline and automate the procurement process for government departments, public sector undertakings, and other organisations. The project aims to enhance the transparency, efficiency, and competitiveness of the procurement process while reducing costs and promoting a fair and level playing field for all suppliers.

The e-procurement process was created to avoid human involvement, i.e. supplier and buyer interaction, during the pre- and post-bidding stages. The approach ensures complete anonymity of the participating providers, even to the buyers, up until the bids are opened on-site. The e-procurement programme performs automated bid evaluation based on the assessment parameters supplied to the system. These improved mechanisms have eliminated subjectivity in the receipt and evaluation of bids, and have greatly decreased corruption. Complete tender documents are also uploaded to encourage transparency in e-procurement. Vendors may download the papers without charge on the day the tender is issued. Each party to the transaction may check the status of the transaction at any point during the procurement cycle and be aware of it. This makes inventory planning easier and reduces the time and effort required to determine the status of a purchase order. Figure 4.10 shows the impact of this e-procurement project.

Figure 4.10. Success of Andhra Pradesh E-Procurement Portal



Source: Government of Andhra Pradesh (n.d.), AP E-Procurement Portal. https://www.apeprocurement.gov.in/

Services provided on the Andhra Pradesh E-procurement Portal include:

- Tender publication – government organisations can publish tenders on the platform, making them accessible to registered suppliers.
- Bid submission – suppliers can submit their bids online, eliminating the need for physical document submission.
- Bid evaluation – the platform automates the bid evaluation process, ensuring that bids are evaluated fairly and transparently.
- Contract award and management – government organisations can award contracts and manage them via the platform, ensuring a seamless procurement process.
- Supplier performance monitoring – the platform allows government organisations to monitor the performance of suppliers, helping them make informed decisions about future procurement activities.

The key features of the Andhra Pradesh E-Procurement Portal are:

- Online platform – the project provides a centralised online platform for government organisations to publish tenders, receive bids, and manage the entire procurement process electronically.
- Transparency – the e-procurement system ensures transparency by making tender information, bidding documents, and bid evaluation reports available to the public. This helps prevent corruption and promotes fair competition amongst suppliers.
- Efficiency – the online platform automates various procurement processes, such as tender publication, bid submission, and bid evaluation, reducing the time and effort required by both government organisations and suppliers.
- Cost reduction – by streamlining the procurement process and eliminating the need for physical document submission, the e-procurement system reduces the overall cost of procurement for both government organisations and suppliers.
- Security – the platform uses advanced security measures, such as digital signatures and encryption, to ensure the confidentiality and integrity of the procurement process.
- Supplier registration – suppliers can register on the e-procurement platform to receive notifications about relevant tenders and participate in the bidding process.
- Training and support – the project provides training and support to government organisations and suppliers to help them use the e-procurement platform effectively.

5. Conclusion

India's digital story is one of ICT-led development through the use of both accessible and ground-breaking technology. The digitalisation movement has been one of the most significant in India since 2015. Due to its youthful population, this rapid development has helped India rise to the top of the digital and technological innovation spectrum. Governments used to communicate with stakeholders, including the public/consumers, enterprises, government, and foreign sector, by a physical form (pen and paper), back in the early 2000s. All parties involved had to fill out paper applications for various government services and wait in a queue in front of government buildings. This involved a lot of time and money. However, the digitalisation of government services has fundamentally altered how the government interacts with its constituents.

Government contacts have been significantly improved by the availability of ICT facilities throughout India's regions and the quick adoption of this technology by all stakeholders and economic sectors. This has allowed stakeholders to access government services round the clock without regard to location, saving significant time and money.

In developing a digital ecosystem for launching and operating businesses, the Government of India has been fairly successful. Most government services are now offered to businesses online, and important ministries like the MCA, Ministry of Commerce and Industry, and Ministry of Finance have been instrumental in putting digital government into practice. State governments have digitalised a sizable portion of their services, in line with this support for the mission of digital government. More services are being brought under the digital system, and existing digital services are being reviewed and enhanced. This process of digital government is still progressing across the nation.

The government's initiatives – including SPICe+, MCA21, eBiz, India's G2B portal, Udyog Aadhaar, PSB Loans in 59 Minutes, Parivesh, Shram Suvidha, GST, and e-Trade, amongst others – have been quite successful in fostering a business-friendly environment. These initiatives to make services available online have contributed to India moving up the ranks for ease of doing business, from 142 in 2014 to 63 in 2020.

Moving all G2B exchanges to the digital paradigm still has certain holes, though. Government services for state incentive approval, entity registration, land acquisition, lift and escalator approval, building plan approval, factory layout plan approval, land use permits, power connection and availability, fire approval, authorisation for hazardous waste, and building competition certificates are a few examples of these areas. Most of these approvals are given by state agencies, many of which demand in-person inspections.

The government has made significant efforts to promote digital progress. However, much work needs to be done before the nation realises its full potential. Governments at all levels may aid in accelerating digitalisation by working with the corporate sector, starting by putting technology at the centre of their operations. This would help establish a market for digital solutions, which generates income for suppliers, stimulates digital start-ups, and gives individuals more reasons for using the internet to conduct government business, apply for a cooking gas subsidy, register for a home purchase, or perform other tasks.

Governments can also help by developing and managing public data sources that businesses can use to enhance and develop new products and services, encouraging the adoption of digital technologies while safeguarding the privacy of citizens, and promoting the development of labour markets in sectors affected by automation.

India has come a long way in its aim to provide companies with digital government, but it is still well behind developed nations in this regard. Nonetheless, the government is making every effort to make all G2B transactions paperless and without interaction.

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Chapter 5

Digitalising Public Services in Supporting Economic Development: The Case of Viet Nam

John Walsh

1. Introduction

In common with many other one-party nations, Viet Nam has appointed the ruling Vietnamese Communist Party to play a leading role in enacting state-level developmental goals. It has also followed the policy of creating large-scale plans for the transformation of the economy and society in dimensions considered to be of strategic importance. In the case of digitisation, this is being accomplished through the National Digital Transformation Programme (NDTP), which has strict prescriptions up to 2025 and a vision towards 2030 (Vietnam Briefing, 2021). The plan contains a wide variety of measurable targets and milestones, with some aimed at incorporating more Vietnamese people into a developing, prosperous, and modern country, and others deepening the existing economic model of reliance on inward investment. In the first category, it is planned that 50% of customers' banking operations will be fully online, 50% of customers will have a digital checking account, and 80% of online public services at level 4[1] will be available through access to mobile devices. In the second category, the digital economy should contribute 20% of the total economy by 2025 and 30% by 2030 (it is currently 5%), while Viet Nam should be listed in the top 50 countries of the UN ICT Index by 2025 (Vietnam Briefing, 2021). To ensure these goals are met, a committee has been established, with 16 members, including the Prime Minister and representatives from a wide range of ministries and agencies. Named the National Committee on Digital Transformation, it will have the tasks of bringing about administrative reform, implementing the NDTP, developing e-government and society and smart cities, and monitoring the implementation of the National Strategy of the Fourth Industrial Revolution (Dharmaraj, 2021b). Clearly, these are wide-ranging responsibilities, and it will be hard for any group of people to fulfil such complex responsibilities. The situation is made more difficult because of the current environment, which contains several dangerous if not existential threats, such as the ongoing coronavirus disease (COVID-19) pandemic, the climate emergency, and rising international tensions focusing on the relationship between the United States (US) and China, as well as Russia's invasion of Ukraine. Under these circumstances, it would be useful to try to identify exactly what the NDTP means in terms of the definition of digitalisation, the forms that it takes with respect to different stakeholders across the country, and the challenges that are likely to be faced (although the possibility of suggesting solutions to such problems is likely to be beyond the scope of a chapter of this sort). The purpose of this chapter, therefore, is to map the extent to which digitalisation policies have been established and implemented in Viet Nam and, more importantly, to establish the gaps that exist in everyday life between what is being made available for people and their experience of those opportunities. It is argued that the gaps that do exist are likely to intensify existing problems of inequality in Vietnamese society but that the government nevertheless will continue to pursue them to achieve the desired level of economic growth.

Defining digitalisation is a task that has occupied many scholars, whose attempts have varied. Other chapters in this volume will explore this issue in greater detail. This chapter will follow Gobble (2018). In distinguishing between two related activities: '... digitization is the conversion of atoms to bits – replacing paper with electronic files, pictures with jpeg images, music with mp3s. Digitalization is the transformation of all those bits into value' (Gobble, 2018: 66). Table 5.1 indicates ways in which value may be created by such means.

[1] At level 4, users can complete and submit official forms entirely online.

Table 5.1. Typology of Digitalisation Strategies

Value creation	**Creating novel offering configurations enabled by digital technology; understanding customer needs; creating value through ecosystem orchestration or collaboration**
Value delivery	Developing and applying new capabilities; revising operational processes and activities for global delivery; revising roles and responsibilities in industrial ecosystems
Value capture	Improving internal processes that enable improved cost efficiency; generating new or increased revenue streams and new risk management strategies

Source: Parida, Sjödin, and Reim (2019).

Some authors consider digitalisation to be a more efficient means of digitisation, using contemporary applications and artificial intelligence, and they use the term 'digital transformation' for the revolutionary changes that the process can involve: 'Digital transformation goes beyond digitalisation by creating a comprehensive change to a company's business strategy. That company might implement an isolated project as a digitalization effort, but a project that has digital transformation as its goal will create change across all departments' (Yokogawa, 2021). Of course, these processes take place in the public as well as the private sector. In this chapter, digitalisation and digital transformation are separated from digitisation in scope and effect.

It is clear that creating value through digitalisation involves many of the technologies that constitute Industry 4.0, a concept that has been taken from its German context and generalised as a useful means of describing widespread change in the confluence of business, industry, and technology: 'Industry 4.0 is a concept of organizational and technological changes along with value chains integration and new business models development that are driven by customer needs and mass customization requirements and enabled by innovative technologies, connectivity and IT integration' (Nosalska et al., 2019: 838). It will depend on seven related and occasionally overlapping technologies: mechatronic systems and automation design and implementation; information technology (IT) and software-related issues; data science and data processing; new manufacturing technologies; networking and connectivity; robots; and system management and services (Nosalska et al., 2019). In the case of Viet Nam, it is evident that most of these Industry 4.0 technologies are not indigenous and their mobilisation will depend on the continuation of the existing economic model, which focuses on the transition from import-substituting, export-oriented intensive manufacturing based on low labour cost competitiveness (although that will continue as long as it can be managed) to innovation and branding – the higher value-adding parts of the value chain smile curve. Much of the government's digitalisation strategy will be involved, therefore, in facilitating the technologies and systems of inward investors and providing whatever inputs and support might be needed. It will also be stimulated by increasing awareness of the climate emergency and the need to promote resilience in communities and, particularly, the major urban areas of the country. It is assumed that the ongoing COVID-19 pandemic will, perhaps not straight away, be replaced by something that can be labelled a 'new normal' in due course. These issues will affect different countries in different ways, and the implications for digitalisation prospects will likewise vary. Currently, Viet Nam is ranked 55th out of 79 countries in progress in this area, according to Huawei's Global Connectivity Index (Dharmaraj, 2021a). This puts the country at the lower end of the adopters group; it is noted that weaker nations in this regard, known as starters, are beginning to catch up more quickly with those above them as technology matures and diffuses. The government's first integrated policy on digitisation of the economy was published in June 2021 as Decision No. 942/QD-TTg, which was made to be consistent with other decrees relating to digital services in Viet Nam and the approach to Industry 4.0 (MIC, 2021). A minister from the Ministry of Information and Communications (MIC) made a statement which enumerated eight ways in which Industry 4.0 was to be approached (Dharmaraj, 2021c):

(i) Renewing thinking, unifying awareness, strengthening the party leadership, and imposing state management over the Industrial Revolution 4.0
(ii) Perfecting institutions to facilitate the Fourth Industrial Revolution and digital transformation
(iii) Developing essential infrastructure, especially digital infrastructure
(iv) Developing the national innovation capacity
(v) Developing human resources
(vi) Developing priority industries and technologies
(vii) Integrating Viet Nam into the international economic system
(viii) Promoting digital transformation

These goals are quite ambitious and consistent with other changes in the economy – e.g. providing high-quality services to society, broadening public engagement, improving state agency operations, effectively addressing issues in socio-economic growth, and achieving breakthrough changes in international rankings in relevant issues – but the measures that can be achieved are quite basic for most people. Access to mobile phones for most of the Vietnamese people and the ability to interact with the National Data Exchange Program are important and useful, but still primarily address digitisation issues. These policies mostly describe a world far away from the lived reality of most of the 97 million Vietnamese. Most Vietnamese do not participate in value chains or form part of the emergent urban middle class, so it is important to consider the digitalisation process from their perspective – focusing on how their lives are affected by it rather than by assuming that they will be drawn into it eventually. Further, the priorities contain several political goals which would not normally be expected in a policy paper from a western perspective. Some of the policies are difficult to imagine: is strengthening the party leadership to be achieved through digital transformation or is it a prerequisite of any change? It is not clear how the policies will distinguish between digitalisation and digitisation or even whether that distinction has any value here. The multiplicity of ministries and agencies involved also makes it more difficult to understand exactly how goals are to be achieved (Table 5.2). Consequently, as this chapter looks at various aspects of society and how they are likely to change because of these plans, there will be some imprecision over which of these approaches is being used at any one time. Bengtsson (2016), writing about the confluence of education and sustainable development, found that (through discourse analysis of relevant policy documents) important terms were not properly defined but instead '... they are suggestive of the limits of hegemonic power and allow for the emergence of a space of contestation' (Bengtsson, 2016: 77). This is true of other policy areas, including the current one. New areas are addressed and commitments are made, but because of the need for a broad range of governmental consensus, individual ministries attempt to enforce their own discourse onto others and onto the final documents, resulting in a struggle which may or may not be resolved. The various sectors of society considered in this chapter also reflect this contestation process, which can therefore appear contradictory.

Table 5.2. Ministries and Agencies Responsible for Developing the Digital Economy

Ministry	Role
Ministry of Science and Technology	Regulating activities related to R&D and innovation; promoting the application, research, development, and transfer of the key technologies of the Fourth Industrial Revolution
Ministry of Information and Communications	Regulating and creating development plans in relation to publishing, news and media management, post, ICT, broadcasting, and national information provision
Ministry of Education and Training and Ministry of Labour, War Invalids and Social Affairs	Developing human resources with respect to ICT
Ministry of Finance	Regulating e-banking and e-finance; formulating policies on tax and finance to promote the application of ICT
Ministry of Industry and Trade	Regulating e-commerce and developing ICT applications in industry
Ministry of Planning and Investment	Developing socio-economic plans and strategies to promote digital adoption of ICT applications
Other ministries and provincial peoples' committees	Developing action plans and promoting ICT applications in regions

ICT = information and communication technology, R&D = research and development.

Source: Adapted from Foreign Investment Agency (2018).

2. Digitalisation and Agriculture

A recent overview of the role of digitalisation in agriculture (McFadden et al., 2022) observed that it offered opportunities to enhance productivity, sustainability, and resilience. It is composed of individual initiatives which could be defined as data collection methods, decision support tools, and precision equipment. Some success had been achieved in using these tools in the Organisation for Economic Co-operation and Development (OECD) countries in row crops (i.e. mostly cereal annual crops which benefit second crops) but less so in livestock management and specialty crops. Reasons for resistance to new tools include user-unfriendliness, lack of resources, and the threat of risk from reduced production or greater costs. In such circumstances, it is evident that government has a role in alleviating bottlenecks. In an interview, a senior spokesperson for the Steering Committee for Digital Transformation in Agriculture observed that the main obstacles to that transformation were the need to change the mindsets of farmers and local leaders and the challenge of scaling up small local initiatives (Ministry of Agriculture, Nature and Food Quality, 2022). However, some progress has been made with respect to digital transformation in agriculture. For example, the Ministry of Agriculture, Nature and Food Quality (2022) reported that (i) cultivation, animal husbandry, fisheries, and forestry use digital technology; (ii) farming uses software to analyse data about the environment and plant growth stages, allowing real-time tracking; (iii) animal husbandry applies the internet of things or blockchain and biotechnology to large-scale farms; (iv) forestry uses barcode technology to manage varieties and forest products; (v) the seafood industry applies fish detectors using ultrasonic waves, satellite phones, and global positioning systems to manage offshore fishing fleets; and (vi) large enterprises such as Vineco or Hoang Anh Gia Lai, Dabaco use high and advanced technology to manage product production, distribution, and consumption.

While these are undoubtedly examples of progress, the results are not general. For example, in Viet Nam, many farming households now have access to mobile telephones, including smart phones, as well as some personal computers, so they would be able to assimilate some forms of precision agriculture when it comes to rice growing. However, the use of such information is still quite rudimentary (Minh, Son, and Trinh, 2019; Walsh, 2019). The World Bank considers improvements in the availability and use of information to be one of the principal benefits to agriculture of digital transformation. Schroeder, Lampietti, and Elabed (2021: 2) argued that 'Digital technologies and networks – rapidly developed and deployed – will transform the agrifood system by overcoming the long-standing transaction costs and information asymmetries'. Additionally, the adoption of precision agriculture will lead to efficiency improvements on the farm, with improvements to technology adoption and profitability (through greater awareness of market movements). Better information will lead to an improved fit with existing and emerging clusters and supply chains off the farm. Other relevant technologies, including distributed ledger technology, mobile money, and remote sensing for insurance, all offer new opportunities for farmers to adjust their production to market requirements (Schroeder, Lampietti, and Elabed, 2021).

Viet Nam earns more than $40 billion in agricultural exports annually, with major goods including rice, shrimps, fish, rubber, and pepper. Having joined various multilateral trade agreements in recent years, the Vietnamese government and various agricultural institutions have been looking for ways to increase exports overall and to add value to product prices prior to export. This has become one of the more important priorities in economic development generally. However, most of the more obvious means of increasing productivity – e.g. expanding the amount of land under cultivation or increasing the quality of fertilisers and other inputs – have already reached a limit (OECD, 2020). In 2018, the government announced that 13 products would be eligible for preferential treatment, including financial incentives and exemptions and support for introducing technological applications. These efforts have been undermined by the measures necessary to take action against environmental degradation in a country in which more than 60,000 people a year die from air pollution (WHO, 2018) and in which the results of global climate change have become increasingly evident (Duc, Ancev, Randall, 2019). The government has introduced an action plan for agriculture for 2021–2030 to try to deal with these problems. However, the outbreak of the COVID-19 pandemic resulted in the closing of the rice export trade and pressure on many agricultural activities because of the suspension of travel. Viet Nam's attempt to minimise the number of infections through extensive lockdowns was quite successful until the arrival of the Omicron variant overwhelmed local defences. Consequently, there will continue to be disruptions to production and export processes in the near future. Further, the need to adjust to differing tariff structures and to new sanitary and phytosanitary standards for new export markets complicates the situation. This has been, in other words, a period of considerable uncertainty that has interfered with the government's ability to create and implement policy in a coherent manner. Planning was more able to go ahead than implementation, so the gap between the two has grown, which has not helped with public confidence.

In 2021, the MIC announced plans to put millions of farmers, cooperatives, and small businesses on nationwide e-commerce sites, Postmart and Vo So, to combat the modest role of e-commerce in agriculture to date (Dharmaraj, 2021c). Farmers will be able to obtain and share information and to receive IT training to be able to navigate the sites. However, it is difficult to imagine that this level of support will be sufficient for agriculturalists to take part in precision farming through such means, not least because of technology and logistics limitations. There is also the issue that Vietnamese people speak a language not spoken elsewhere, so additional language-related transaction costs are involved in the localisation of IT applications.

Other government policies have attempted to tackle problems that small businesses of all types face, such as the bureaucratic procedures necessary to access desired services and capital. Decree No. 116/2018/ND-CP provides various incentives to agricultural firms to obtain technological assistance, such as enabling them to borrow up to 70%–80% of new project investment without the need for collateral. Meanwhile, Decision 19/2018/QD-TTg simplified classifications of investment projects and agricultural technology use to help farming interests obtain support for investment (UEH News, 2021). Nevertheless, there remains a gap between the provision of services from the government and the ability of people at lower levels to be able to profit from them. This is evident from the following case studies.

Ngoc Linh is home to Viet Nam's premier ginseng-growing area. The plant grows well at height and its quality is established since becoming a national treasure according to Prime Minister's Decision No. 787/QD-TTg. The ginseng-growing area covers 1,600 hectares, with 1,200 households participating. As prices have increased to VND75 million–VND100 million per kilogram ($3,300–$4,400), some farming communities are becoming rich. A cluster of activities has formed around the growing of the ginseng, including the production of dietary supplements, energy drinks, and ginseng-flavoured alcoholic drinks, as well as the mounting of monthly fairs and an annual thanksgiving event. Support has been received from Gyeongsangnam-do Province in the Republic of Korea (henceforth, Korea), a world leader in ginseng production and consumption, which led to the creation of a trademark and the formation of a cooperative for more equitable involvement of all participants (Quang Nam Portal, 2019). The Vietnamese government has provided support both in the form of improving infrastructure and support services and in technical support for mapping and improving the genetic material of the plant (Saigon News, 2019). This project is an example of the new thinking of the Vietnamese government following the establishment of the Doi Moi economic reform programme. Agriculture fell behind industry because of poor rural infrastructure, low productivity and quality, lack of access to markets, and low involvement of the private sector. In response, the government initiated a decentralised participatory approach that encouraged local communities to concentrate on specialities that could be provided by their configuration of geographic factors and local knowledge. However, rather than providing incentives or subsidies, a policy of 'let the market decide' was adopted (World Bank, 2016), irrespective of the danger of promoting inequality.

A similar project in the mountainous northern province of Lao Cai had successfully transformed the existing fish farming industry, which was small and focused on typical Vietnamese fish, with low selling prices, to a systematically organised caged-fish aquaculture project raising and selling much more profitable sturgeons (*Viet Nam News*, 2019). This project also benefited from government support in terms of training local farmers to keep the fish living in clean water and, hence, good quality products. The government also assisted by identifying the potential of the area, which is home to many ethnic minorities as well as hydroelectric plants, as suitable for this form of production and in helping to link the production with suitable regional and international markets. The first stage of the process, for both ginseng and sturgeon, is digitisation – i.e. itemising and documenting the wildlife and farmed products of the country (and Viet Nam is part of a region in which this process is still being undertaken (Associated Press, 2022)) and, then, using that information to create new business models which are beneficial to local people and to the overall development of the country. These two examples show the limitations on digitalisation in agriculture in Viet Nam, which is mostly still in the digitisation phase. Most people have access to the internet and can access information, but they tend to do so in quite a rudimentary way. Local government officials and extension service providers also tend not to be much more sophisticated in their use of information, so the activities they can provide are also limited. In these cases, greater use of market mechanisms might increase the amount of digitalisation taking place, although at the risk of perpetuating the unequal distribution of resources gained as a result.

These projects are examples of individual success that work in one place, but which are difficult to replicate elsewhere. In other words, they suffer from the scalability issue. In part, this is the result of inter-agency rivalry, as described above. In other cases, it is because the subject is complex and dependent on subjective opinions. USAID (2018) produced a tool for assessing the degree to which individual projects may be scalable, but its correct use requires a degree of technical capacity that may not always be available. It also requires decision-making to be free of local influences, which can be problematic.

Viet Nam has benefited from various free trade agreements that have made it easier to export goods to high-value markets, including the European Union, Japan, and Korea. Some have benefited from becoming integrated in China's advanced e-commerce agricultural systems, and these have been beneficial in the era of the COVID-19 pandemic. COVID-19 was tackled at first by strict local lockdowns and a zero-tolerance policy, which meant closed borders and workplaces. This was successful for some months, in which the spread of the disease was very restricted, and for months the country could claim that there had been no deaths. However, successive waves of the virus, especially the more infectious omicron variant, combined with increasing pressure on the economy, meant that this policy could not be sustained in the long term, and there have been more than 2.1 million cases and 37,000 deaths as of January 2022. The impact of COVID-19 included broken or fractured supply chains, as people were forced to remain at home, and concomitant loss of earnings. These effects were particularly noticeable in the agricultural sector: at times in Hanoi, leading supermarkets were bare of fresh produce, especially meat and fish. One longer-term impact of the pandemic has been the intensification of existing government plans for the sector, especially those involving the use of technology. In essence, technology replaces labour in agriculture, especially when it comes to larger-scale farming with more land involved, when the benefits of machinery over human labour become more obvious. In some cases, this involves similar processes to those mentioned above but at a higher scale – more data about land conditions, the prevalence of insects and pests, the impact of climate change, and so forth can be used to provide better planning for production schedules, while the use of appropriate software and hardware can greatly improve management efficiency (Dao, 2021). One characteristic of the 'new normal' that may settle once the virus is either defeated or just tolerated is the withdrawal of the individual from personal transactions (Walsh, 2021). Many people have become nervous of dealing with other people and will take precautions to reduce their human interactions.

In the case of agriculture, digitalisation is most influential in the area of value delivery. Farmers and their organisations are drawn more deeply into international value chains which are mainly organised externally, while production in Viet Nam is becoming more efficient and is becoming specialised in some cases in high-value items that can be exported. Until the country's retail system is liberalised and made more open to international competitors, there is only limited scope for domestic-led marketisation. It should be noted that many senior Vietnamese politicians and bureaucrats can remember hunger in the country (in the 1980s), and this makes them more reluctant to surrender food sovereignty to outside interests, which is one way of thinking about liberalisation. Food insecurity provoked by the COVID-19 pandemic will be a contributing factor to this reluctance. However, there are more possibilities in the case of sectoral development. Viet Nam is one of the world's largest cashew nut processors and exporters. However, processing capacity greatly exceeds domestic growing capacity, so large amounts of nuts are imported from various countries, including several in Africa and neighbouring Cambodia. Led by the Vietnam Cashew Association (VINACAS), detailed plans have been drawn up to promote various aspects of the supply chain and to create branded products for which premium prices might be paid. Viet Nam now accounts for 80% of the global trade in cashews (VNA, 2020). This progress has been made in a pre-digital transformation industry, although it is connected to digitalisation through the logistics industry. In common with other agricultural sectors, cashew nuts divide activities between a small minority at the top who are involved with technology at a high level and the majority at lower levels who persist with analogue-style activities. Decision 1992/QD-BCT, which aims to establish an institutional framework to support the National High-Tech Development Programme (VNA, 2021a), does so on the basis that it will involve a small number of entrepreneurs, global in thought and education and supported by capital, who might one day provide benefits across society but who will be more important in the foreseeable future in linking the Vietnamese economy with inward investors. Eventually, linkages with the rest of society will develop but it is not clear how long that will take.

3. The Informal Sector

Viet Nam has a large informal sector, in common with many other countries in the emerging market category. The informal sector consists of all those activities that are not covered sufficiently by formal arrangements. It is distinct from the illegal economy. The informal sector is distinguished by lack of registration of businesses, lack of taxation, lack of access to government services and, above all, lack of awareness of exactly who is doing what. Some people might be involved in the informal sector because they are own account workers who are never likely to earn enough to pay tax, they may be family members accompanying a migrant worker who seeks to supplement income by working in a market, or they may be related to a farming household and bring seasonal produce into towns and cities for sale to passing residents. As much as 82% of total employment in Viet Nam may belong to the informal sector (credible national-level statistics are scarce) and about 8.4 million informal household businesses. Of these, manufacturing and construction compose the largest component (43%), followed by trade (31%) and services (25%) (Cling, Razafindrakoto, and Roubaud, 2011). The Vietnamese government has made overhauling the informal sector one of its priorities, specifically by encouraging people in the sector to become part of its digital accounting systems. These include cloud and artificial intelligence (AI) technology to help introduce e-invoices into general use (Nguyen, 2022). Bringing more people into the formal sector would increase the government's tax revenues, and the increase in information would help to improve planning processes.

Depending on the nature of the state, officials may be neutral to informal sector workers – effectively ignoring them – or else be hostile. In the case of Viet Nam, sedentary and mobile street vendors have from time to time been considered personae non gratae because of their apparent unruliness and suggestion of a pre-modern reality. Hanoi authorities banned street vending in 2008, and vendors have spent the years subsequently learning how to dodge the authorities through various strategies (Eidse, Turner, and Oswin, 2016). More generally, the Vietnamese government had until recently shown little interest in the informal sector or in systematically drawing its members into the formal sector. There are relatively few interactions between the formal and informal sector, and city centres tend to be home to formal sector activities (Cling, Razafindrakoto, and Roubaud, 2011). However, the COVID-19 pandemic revealed the importance of the informal sector in supplying goods and services throughout the country, particularly food. It is estimated that 2.2 million Vietnamese moved internally during the COVID-19 period, which contributed to problems with the country's role in global supply chains. This has led to new emphasis on the role of the informal sector. Currently, the approach is not to bring workers into the formal sector completely but to make participation in social security compulsory, which will enable more security and control (Viet Nam Social Security, 2022). It will take some time before a comprehensive policy approach can be developed, if at all.

It was thought that the informal sector existed in an economy because its formal sector was not large enough to accommodate its members and that economic growth would, therefore, cause its inevitable elimination. This has been found not to be the case. Instead, the informal sector acts as a supplement to the formal sector, expanding or declining depending on the relative success at the time and providing the low-cost goods and services necessary to support an economy based on low labour cost competitiveness. During the COVID-19 pandemic, many workers lost positions in the formal sector and turned to informal sector work to compensate. Many types of informal sector work rely upon mobility, and this was greatly limited during the lockdown period. Consequently, new methods of working were required. One response has been the widescale creation of the motorcycle delivery system which, together with apps that can be used for mobile devices, has meant that a previously unthought of plethora of goods can now be delivered to the doorstep. This is a form of digitalisation, as it enables the intermediary company to coordinate demand and supply for goods by using riders to provide them. This has contributed to increases in pollution and the likelihood of accidents, which are risks that the riders must bear. When dining out and shopping became risky because of COVID-19, rather than a benefit of wealth and mobility capital, the middle classes returned to their homes and transferred the risk to the workers. This is true more widely in the informal sector, as workers have sought new ways of delivering their goods and services to customers. Research indicates that the informal sector in Viet Nam is not as well integrated in the formal economy as in other countries (Cling, Razafindrakoto, and Roubaud, 2011), so it is less likely to be able to benefit from government transfers to formal sector workers. For example, the estimated 200,000 Grab riders in Viet Nam were determined legally not to be employees and so, not having social security paid by an employer, were not eligible to receive relief benefits (Indochine Counsel, 2021).

In general, the informal sector is very heterogeneous in nature, in Viet Nam as elsewhere. Consequently, the impact of digitalisation and the threats and opportunities people face depends on a wide and probably unpredictable range of factors (GIZ, 2020: 9). Increasingly, everyday communications with digitalisation for the informal sector come through the online world. While this is welcome overall, given the relatively low costs of accessing the internet, dangers remain. Even mild criticism of the government's response on Facebook has led to the arrest of one man (the latest in a long string of prosecutions) and the firing of a university lecturer (Whong, 2021). It is common for prosecutions to be mounted against critics of any sort, including journalists, and there are concerns about the extent to which free trials might be being received. United Nations human rights bodies have issued condemnations, but there is little prospect of any changes at present (Schlein, 2021). There is, of course, quite a distance between accessing an app for information and getting into trouble for making comments that are considered unwelcome by the government, but the same equipment may be used for both. It is not surprising that people generally assume that surveillance of their actions is widespread, and online interactions make recording what people say or think more convenient. This point will be revisited when smart cities are considered.

Members of the informal sector are spread across Viet Nam and present in many sectors, including agriculture. Although they are unlikely to benefit directly from government-led digitalisation, they may benefit indirectly from the kinds of projects discussed in the agriculture section above. Digitalisation helps move some people from the informal sector to the formal sector; in the formal sector, they may interact with other informal sector workers. These workers will also encounter some government services, e.g. through household registration or registration of motorcycles. It is likely that it will take some time before partial interaction with the state can be built up to a full portrait of people and their circumstances. People, after all, tend to see the world around them in consistent ways influenced by their background, their way of thinking and, technically, the physical embodiment of the cultural capital they possess (Bourdieu, 2010). That way of thinking is influenced – or not – by what daily interactions they have with, in this case, the state. In Viet Nam, the everyday politics (Kerkvliet, 2009) of individual-state interaction are quite common as state representatives are involved in nearly all aspects of daily life, from housing to street cleaning. It would not be surprising if some people in the informal sector prefer to try to avoid some of these instances of interaction.

Improving the situation and enabling members of the informal sector to be in receipt of digital services depends most critically on education, including skills-based education (O'Higgins and Viegelahn, 2021). Vietnamese families tend to prioritise university education above vocational education, even when skilled workers are in much greater demand in society. Finding some means of providing skills-based education, digitally, would be an important means of extending services to the informal sector. These issues relate to equality and equity as much as education and are, therefore, close to the heart of the government's stated policy. While a large informal sector and significant differences in lifestyles with the formal sector persist, the equity situation will remain problematic. The provision of further digital services, which will help narrow the gap between the two, is an important goal.

4. Smart Cities

Cities are increasingly important in human society. They have been described as '... the defining social and ecological phenomena of the twenty-first century' (Dawson, 2017: 5). By 2020, most of the world's population (56.2%) lived in cities and for developed countries that number reached 79.2%. Urbanisation is increasing most rapidly in developing Asia and Oceania (UNCTAD, 2021). Yet cities are particularly vulnerable to global climate change, since they are necessarily built on waterways and, most commonly, linked to the seaports necessary for international trade, at sea level, and hence vulnerable to rising sea levels. More than 50% of the world's population lives within 120 miles (about 193 kilometres) of the sea, and that is likely to increase to 75% by 2025 (Dawson, 2017: 6). Viet Nam's urbanisation rate reached 37.1% in 2017, and the country was on course to follow the dictum that no country achieves middle-income status without reaching 50% urbanisation. Most population change is occurring in and around Hanoi and Ho Chi Minh City, which offer attractive job opportunities to people in rural areas. These two cities dominate their areas (north and south) and are amongst the five cities that are under direct governmental control (Class 0, special cities) (Table 5.3). There are also 68 provincial cities, of which 14 are class 1 (relatively large), 24 are class 2 (medium size), and 30 are class 3 (small). Towns are usually class 3 and townships class 4 or 5 (World Bank, 2020: 3).

Table 5.3. Viet Nam's Largest Cities

City	Population	City classification
Ho Chi Minh City	8,993,082	0
Hanoi	8,053,663	0
Da Nang	988,561	0
Hai Phong	841,520	0
Bien Hoa	830,829	1
Can Tho	812,088	0
Thuan An	588,616	3
Di An	474,681	3
Hue	351,456	1
Vung Tau	341,552	1

Source: Adapted from World Population Review (2022), Population of Cities in Vietnam. https://worldpopulationreview.com/countries/cities/vietnam (accessed 9 May 2023).

Digital government is a main component of smart city development. Central and local government agencies work to promote the means of 'smartness' within their cities through providing such means as online platforms on which people can find integrated information and services relating to public health, social security, education, and so forth. In the first stage of development, smart cities act like islands within nations and they may be linked together, ignoring rural areas. For sustainable development, it is necessary to move from the smart city concept to the smart nation concept (Kar et al., 2019). This is a long-term process which involves extensive spatial planning at a time of uncertainty. Spatial planning is conducted by several ministries, and differences in definitions and practice amongst them can lead to lack of clarity in planning and some contradictions. Additionally, since the government allocates budgets for infrastructure based on the size of an urban area, there are incentives for local authorities to maximise the amount of land classified (in whatever way) as urban in nature. It is not surprising that such authorities would also want to benefit from income flows relating to smart city status.

The Vietnamese government is committed to the smart city concept and has announced a number of plans for different cities and the public–private partnerships that will help to build them. According to The Welding Institute (TWI), 'A smart city uses information and communication technology (ICT) to improve operational efficiency, share information with the public and provide a better quality of government service and citizen welfare' (TWI, 2022).

In general, smart city technology relies on big data analysis in real time to help make decisions about resource allocation, such as directing energy supplies and traffic management. This entails widespread monitoring of cities and their residents. A principal drawing point for the development of one new project is that it will provide facial recognition, which is becoming increasingly important in Viet Nam, as it is internationally, for a variety of reasons. One of these is for payment of bills. The pandemic encouraged people to prefer contactless payment systems and facial recognition helps with this. Now it is possible to install an app on a mobile device which can scan the face and then be used as a form of payment in convenience stores and elsewhere (Vietnam Insider, 2020). Meanwhile, some large hotels are introducing similar forms of technology so that guests can check in at reception without the need for human contact (Hotel Technology News, 2022).

However, this technology can act as a double-edged sword. Describing the government's approach to cybersecurity as part of its smart city approach, Arup and Vriens and Partners (2021: 43) stated that 'Cyber security regulation has been a big focus of the government over the past few years. Plans have been put in place to prevent the abuse of personal information, as well as access to illegal content. The government has also developed an emergency response plan in the case of a major cyber security breach'. It is quite clear that this policy is designed, in addition to any smart city application, to maintain and reinforce control of information in the country.

Reporters Without Borders (RSF) ranked Viet Nam 178th out of 180 countries for press freedom in 2023 (RSF, 2023) and this performance has been consistent. Authorities already use COVID-19 test and tracing apps to monitor people's movements: '[Vice Director of Hanoi's Department of Information and Technology Nguyen Viet] Hung referred to the widespread use of COVID-19 prevention and control apps, including PC-COVID and Bluezone, amongst the public, as well as QR code scanning to control people's movements' (Mai, 2022). As Frederick Douglass observed, 'Power concedes nothing without a demand'.

A second way in which people's lives will be directly affected by the introduction of a proposed smart city is through personal transportation. Viet Nam's cities are notoriously clogged with motorcycles, and many areas are reliant upon the narrow roads of earlier historical periods. People have become accustomed to using motorcycles to navigate cities from home to work to shopping centre to leisure activity and so forth, and space is routinely provided for parking at destinations. However, smart cities operate on the basis of large-scale public transportation as a more efficient means of moving people around the city and keeping other areas clean and modern in style. Unfortunately, lengthy delays have meant that the rail systems expected to serve Hanoi and Ho Chi Minh City have yet to be finished, so the increases in public transport capacity will fall heavily on bus systems, which are not universally popular. Consequently, plans announced to end the registration of new motorcycles to reduce congestion in the capital city have been met with dismay because of the likely reduction in personal mobility and its impact on equality, since no such restrictions would be placed on new cars (Kiet, 2020).

A third area of smart city design with a direct impact on people's lives is environmental management. Having been built in a period in which few people felt it necessary to give any thought to the physical environment, many of Viet Nam's urban areas are subject to rapid flooding and air pollution from excessive traffic and the intensive industrialisation deemed necessary to enable the country to achieve its potential for economic growth. As a result, Hanoi was ranked as one of Southeast Asia's most polluted cities in 2021 and 80% of its wastewater is discharged directly into waterways. Metropolitan Hanoi is so densely packed that no solutions to these problems are possible without rehousing many residents, which precedent suggests will be only with limited agreement or compensation (e.g. Hai, 2021). It seems unlikely that the smart city concept in Viet Nam will be implemented without intensifying some inequalities.

Despite the proclamations of the importance of marrying digital transformation with the smart city concept, the example of Hue indicates the ways in which Vietnamese cities will really change. Hue will receive $13 million from the Korea International Cooperation Agency as part of an overall $18.8 million five-year plan to upgrade the city to a smart cultural and tourism city (Quy, 2021). The project will focus on the former imperial palace as a tourist destination. It will create a smart tourism information centre, a pedestrian walking zone, and lighting along the River Huong walkways. This project demonstrates the importance of international partnerships, which will import both capital and technology. The benefits will be restricted to a limited number of people, and few local people will benefit from the investment with jobs. It is not clear whether the project will have any impact on other parts of the city or pay attention to the needs of the people. In common with other instances of the introduction of digital transformation, the effect is to create an island that is connected to other similar islands within Viet Nam or overseas but has little contact with other, unimproved parts of the country. Meanwhile, the needs of the people which might be met by digitalisation are not addressed in ways likely to be as helpful as might be the case.

5. Regional Development

The Vietnamese government has been effective in reducing poverty across the country following reunification (Cuong, Tung, and Westbrook, 2015). This is an important policy issue for the government both in the context of the communist ideology and as a post-colonial state. The urban, coastal, and Mekong delta regions tended to be better developed than inland, often remote regions where ethnic minorities live and which it is quite difficult for government services to reach. To what extent will digitalisation make a positive change to this situation? A study of its adoption in the high-tech small and medium-sized enterprise (SME) sector of Viet Nam demonstrated that the major problems facing successful implementation involved managerial and technical capacity (Trung, Walsh, and Hoang, 2020). This problem is likely to be worse in rural areas, where skills and competencies are generally weaker than in urban companies. Digitalisation can involve decentralisation of resources and decision-making, which could help to reduce interregional inequalities. However, there are challenges to overcome. Digital transformation can lead to displacement effects, wherein labour is replaced by technology and its share of value added is reduced. Further, it may bring about premature deindustrialisation, which would be particularly acute in the case of Viet Nam and the structure of its economy (Ing, 2022), not to mention the issues involved with cybersecurity and the concentration of market power. As will be seen below, the Vietnamese government has sought to tackle these issues through a systematic approach.

Although various tools and databases focus on provincial level indicators and resources relating to digitalisation policies, there is less information on how existing regional disparities will be tackled. It is known that there are significant differences between the urban and delta regions on the one hand and the mountainous and inland areas on the other hand (Table 5.4). Communist ideology requires that all people be treated equally and that the laws of the land be respected, demonstrating morality, obedience, and solidarity. However, the country remains culturally divided between north and south, specifically between Hanoi and its environs and Ho Chi Minh City. To some extent, neighbouring provinces will join the nearest metropolis to try to obtain advantage in resource allocation decisions, but some regions and provinces – remote from either city and with few resources to attract special consideration – may be ignored at the national level. Some research indicates that differences in equality result from the inability of rural areas to keep up with improvements in urban areas (Tuyen, Lanh, and Thao, n.d.).

Table 5.4. Selected Regional Indicators, 2020

Region	Population density (person/km²)	Net annual migration rate (%)	% of trained labour force (15+)	Total registered capital of inward investment ($ million)	Average compensation per month of employees in acting enterprises having business outcomes (VND'000)
Whole country	295	-	24.1	386,233.5	9,325
Red River delta	1,078	3.0	32.6	112,541.8	9,358
Northern midlands and mountain areas	134	-5.3	20.5	20,143.6	7,764
North central and central coastal areas	212	-6.2	22.7	59,927.4	6,608
Central highlands	109	-6.3	16.9	1,089.9	5,907
Southeast	779	18.7	29.5	161,242.9	10,260
Mekong River delta	424	-10.5	14.9	28,519.2	7,039

km² = square kilometre.

Source: General Statistics Office (2020).

From a strategic perspective, the government has established pilot projects targeting disadvantaged communes and aims to integrate them thoroughly in the national digital infrastructure. In Yen Hao, all government offices have computers and internet connections, and citizens mostly use smart phones (70%) and have household internet access (90%). A coalition of local government organisations is implementing a plan that will upgrade digital infrastructure, provide smart health care and education (remotely, if necessary), make available smart media, and develop trading and online payment systems to help trade agricultural products (i.e. market development) (FAO Regional Office for Asia and the Pacific, 2022). These activities will combine public and semi-private sector organisations. For example, Vbee, which is active in the digital village initiative, was established by MIC to help enact state-level developmental goals, such as a Vietnamese speech-to-text generator and other means of facilitating online interactions for local people through 'Make in Vietnam' (Khanh, 2020). Of course, there is a distance between setting up demonstration projects and scaling them up to the regional or national level. Also, it is not certain that government-established firms operating in what is close to being a monopoly will be able to compete in a less friendly marketplace. However, Viet Nam has created corporations from similar beginnings into successful multinational enterprises, such as Vinamilk and Viettel.

The use of various types of economic zones across the country has been designed to take advantage of location-specific characteristics. Those in the north focus on manufacturing and industry, while those in the south are based on service industries and high-technology applications, such as the Quang Trung Software Park, which is envisaged as the flagship for digital transformation (VNA, 2021b). Those in the central area currently lag but have extensive transportation infrastructure to help their growth in the future (Lang, 2022). The government has also, in this case, taken significant steps to enhance trade facilitation through digital applications (Ha & Lan, 2021). As Table 5.4 shows, different regions of Viet Nam are diverse in economic prospects as well as geography and climate. Outward migration from poorer areas with lower levels of educational attainment indicates a steady move towards urban areas, from where (COVID-19 permitting) remittances might compensate for some of the income inequalities between regions. The International Organization for Migration (IOM) has been working with the Vietnamese government to provide digital skills to young people, including migrants, via the platform congfanso.edu.vn, in cooperation with Microsoft (IOM, 2022). Eight courses are available, targeting vocational students and migrant workers in the various economic zones of the country (IOM, 2022). They are aimed at improving employability in the present and, through a module on entrepreneurialism supported by the Government of the United Kingdom, with a view to the future.

Some research shows that the use of zones can lead to the development of specialisations which increase the attractiveness of certain areas (Tien and Huong, 2020). Special economic zones (SEZs) work best when local firms can work as stakeholders for inward investing firms and provide them with valuable services and inputs. Doing so enables the main benefits of hosting investment (i.e. direct employment and taxation effects, technology transfer, and spillover effects) to take place. To enable local companies to do this, the Department of Enterprise Development under the Ministry of Planning and Investment has established schemes to help them to overcome lack of financial resources, poor IT infrastructure and cybersecurity, and lack of skilled workers (The Star, 2021). Nevertheless, a gap remains in the supply of suitable employees because of weaknesses in the country's education system, especially its propensity to produce university graduates with relatively low levels of transferable skills rather than skilled vocational education graduates.

As mentioned above, Viet Nam regulates its territory through the vertical and horizontal division of governmental agencies. There may be some discrepancies between definitions and policies between these agencies and, to some extent, there can be competition between local authorities in terms of attracting national attention and, particularly, budget allocations. Even if not at the level of digitalisation, the digitisation of many basic government services and functions would be beneficial and would contribute to equality issues.

6. Discussion

In his analysis of the impact of technology on work and the workplace, Mueller (2021) observed first that 'Technological development leads to vast accumulations of wealth and with that, power, for the people who exploit workers' (Mueller, 2021: 4) and, second, that 'Tech humanism is not about liberating people from digital capitalism, but about extending its reach' (Mueller, 2021: 122). These are useful reminders that technology is not neutral in terms of its impact on society and on the human relations that constitute society.

Digitalisation as a form of technology, therefore, will provide opportunities for more Schumpeterian creative destruction and this will provide winners and losers. Under the current economic model, most Vietnamese people ultimately work in export-oriented manufacturing or assembly industries. Much of the value added thereby generated will ultimately leave the country. While their quality of life may be enhanced by access to the online world, ultimately, for most people, their online interactions function to monetise their own data, which is then sold on to others. When this is presented in the form of a business transaction, the people involved treat it as work and, therefore, have no objection to providing time and data. It is expected that this will promote efficiency overall and that any opportunities created will be available to all.

Indeed, digitalisation offers network benefits; that is, the more members of the network there are, the greater the level of benefits available. This can be in the greater number of income-generating opportunities that can be found. Most businesses will expect the public sector to bear the cost of establishing and maintaining the infrastructure of such a network, as well as the risk of any cyberattacks. As previously discussed, the Vietnamese government sees its role in economic development as facilitating inward investment and in helping provide inputs that will be required by investors. This approach is in accordance with the argument by Lee, Lin, and Chang (2005) about the late industrialisation of Viet Nam, in which the state retains a dominant role and in which 'Market discipline can be introduced in two ways: first, by exposing firms to world export market competition; second, by allowing multinational corporations (MNCs) to compete with domestic firms (of course, these two mechanisms can be pursued simultaneously to an extent)' (Lee, Lin, and Chang, 2005: 46). While the process is similar, it is possible to wonder whether the pace of change is sufficient to the need and, indeed, the discourse of urgency that surrounds all discussions of digitalisation.

Digitalisation assists the process of movement of capital – the spatial fix that is required to overcome the falling rates of profit inherent in manufacturing and assembly, especially when that is based on low labour cost competitiveness. Moving capital to achieve the spatial fix can be problematic: 'Frictions within or barriers to this spatial movement take time to negotiate and slow down circulation' (Harvey, 2011: 42). Digitalisation helps reduce such forms of friction, making Viet Nam a more welcoming place for investors.

However, Viet Nam's method of industrialisation involves more than just agglomerating capital in Viet Nam overall – it has a more sophisticated approach in terms of regional development. SEZs of various sorts have been used to attract investment to different parts of the country, to some extent to reduce the threat of increased inequality. As Glassman (2007) observed, the distribution of investment within a country requires different accumulation strategies and, therefore, different political coalitions. In different regions of Viet Nam, then, with different degrees of success, groups of political and commercial actors joined together to provide offers to international investors to use their services. Digitalisation has provided new dimensions by which communications can take place and through which value chains can be newly configured to be of service to investors. This is in line with Myovella, Karacuka, and Haucap (2020), who argued that different technologies benefit regions at different degrees of development and that digitalisation has resulted in economic benefits overall. In the case of Viet Nam, the country has successfully navigated a course from low- to middle-income status through the application of an economic model familiar in East Asia, which involves intensive manufacturing based on low labour costs that is intended primarily for export. The next stage of economic development adds innovation to the mix, with the intention that local firms and firms that have based themselves in Viet Nam will be able to compete with overseas firms and this means more import substitution will be possible. That means more added value will remain in the country. Digital applications have been introduced to support various aspects of this process, e.g. in online skills and trade facilitation, but the government has also been concerned with ensuring that this a national phenomenon – spread to every region in both rural and urban settings. This is why it has been important to consider regional inequality, smart cities, and the informal sector. If some sectors are left too far behind, this will be seen not just as an ideological failure but also a possible source of instability.

The value of digitalisation in an economy depends to a considerable extent on the human capital able to utilise it. Various studies (e.g. Schneider, 2018; Zaborovskaia, Nadezhina, and Avduevskaya, 2020; Fenech, Baguant, and Ivanov, 2019) have indicated the dialectical nature of the relationship between the two: digitalisation aids in human capital formation and is instrumental in making it effective. Successful policies in this regard should, therefore, incorporate a broad range of measures – including enhancing education, particularly vocational rather than degree-based education; spreading internet access to all communities; reducing the digital divide; and so forth. The Vietnamese government has been trying to implement policy platforms of this sort but has been hampered, significantly, over the past couple of years by the COVID-19 pandemic. For most of the time since, teaching at all levels has taken place online and this has revealed the digital divide within and between institutions and the lack of usable internet access for many students. It also revealed the poor housing that many Vietnamese must face, even amongst middle-class families in the major cities. Students in both Hanoi and Ho Chi Minh City really need to visit their campus to have space to work properly, not to mention all the other issues concomitant with insufficient space or overcrowding. It remains to be seen whether, should a new normal eventually be established, the necessary supports for human capital formation can be implemented.

The three methods of value production envisaged for digitalisation above (cf. Parida, Sjödin, and Reim, 2019) are all in action in the process taking place in Viet Nam. Of these, the most important activities are those that inspire existing human capital and embed new knowledge and competencies within the people involved. There is so much more to be achieved that it is difficult to imagine any alternative to the policy of doing everything at the same time. If differentiation is to be found in the progress made, it is likely that it would be the result of international influence, with specific requirements which would be planned for accordingly. As mentioned previously, large investors in the country can call upon quite a high degree of influence when necessary.

Overall, there is a gap in the official discourse between what the government proposes for the people in terms of digital transformation and what most of them can hope to receive for the foreseeable future. This is not unusual for any government – the intentions may be genuinely felt but the difficulties involved in bringing them to fruition can be formidable and the ability to solve them in a reasonable period overly optimistic. However, another gap is between the areas identified for improvement according to the desired economic development model, which relies to a considerable extent on external partnerships. Those partnerships should provide genuine benefit to the parts of the economy targeted and, in due course, spin off. This could cause technology transfer effects to spread the benefits more widely, although that is not definite and is not subject to a specific timescale. Consequently, it may reasonably be concluded that Viet Nam's two-tier economic policy is matched by its two-tier digitalisation policy.

Conclusion

There is little doubt about the determination of the Vietnamese government to realise the potential of digitalisation to the fullest extent possible, at least judged by the number of speeches, plans, and committees that have been created to try to bring this about. Resources have been invested in a series of databases and systems that come as close as might be hoped to achieve the ambitious goals set out for the policy. The plans are mostly issued at the top level, and it is expected that lower levels of government – local government and local communities – will do their part to enact them. It is quite possible that good results will be found at the highest level, especially because leading inward investors, whose influence is considerable when it comes to configuring the country's economic model, can make their feelings known and acted upon. However, at lower levels, some unintended and unexpected results might occur. These results may have negative consequences for people or communities: freedoms are restricted, personal mobility is limited, and opportunities are distributed unequally across the country. As a result, mostly passive resistance to change may emerge and, if this is interpreted as a challenge to government legitimacy, it could lead to a major event. It is hoped that personal or soft skills will develop to the same extent as hard skills in the implementation of digitalisation in the country.

Nonetheless, the methods chosen by the Vietnamese government to provide digitalisation may be criticised on the basis that they are not tested by competition and may face scaling issues. Ideology dictates that public sector-based solutions be prioritised and, as noted throughout the chapter, this approach has been adopted in the case of digitalisation. However, it is not clear that the public sector has the technical capacity and resources necessary to solve problems and enhance existing capacity throughout the country and, even if it does, whether these resources are sufficiently widely available that enterprises throughout might benefit equally. Companies now need quite advanced knowledge and extensive financial resources to be competitive in this area. Support from the international community is being made available in good numbers but there are sensitive issues to negotiate, and it is important that advice and support is provided in the Vietnamese language for equity issues. It is possible, in other words, for an alternative market-based approach that complements or partly replaces the current approach to prove more successful or efficient.

The aspects of society and the economy selected for study in this chapter have been intended to show how the Vietnamese government has identified a series of plans and policies for the country which mostly work in parallel with each other and in support of a specific economic model. This is a dynamic vision that is upgrading from being an export-oriented, import-substituting, intensive manufacturing state based on low labour cost competitiveness to a model in which Vietnamese firms and localised foreign firms contribute more value added to the global supply chains of which they have become a part. Various forms of digital transformation have been employed to try to facilitate this process, although progress has been interrupted by the COVID-19 pandemic and global economic problems. Specific applications have been brought in, for example, to enhance the skills of young people and in terms of agricultural extension. The government's plans to ensure that such applications are available nationally have yet to be fully achieved because of lack of capacity and resources.

It is customary to acknowledge the shortcomings in methodology in a work of this sort. It is true that it has been written at a time of uncertainty, with the ongoing COVID-19 apparently reaching a peak for the omicron variant, at least in some countries, although it is unknown whether new strains will emerge in a world in which many poorer countries remain mostly unvaccinated. At the same time, the climate emergency witnesses fresh instances of doom on almost a daily basis and world leaders have shown precious little evidence that they are willing to take the action required to address it. In such circumstances, all considerations of what might happen in the future are more hazardous than normal and more subject, therefore, to being proved wrong. There are numerous ways of framing the prospects for digitalisation in Viet Nam and it may be that others would be more useful in analysing the situation. As ever, more research would be helpful in improving the quality of the paper. More understanding of the connections between different levels of society and mobility between those levels would be useful. It might also be noted that the chapter has not referred to several of the more well-known and well-established databases established by the Vietnamese government, since these are addressed elsewhere in this volume.

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Chapter 6

Digital Government in the Republic of Korea: Evaluation and Challenges

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1. Introduction

The foundations for 'Korea's economic miracle' were built in the 1960s (Seth, 2013). Although the country was poor, support for education and training from the United States (US) resulted in a significant amount of outstanding talent – from statisticians to economists and engineers. The Government of the Republic of Korea (henceforth, Korea) promoted a systematic economic development policy in the 1960s. It focused on improving the efficiency of public administration by enhancing its information processing capabilities in policymaking decisions. Noting that government research and management were needed to allocate scarce productive resources efficiently, Korea began using a computer named IBM 1401 on 24 June 1967 for the population census.[1] The IBM 1401, a mainframe computer commercialised by IBM in October 1959, was the best-selling computer at the time, comparable to the Ford Model T. Government officials became aware of the advantages of computerisation while formulating economic development plans in the 1970s, and later recognised that administrative computerisation was a decisive factor in improving administrative efficiency, with accurate data and statistics. In 1978, an administrative computerisation pilot project was promoted, and a portion of the national budget was invested in administrative computerisation although the country was poor and depended on foreign aid.

Korea ushered in the era of e-government in the 1980s and expanded its scope substantially in the 1990s and 2000s. Following the success of e-government, Korea entered the era of digital government with the conspicuous development of the digital economy.[2] The digitalisation of government activities is expected to play an important role in government services to the people and the development of the economy. Although evaluation results may vary depending on the criteria, Korea's e-government and digital government system generally obtains high evaluations from international organisations such as the United Nations (UN) and the Organisation for Economic Co-operation and Development (OECD).

Koreans are accustomed to fast processing in private services such as banking, telephony, and electricity, in addition to public administration. With the establishment of the digital government system, most public services can also be applied for and provided via the internet or smartphones. With a tap on a smartphone screen, people can communicate with government agencies and many complaints can be solved. Similar services are provided in other countries, but in Korea, the range of digital service application is wide, and the service provision speed is fast. Due to these factors, Korea is highly regarded internationally in the field of e-government and digital government.

[1] To promote the development of e-government by informing the public about the excellence and convenience of e-government and raising its international status, 24 June was designated e-Government Day, and a commemorative ceremony has been held on 24 June every year since 2018.

[2] Definitions of the digital economy vary, but what they have in common is that they are new business models based on the internet and digital technology. The digital economy implies that all economic activities are based on the internet. e-Business is synonymous with the digital economy. Since it is based on the internet, it is possible to run a business with a small number of people, and economic activities (e.g. technology development) are carried out quickly. Consumption patterns are also being diversified and specialised through online shopping, and product information via the internet or e-marketplace has been diversified.

Digitalisation can provide a new growth engine for the Korean economy. Korea entered the world's top 10 economies (based on the gross domestic product (GDP) data of the World Bank)[3] in 2022 thanks to export-led growth of traditional industries, but its growth potential has been weakening over the last decade. Korea believes that it can expand its growth potential through a rapid transition to a digital economy. Efforts are being made to transition to the digital economy, but the country is experiencing slow progress. The smart factory support project is a typical example. Smart factories use information and intelligence technologies such as cloud computing, big data, artificial intelligence (AI), and the internet of things (IoT) to improve productivity and the flexibility of production. Smart factories can also contribute to job creation by encouraging reshoring of Korean companies operating abroad, and are central to the government's Fourth Industrial Revolution plan. Korea should not be complacent about the success of its e-government and should extend digitalisation beyond government to its major industries.

Korea has extensive literature on e-government, but little on digital government. In some literature, the two terms are used interchangeably. This may be because the concept of digital government has only recently been established and is still in the research stage. Digital government tends to be developed based on e-government, and the concept of digital government is not fixed yet in Korea, although several large-scale projects are under way to transform e-government into digital government. This chapter evaluates the development of digital government in Korea. Section 2 presents the effects of digitalisation by reviewing related reports and papers, and Section 3 presents the development process of e-government and digital government in Korea. Section 4 evaluates Korea's e-government and digital government, and Section 5 presents challenges and tasks for the continuous development of digital government in Korea.

2. Impact of Digitalisation and Digital Government

2.1. Impact of digitalisation

Digital technologies have changed almost all aspects of the day-to-day interactions amongst people, business, and the government. For consumers, digital technology has brought lower prices, more options, and better information, but also new potential risks. Businesses may face disruptive changes brought about by digital technologies. Innovators and fast adopters of new technologies may thrive, but other businesses may struggle to adapt to the digital economy. For governments, digital technologies trigger large-scale changes ranging from regulatory design to service delivery. Digital transformation and commercialisation are becoming increasingly important to governments and businesses (Australian Productivity Commission and New Zealand Productivity Commission, 2019).

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[3] Refer to the analysis of the Top 15 Countries by GDP in 2022 (Global PEO Services, n.d.).

The development of digital technology has completely changed the industry landscape. A typical example of a change in the industrial structure due to digital transformation is in audio-visual services such as broadcasting and media. Most countries impose many regulations and restrictions on the services because broadcasting and media greatly influence the way of thinking and living patterns of the people. However, due to the development of information and communication technology (ICT), big tech companies such as YouTube, Netflix, and Google have taken over these services around the world, either by technically bypassing national regulations or through the exertion of US government influence to change them in some cases. In the 21st century digital era, data are emerging as one of the critical production factors – along with land, labour, and capital. Digital transactions have been growing faster than traditional business. The digital economy grew at an average annual rate of 5.2% per year from 2005 to 2019 in the US. Some 9.6% of US GDP in 2019 was created by the digital economy, accounting for 7.7 million US jobs, which is equivalent to 5.0% of total US employment (US Congressional Research Service, 2021).

Today, digital technology has become a part of everyday life, and digital government services have increased the efficiency and convenience of citizens. This allows everyone to communicate freely with public authorities and access the necessary information with a few clicks. Drop-down menus and easy-to-fill online forms are becoming commonplace, instead of filling out paper documents and waiting in lines for long periods. Smartphones can access the services they need at any time, enabling governments to reduce labour costs and encourage collaboration within departments.

The internet contributes to the cheap dissemination of information flows between countries and reduces trade costs. ICT improvements facilitate price advantages amongst countries and improve mechanisms of cooperation between importers and exporters. The reduction of fixed costs in trade lowers the barriers of entry to the market and expands trade through extensive margin (exports of new products) rather than intensive margin (more exports of the same item). The digital economy has contributed to the fragmentation of international trade and global value chains (GVCs). The fragmentation of GVC production depends on digital connectivity, creating production efficiencies across international borders (Pomfret, 2021).

Physical goods are costly to store and transport to consumers, whereas digital products are easily portable and transported with almost zero marginal costs because they store electronic copies of the originals. This dramatically lowers shipping and trade costs, especially when digital products are replacing physical versions (Quah, 2003). Data can be copied without loss of fidelity at a relatively low cost (Shapiro and Varian, 1998), and can have a non-rivalry (non-contention) property (using one person without disturbing another) (Duch-Brown, Martens, and Mueller-Langer, 2017). These properties allow larger production runs and higher consumption than would be possible or cost-effective as a physical product (Australian Productivity Commission and New Zealand Productivity Commission, 2019). However, there is no such thing as a free lunch. Although the digital world can bring many advantages, serious side effects include privacy violations and infringement of intellectual property rights.

Digital technology is part of the Fourth Industrial Revolution, distinct from the primary (steam engine), secondary (electrical energy), and tertiary (ICT-based) industrial revolutions (Schwab, 2016). Digital technologies have transformed the way information is produced, accessed, and used by combining technology and human capabilities in unprecedented ways through AI, deep learning, big data analytics, and other technologies (Schäfer, 2018). Digital companies collect significant amounts of data on service users through their business platforms. In addition to the sale of simply processed data, the data collected are used for various purposes such as improving service quality and targeting advertisements for higher revenue.

Companies with new business models, armed with digital technology, can drive out incumbents from the market. New technologies, such as digital photography, can cut prices to virtually zero. With a digital camera or smartphone, you can take as many pictures as you want without consideration of cost, as the marginal cost of photography has dropped to a negligible level. Twenty years ago, 80 billion photos were taken worldwide per year, but this rose to 1.6 trillion in 2015. In addition to the price reduction, improvements include waste reduction, photo quality, and ease of editing (Varian, 2016). On the other hand, KODAK, which had dominated the global photographic film market for the previous century, went bankrupt and many film labs closed.

New businesses will affect the interests of existing businesses. Due to such interaction, government regulations come into play. These regulations are often closely linked to policies on digital government. The Australian Productivity Commission and New Zealand Productivity Commission (2019) pointed out the conflict between digital innovation and existing regulations. Digital transformation is in conflict with many existing regulatory regimes. Technology can make progress at a faster rate than regulators can manage. It creates new products and services that are not managed by current rules and practices, or where the responsibilities of multiple systems may work against new businesses. Many government organisations are chasing new business models in the digital world, which can create an unequal competitive arena for incumbents and new entrants. The costs of regulations that are not compatible with new digital businesses can impede the entry of innovative goods and services to the market. Conversely, new entrants often take advantage of regulatory loopholes to grow unhindered by regulations that incumbents must comply with. The digital economy continues to present new challenges for regulators, but traditional principles for good regulations remain relevant. The regulatory framework should be technology-neutral and reviewed regularly.

2.2. Literature on digital government

Although e-government and digital government are often used interchangeably, their meanings are quite different. Whereas e-government focuses on ICT (internet, telecommunications, IT services, related hardware, and software) used to realise government goals, digital government refers to a comprehensive digital system to better serve citizens and the private sector. e-Government includes computerisation and networks of procedures, documents, and services to improve governance using information exchange technologies. Digital government refers to a set of effective mechanisms for improving the management and organisation of government services from the viewpoint of service consumers. Digital government improves the transparency of government services, and civil servants are obliged to be more accountable for the services they provide.

e-Government is a system that allows individuals, companies, and public officials to access large-scale public information collected under certain guidelines, and use it for business or public policy purposes. Digital government has broader implications than e-government. It is the use of ICT solutions by governments to provide online services to the public, as well as facilitating interactions amongst different stakeholders and improving the inclusiveness of public policy and decision-making. It increases transparency in public services and enables open and user-centric approaches and operational innovations beyond e-government services that set up ICT-based procedures. Digital government refers to the overall administrative process involved in providing open and efficient services to the public through digital technologies. Digital government transformation goes beyond simply putting forms online: it means assessing the needs and interests of users and improving services accordingly. In other words, a two-way service improvement system is operated in consideration of users' responses.

Research results on the economic feasibility of digital technology are also applied to government activities. Digital government in public governance that integrates the effectiveness of the availability and quality of data as well as the technologies used in the public sector can be seen as essential aspects of innovation, co-production, transparency, and public value creation (Gil-Garcia, Dawes, and Pardo, 2018). Luna-Reyesa and Gil-Garcia (2014) stated that digital technology and ICT can facilitate government transformation (institutional transformation) taking place. Noting that it is not easy to confirm this transformation empirically, they presented the theory of co-evolution of technology, organisational networks, and institutional devices in government transformation.

The realisation of digital government facilitates the growth of the digital economy, but the coverage of the digital economy in the context of digital government will not be the same as the digital economy in the business sector (OECD, 2014), although this is a missing gap in the related literature. Definitions of the digital economy range from a narrow focus on the ICT sector to a broader definition that includes other sectors integrated with digital technologies (Zhang and Chen, 2019). Public authorities may use electronic technology to provide and request necessary information from other government departments, businesses, or individuals. The ease of data transfer between departments will facilitate collaboration amongst the agencies. Digital government services include any process that the government provides online. The adoption of digital technology makes it easy for all citizens, regardless of where they live, to access government information and request the services they need, as long as they are connected online. Moreover, as the internet network and facilities improve, the services that governments provide will increase due to network effects (Yun, 2020).

Although we are witnessing the growing importance of the digital economy, there are significant differences in digital trade policies amongst the world's major countries. This point is related to digital government policy. As digital transformation has turned an astronomical number of transactions into machine-readable data, collected and stored data become the basis of a new business – big data. Here, data management rules and institutions are critical for the development of the data business. Entering the era of the digital economy, two extreme cases are in competition. The US is advocating freedom for digital trade, while China is adhering to digital sovereignty. Because international rules on digital trade have not been established, conflicts between international law and national sovereignty are emerging (Office of the US Trade Representative, 2021).

3. Korea's e-Government and Digital Government

3.1. Overview of the development of e-government

The Government of Korea has paid high attention to administrative efficiency. Korea promoted national informatisation using ICT as a national development strategy. In the late 1970s, a pilot project for administrative computerisation was carried out, and in the 1980s, the foundation for e-government began to be laid. In the 1990s, Korea established and implemented an e-government promotion plan.

In line with the development of computer technology, Korea has established and implemented e-government goals in four stages, as summarised in Table 6.1. First, in the 1970s and 1980s, one of the main policy goals of ruling governments was to increase administrative efficiency by computerising administrative tasks. Second, from the late 1980s to the 1990s, the government attempted to establish the National Basic Information System by connecting the central and local administrative agencies with a network through the expansion of information and communication networks. The basis for computerisation, transmission, and common use of tasks amongst various administrative agencies was prepared and gradually implemented.

Table 6.1. Development of Korea's Major e-Government Projects

Period	Details and Progress of e-Government
1970s–1980s	Introduction of computers and computerisation of basic administrative tasks
1980s–1990s	National Basic Information System Project
1990s–2000s	Launch of nationwide networking for informatisation
2000s–2010s	Advancement and spread of e-government

Source: KIPA (2020).

Third, in the 2000s, Korea advanced the e-government service by building a national backbone network and completing administrative computerisation. With the enactment of the Electronic Government Act in 2020, efforts to realise the goals of e-government, such as efficiency, democracy, and transparency, have been spurred. To develop e-government systematically, Korea has implemented several projects and programmes according to the stage of technological development, which are summarised in Table 6.2. Public officials who were accustomed to documents and manual work opposed such programs. Computer education and training were provided to public officials to reduce resistance to the use of information technology in their administrative work. With capacity building of public officials and the enactment of laws, administrative computerisation and the introduction of e-government in Korean public institutions was promoted, although it was not successful in all cases.

Table 6.2. Key Periods in the Korean e-Government Process

Period	Period	Period	Details and Progress of e-Government
1970s– 1980s	Computerisation of basic administrative work	• Introduction of computers and computerisation of government affairs	• Master Plan for the Computerisation of Administration (First and Second)
1980s– 1990s	National Basic Information System Projects	• Construction of information and communication infrastructure through the establishment of a national backbone network. Resolving the problem of information linkage due to overlapping investment and insufficient standardisation between ministries • Promotion of computerisation, automation, and informatisation of the entire national society in preparation for the information society • Fostering the information industry	• Act on Expansion of Dissemination and Promotion of Utilisation of Information System (NBIS Act) • Establishment of basic plans for each of the five areas

Period	Period	Period	Details and Progress of e-Government
1990s– 2000s	Launch of nationwide networking for informatisation	• To expand the national infrastructure in preparation for the 21st century, the government built an information highway that can transmit information such as voice, data, and video as well as multimedia information that appears through the convergence of information technology.	• Master Plan for Promoting Informatisation
2000s– 2010s	Establishment of basic infrastructure of the e-government	• Efficient promotion of national informatisation • Strategic fostering of the information and communication industry • Innovation in the public sector through e-government	• Electronic Government Act

Source: KIPA (2020).

3.2. Transition to digital government

As digitalisation progressed after 2010, the government pursued a transition from e-government to digital government. Korea's transition to digital government has been smooth, due to its high capacity in e-government. The country has been recognised for excellence in the UN E-Government Survey since 2010. Since the early 2000s, 11 large-scale national e-government projects, various roadmap projects of government and public institutions, and the integration of more than 16,000 information systems have been promoted.

The OECD (2014) concluded that digital government creates additional value for public services through reviews of policies and programmes and service provision via digital technology. It added that digital government depends on an ecosystem that connects everything and supports the production of and access to data, services, and content through interactions across governments. When the concept of the Fourth Industrial Revolution was presented at the World Economic Forum Annual Meeting at Davos in 2016, Korea established a digital strategy for the public sector. Initially, the goal of the strategy was to increase administrative efficiency and improve public convenience, but it has been changed to expanding the value of services in the public sector. The goal was upgraded to re-establish the relationship between the people and the government by enhancing people's access to the public sector via ICT.

Although the government considered transitioning to digital government in 2017, the concept of digital government was not clear and the infrastructure needed to be improved. It was also difficult for the public to understand the difference between e-government and digital government. In the end, although the government was aiming for digital government, it decided to use the term e-government at that time. In October 2017, the Ministry of the Interior and Security (MOIS) designated 24 June e-Government Day to raise public awareness of e-government through the revision of the Electronic Government Act. The aim was to share the achievements of e-government, which had established itself as Korea's global brand, and to solidify its status as a world-leading country in the field of e-government. The results of a comprehensive e-government evaluation have been announced annually at a commemorative ceremony since the first e-Government Day on 24 June 2018. The date was chosen because 24 June is the day the Statistics Bureau of the former Economic Planning Board installed Korea's first computer in 1967 and started its operation. The government invested in an expensive mainframe computer in 1967 despite the prevailing poverty. There was a lot of trial and error, but Korea subsequently experienced rapid growth. It advanced in all areas of administration and civil affairs by using ICT and networking infrastructure, giving it a competitive edge globally. Korea's e-government, which started with a single computer, developed rapidly over the next 50 years and has emerged as a world-recognised e-government powerhouse.

In 2018, Korea decided to pursue digitalisation of the public sector, i.e. digital government. It considered digitalisation an effective mechanism to spur innovation in the public sector and enhance national competitiveness. Digitalisation is expected to be an effective means for maximising 'social impact', by forming new institutions and communication structures for interacting with various actors while strengthening the role of people in the public sector (Table6.3). It was decided to spread digitalisation within government organisations to act as a factor inducing government innovation and changes in the way government works. Digitalisation was adopted to increase the efficiency of the public sector, with an end-to-end method that transcends organisational boundaries, and to increase citizens' satisfaction with public sector services. As digital government develops and matures, the provision of public services is expected to improve by adapting to the flexible environment, which will increase the public's trust in the government according to the National Information Society Agency (NIA, 2018).

Table 6.3. Transition Towards Digital Government

e-Government => Digital government		
Source of works	Issues raised by people and public officials	Automatic detection of issues and problems → automatic suggestion of solutions
Policymaking	Government-led policy management	Policymaking led by the people (evidence-based, data-informed policymaking)
Field administration	Focusing on simple business	Solving complicated and complex problems
Service approach	management processes	Collaborative production of qualitative and emotional services
Service content	Focusing on quantity and efficiency	Daily life stages of the life cycle
Delivery	Online and mobile channels	Demand-based multiple online and offline channels

Source: MOIS (2019).

3.3. Recent developments

Digital government emerged as one of the hottest issues in the official debate of Korea's presidential election in March 2022. Although significant data are collected and stored automatically while performing administrative tasks or providing services to the public, it was argued that the government has not optimised its use of such data in improving its services. Some candidates argued that they should switch to a digital platform government from e-government. Candidate Seok-ryeol Yoon,[4] who was elected Korea's 20th president in this election, advocated a system in which the government could pre-empt people's needs using AI technology based on big data and provide the corresponding services. e-Government is a supplier-oriented policy system in which public officials decide on and implement policies, but digital platform government is a user-oriented policy based on big data. The objective of digital platform government announced during the Korean presidential election in 2022 is to improve the ongoing digital government project. Candidates' explanations of digital platform government were not very different from those of digital government. In the end, regulating digital platform drew criticism for being used as a political slogan.

Recent digital government-related policies in Korea evolved as follows. First, in 2020, the government declared its intention to improve the perception of public services by accelerating the digital transformation. MOIS and NIA, the leading agencies for digital transformation, held a ceremony to celebrate the third e-Government Day and announced that they would share the achievements of digital government and present the mid- to long-term policy direction to the public. In 2020, the convenience of digital government in people's daily lives following the coronavirus disease (COVID-19) pandemic was evaluated, and its results were reflected in the mid- to long-term policy directions of the Second E-Government Basic Plan to be pursued until 2025 (MOIS, 2020a).

Second, after the decision to promote digital government, public services were diversified or improved to make them more user-friendly. For example, Korea has decided to accelerate the introduction of mobile IDs to expand non-face-to-face services. The mobile civil servant ID was introduced in 2020 as a pilot project, and the mobile driver's licence was added in 2021. Korea also increased the number of documents online in 2021, such as the certificate of family relations, which ordinary citizens can apply for and download free after their identity is confirmed. In addition, people can search for personal information held by public institutions and download it directly from government servers or banks.

[4] Presidential candidate Yoon announced his intention to provide digital government at the People's Power Party (Yeouido, Seoul) on 2 January 2022, saying 'I want to change the Korean government into a digital platform government. This is a government tailored to the people based on digital technology and big data. The reason for promoting a new digital platform government is, first, to accurately identify and service what the people want based on scientific data, not people. Second, it is for the government to provide services first to the people who have not been able to find their rights because they did not know how. Third, it is to ensure that all citizens receive fair and honest service, regardless of whether they have an acquaintance with public officials'.

Korea introduced the My Data service, whose anonymised data can be easily transmitted to others for business purposes. This has enabled the development of a new data industry, which provides a variety of personalised services in finance, medical care, and employment.

The government also accelerated innovation in providing digital services to people. In 2021, the app of the Kukmin Bisu (national secretary)[5] function was expanded to provide notifications for various activities, such as health check-ups under the national medical insurance system, national scholarship applications for university students, and tax information for taxpayers. All government subsidies and services were integrated into a single 'Government 24' portal to make it easier to check information and submit applications. In line with the digitalisation trend, 11 call centres of central ministries and 156 call centres of local governments and public institutions are being integrated into one call centre. Registered complaints are designed to be processed automatically following digital government guidelines.

Third, the government expanded the availability of data for business use and for promoting public–private cooperation. The government also improved the entire process of data availability and utilisation from the user's point of view, and to build the foundations for creating new industries such as autonomous driving and digital healthcare.

Fourth, the government expanded the digital infrastructure of the public sector. By converting the government communication network from a wired network to a 5G wireless network, it supported rapid business processing and on-site administration. The training/education curriculum for public officials was reorganised so that all civil servants could participate in digital government innovation and engage in digital transformation. The process of nurturing experts in public office necessary for new technologies, such as AI and data analysis, was also expanded.

Finally, in recent years, Korea has taken a whole-of-government approach to transition from an information society to an intelligent society. Based on e-government capabilities, Korea is promoting the development of digital technology and the transition to digital government. The country is concentrating its capabilities on digital transformation for non-face-to-face activities, which have become routine since the COVID-19 pandemic. For a successful digital transformation, Korea has established and is pursuing the 6th National Informatization Basic Plan (2018–2022), which aims to transform Korea from an information society to an intelligent information society. The COVID-19 pandemic quarantine measures accelerated non-face-to-face digitisation, but the performance of digital government may not have reached the goals of the plan. The government will evaluate the performance of the digital government and introduce additional programmes in 2024.

[5] As a kind of notification service, it refers to a service that provides important information to individuals by e-mail or text message.

4. Evaluation of Korea's e-Government and Digital Government

4.1. International evaluation

The UN E-Government Survey, issued by the Department of Economic and Social Affairs, comprehensively evaluates the E-Government Development Index of UN Member States. This development index is determined by comprehensively evaluating the Member States' Online Service Index, Telecommunication Infrastructure Index, and Human Capital Index. Korea has received excellent evaluations in the e-government evaluation conducted by the UN every 2 years.

Although many improvements are still needed, Korea has been at the forefront of the global e-government trend. In the global e-government evaluation conducted by the UN in 2020, Korea ranked second after Denmark amongst 193 Member States. Korea ranked third after the United Kingdom and Australia amongst 193 Member States in the 2016 evaluation. It has an excellent record, taking first place in three consecutive surveys (2010, 2012, and 2014). This is no mean feat due to the nature of the UN e-government evaluation, which quantifies and compares the levels of software and hardware elements.

The OECD released the 2019 Digital Government Index (DGI) for the first time in 2020. The assessment measures various criteria of the DGI for 33 countries (29 OECD member countries and 4 non-member countries). Korea received the highest score of 0.742 on a scale of 1, followed by the United Kingdom (0.736) and Colombia (0.729 points), Denmark (0.652 points), and Japan (0.645 points) in that order.

To learn about Korean e-government, foreign visitors continue to visit MOIS, NIA, and the Korea Local Information Research and Development Institute, which oversee e-government. The annual Korean e-government training for civil servants from developing countries is also receiving a good response. Korea is transferring its e-government and digital government system to many countries through NIA, an organisation specialising in digital transformation. In 2021, in collaboration with the Inter-American Development Bank, a seminar was held to transfer digital government policy and operational experience to civil servants in charge of e-government in Brazil and Panama. Incorporating the requests of Brazil and Panama, this seminar focused on six topics: Korea's digital new deal and digital government policy, public data, national information resources management, cases of intelligent government using AI, smart cities, and cybersecurity. The World Bank is posting comprehensive lecture content on Korea's digital information on its website so that other countries can benchmark it (MOIS and NIA, 2020).

4.2. Domestic survey

The 2020 E-Government Service Usage Survey (MOIS, 2021) was conducted from October to November 2020, based on household visit interview surveys and online surveys targeting 4,000 citizens aged 16–74 across the country. The Government 24 usage rate increased by 26.7% compared with the previous year – from 57.4% in 2019 to 84.1% in 2020 – possibly affected by the COVID-19 pandemic. In 2020, about nine out of 10 Koreans used the e-government service, and 98.1% of citizens were satisfied with the service (Table 6.4). The survey also found that most Koreans accessed Government 24 via the internet, with a minority using phones.

The most frequently used e-government services were home tax (86.5%), Government 24 (84.1%), and national health insurance (65.9%). Detailed survey results are in Table 6.5. The awareness of e-government service was 95.7%, the usage rate was 88.9%, and the satisfaction rate was 98.1%. In terms of age, the usage rate was highest amongst teenagers, and the satisfaction rate was highest amongst those in their twenties. The awareness of people in their 60s or older, the digitally vulnerable group, was 79% – up by 9.3% from the previous year.

Table 6.4. Share of Positive Responses on Digital Services by Age Group

(%)

Item	Year	Share	Age					
			16–19	20–29	30–39	40–49	50–59	60–74
Perception	2020	**95.7**	100.0	100.0	100.0	100.0	99.9	**79.0**
	2019	93.8	100.0	100.0	100.0	100.0	99.3	69.7
Utilisation ratio	2020	**88.9**	100.0	99.1	99.7	99.4	88.0	59.2
	2019	87.6	98.7	99.1	98.6	95.5	84.9	58.1
Satisfaction	2020	**98.1**	96.3	99.7	98.4	97.6	98.0	96.8
	2019	97.8	97.1	98.1	97.2	98.6	97.8	97.7

Source: MOIS (2021).

Table 6.5. Utilisation Ratios of Digital Services by Age Group

(%)

Item	Utilisation ratio		Utilisation ratio by age group (2020)					
	2019	2020	16–19	20–29	30–39	40–49	50–59	60–74
Home tax	97.2	**86.5**	58.5	73.8	**90.0**	**91.5**	**88.2**	**92.7**
Government 24	57.4	**84.1**	78.5	80.3	**87.8**	**85.6**	**82.3**	**86.1**
National health insurance	68.8	**65.9**	32.0	48.7	**67.5**	**73.4**	**74.1**	**67.9**
Express trail	77.6	58.2	48.1	**67.7**	51.3	54.3	**63.8**	**58.3**
Worknet	-	38.4	**49.6**	**57.4**	39.9	31.6	35.0	24.9
NICE (payment)	12.2	32.9	**45.2**	34.3	30.9	38.4	26.1	29.1
Village Info	36.1	31.6	24.8	27.0	30.4	29.6	**38.3**	**36.5**
Request hub	-	19.8	8.0	11.9	**24.4**	**23.0**	**20.7**	**21.7**
Q-Net	-	14.3	**22.9**	**23.4**	14.5	12.6	10.7	9.0
I-Sarang	20.3	13.2	4.6	1.9	**30.4**	**14.7**	8.7	9.1

Source: MOIS (2021).

4.3. COVID-19 and Digital Government

Korea's digital government strategy demonstrated excellence in its response to the COVID-19 pandemic. Informatisation and digital government functions were widely used in virus pre-quarantine and prevention, transparency of information disclosure, control of infected persons, rapid response, and follow-up management such as disaster relief subsidies. For example, after receiving an online application for personal disaster assistance for COVID-19 victims and payment of national disaster assistance, 99.5% of the assistance could be paid within 1 month (MOIS, 2020b). For reference, in the US, it took several months to classify victims and identify personal information, so it decided to pay the same amount to all citizens. In a situation where many countries were experiencing technical difficulties in distributing disaster aid, Korea had exemplary performance.

In the early days of COVID-19, Korea became a successful model for controlling the epidemic with its e-government and excellent ICT base. Major countries (including the G20) and many international organisations (e.g. the World Bank, the Asian Development Bank, and the OECD) requested Korea to share the experience of its response to the pandemic. Through collaboration amongst relevant ministries and institutions, such as the Ministry of Economy and Finance and the Ministry of Science and ICT, a book in English on Korea's experience with COVID-19 was published titled *Flattening the Curve on COVID-19* (Government of Korea, 2020). In addition, NIA published *Korean ICT Services Against COVID-19 Pandemic* (NIA, 2022), an English case book covering the major government systems and public services provided by the Korean government to respond to COVID-19 in stages (diagnosis, epidemiological investigation, patient/contact management, and prevention). Korea's infectious disease control system was established before the outbreak of COVID-19 in the context of e-government, and its power was confirmed while responding to the pandemic.

5. Challenges for Korea's Digital Government

Digital government can be understood as the establishment of an overall system to ensure that various data collected and stored by public institutions are used efficiently for improving the quality of government services to the public. To protect privacy, the data is anonymised and subjected to further processing to become big data. The size of data is important, but it will be more important that companies or governments actively utilise it. Although Korea has received excellent evaluations for its e-government, it has many areas to improve or supplement. Korea must develop from a digital government to a digital platform government, not only in terms of a political slogan.

The concept of digital platform government received attention in 2009 when the Obama administration in the US promoted the establishment of the world's first national data platform government, advocating open government. As of 2020, about 220,000 data sets have been provided to businesses and the public, and raw data can be viewed and downloaded by accessing a US government website (data.gov). Similar measures were taken in Korea. In early 2021, Korea decided to support an integrated platform for public data owned or created by 925 public institutions covering national and local governments. The programme was established so that the private sector could easily search for, analyse, and visualise the desired data. Analysis using individual data has become much easier, but the level of use of integrated data is not very high. The format of each data set is different, and it is difficult to create a single integrated database without significant additional work.

Korea's digital platform government aims to innovate operational methods of e-government for the 21st century. In the era of the great digital transformation, the digitalisation of government cannot be delayed. The world is suffering from severe distortions of the supply chain, high energy prices, stagflation, and geopolitical conflict. The government and companies should find solutions using a data-based decision-making system to enhance the national crisis response ability in the deteriorating external conditions. For this, it is necessary to collect and combine the data from each department and institution, and dig out the implications contained therein. The government is preparing a blueprint of digital government for the coming years based on the achievements of its past three decades. Many challenges remain to be solved for the second leap forward. For the development of digital government, it is urgent to improve the awareness of digital government above all else. The organisation and roles of the government and related institutions that promote national informatisation and e-government should be reorganised. When new technologies such as AI and cloud computing emerge and spread, new public demand appears and the administrative service environment changes. To reflect this in a timely manner and upgrade the system, it is necessary to increase investment continuously.

Perceptions regarding digital government need to be corrected. The view that digital government involves a simple server and storage installation is still prevalent. Support and interest in digital government – including upgrading – have declined in Korea despite its emergence as a role model on the world stage. Once the necessary system for digital government is built, it is difficult to secure an additional budget. Now that we have all the necessary systems in place, there is a danger of complacency in simply maintaining the status quo rather than pursuing constant upgrading. In this regard, it is necessary for the fiscal and budgetary authorities to understand that continuous investment must be made due to rapid technological development.

In addition to the challenges discussed above, the implementation of digital platform government faces several obstacles. It also has inherent limitations, which can be broadly divided into two categories: the data point of view and the service point of view. From the data point of view, the nature of the public platform contains sensitive information (personal information, etc.). To minimise these problems, related laws (the Data 3 Acts) were revised and implemented in 2020, but concerns about personal information breaches remain. There is still a limit to the provisions of data due to difficulties in data processing and securing data required by the laws. Sometimes, it is difficult to standardise various data sources. From a service point of view, there is a difference between the service of the data platform and the request of the user, so there is a limit to the user-centred service. Only government-accredited institutions can process government data in accordance with regulations and make it available to the government and the private sector to prevent personal information breaches and protect privacy, but processed data may not meet user needs. It can also be difficult to combine various types of information to meet users' demands. Therefore, it is difficult to implement a virtuous cycle for platform business value creation, and the lifespan of service and data may be short.

Under the current digital government, the information governance system is still inadequate, so data accumulation, sharing, and utilisation are not smooth. Cooperation between major actors – such as the central government, local governments, residents, and ICT companies – should be improved. The information-sharing mechanism needs to be enforced, and coordination amongst various data generation and management organisations should be enhanced through interlinkages.

Lastly, Korea's challenges in corporate digitisation and corporate utilisation of data should be emphasised. Digital government will expand its performance when it is linked with the digital system of business activities. Although Korea's digital government is highly regarded, the digitalisation of enterprises is still on the slow side. Over the past two decades, Korea has remained at the forefront of ICT technology thanks to the outstanding performance of its mobile devices, chips, and consumer electronics. However, today, Korea is lagging advanced countries in emerging Fourth Industrial Revolution sectors such as 3D printing, AI, big data, and cloud computing. Only 23% of Korean companies have used cloud computing, while it has become part of daily business life in more than half the companies in the Nordic region (Pak, André, and Beom 2021). Although digital technologies are increasingly powerful and suitable for small and medium-sized enterprises (SMEs), there is a wide gap between large enterprises and SMEs in the adoption of sophisticated digital technologies. Since Korean SMEs are less knowledge-intensive, they are less prone to innovation than manufacturing. Some 57% of service companies do not invest in innovation (i.e. research and development). In general, innovation in the service industry is weaker than in the manufacturing industry (Kang and Lee, 2019). Korea is one of leading ICT countries, and the ICT sector has become one of the main economic drivers in the nation. However, the potential to develop smart factories, create value through the servitisation of manufacturing, and increase the productivity of services is still untapped. To this end, it is necessary to support the adoption of digital technology through investment in ICT technologies, strengthen research and development support for innovative and productive SMEs, and reduce institutional and bureaucratic interventions that impede the adoption and diffusion of digital innovations (Pak, André, and Beom, 2021).

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Chapter 7

The Effectiveness of Online Public Services: A Comparison of ASEAN Member States and the Way Forward

Saurabh Kumar

1. Introduction

The potential of information and communication technology (ICT) to bring about digital and networked forms of governance has been a topic of much theoretical and empirical research in recent years. There is no facet of the economy, society, and life in the modern world that has not undergone a substantial change with the advent of ICT. Governments in the Association of Southeast Asian Nations (ASEAN) Member States (AMS) are no exception.

However, only developing infrastructure and simply digitising existing processes is not a workable solution for long-term successful digital government. Instead, processes need to be overhauled, and continuous improvement of infrastructure – along with public awareness and knowledge dissemination – is necessary to realise the full potential of digital government. Governments at all levels should use data analytics to improve operational efficiency and engage with citizens through news media, social media, and targeted programmes. If digital government is to be successful, AMS will have to ensure that all segments of their diverse populations are aware of and have access to e-government services.

Some AMS score substantially below not only European Union (EU) member countries but also some South Asian (e.g. Pakistan and Bangladesh) and African (e.g. Nigeria) countries on the United Nations (UN) E-Government Development Index (EGDI) 2020, which is based on three broad components: online services, human capital, and telecommunication infrastructure. For example, Cambodia is ranked 124th on the EGDI, Indonesia 88th, the Lao People's Democratic Republic (Lao PDR) 167th, Myanmar 146th, the Philippines 77th, and Viet Nam 86th. It is evident from these figures that there is room for improvement in the digital e-government of AMS. However, the region has a good base to build on, and there is no reason that AMS cannot be amongst the top performers in the world on the EGDI if they embrace digitalisation and continue to improve their digital infrastructure and capacities in the coming years.

Given this background, this paper attempts to understand the role, importance, and complex applicability of digital governance and the role of standards in the ASEAN context. The e-government movement is a major development in the world of government. It has affected the way governments operate, the services they provide to citizens, and the way they interact with each other. This paper seeks to understand the factors that contribute to the adoption, implementation, and success of e-government programmes in AMS. The study focuses on the 10 AMS: Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Viet Nam, Singapore, and Thailand. The study of the e-government movement also provides an examination of the political and economic context of the countries in which it is implemented. The research provides insights into how governments can leverage technologies to improve the efficiency and effectiveness of public services.

2. Literature Review

Baird (2007) identified the following facets of an interoperability ecosystem:

(i) Technical interoperability can be described as the capacity of a system or product to function seamlessly with other systems or products, requiring no additional effort from the user. It can be seen as the aspect of technological convergence amongst information technology (IT) systems.

(ii) Organisational interoperability ensures that organisational structures, goals, and administrative processes align with each other, facilitating efficient collaboration and information exchange.

(iii) Legal and public policy interoperability refers to the development of legal frameworks at both national and regional levels, along with the establishment of mutual recognition mechanisms. These measures aim to facilitate interoperability in various aspects, enabling seamless interaction and cooperation amongst different systems and entities.

(iv) Semantic interoperability ensures comprehensibility amongst different personnel, negotiating counterparts, user communities, and devices.

Studies on e-government have addressed the issue of e-government service adoption by citizens, e-government usage in organisations, and e-government website design. In their assessment of e-governance adaptability amongst citizens in Malaysia, Lean et al. (2009) identified factors that influence citizens' 'intention' in using e-government services and ascertained how the elements of trust and perception of usefulness, relative advantage, image, and complexity influenced their decisions. Hussein et al. (2007) analysed organisational factors that influence e-government success in selected public sector agencies in Malaysia, including top management support, decision-making structure, management style, managerial ICT knowledge, goal alignment, and resource allocation. Seng, Jackson, and Philip (2010) used two case studies in Malaysia to contrast the enabling and constraining characteristics of e-governance. Southeast Asia specific studies have also focused on factors that negatively affect the implementation of e-government projects, including low economic growth, low productivity, lack of skilled personnel, poorly developed ICT infrastructure, and the digital divide, which includes digital illiteracy (Chen et al., 2006).

Researchers have highlighted the limited understanding of the dynamic processes that contribute to the success or failure of e-government initiatives. In their study on the failure of e-government in developing countries, Gunawong and Gao (2017) utilised the actor–network theory to examine the reasons behind the unsuccessful outcomes of certain national endeavours, such as Thailand's Smart ID card, which aimed to promote economic growth and structural transformation through ICT. The actor–network theory bridges the social/technical divide, treating human and non-human actors equally in understanding innovation. It offers an alternative to innovation diffusion, focusing on network formation and persuasion amongst actors. By extending ethnography, it analyses humans and technology together, avoiding binary thinking. The actor–network theory is valuable for studying information systems with social, technological, and political interactions. It benefits areas such as online business, IT project management, collaborative work, interface design, and usability testing (Tatnall, 2005).

Degelsegger-Márquez and Remøe (2019) examined the role of science, technology, and innovation (STI) at the ASEAN level in Southeast Asia. They questioned how the intergovernmental STI system relates to the region's diversity and traditional linkages. The authors drew on the concept of 'the ASEAN Way' of integration, which prioritises non-interference, as discussed by Masilamani and Peterson (2014). They found a parallel between ASEAN governance and an intergovernmental approach, where compromise, consensus, and consultation play key roles in decision-making. This emphasis on informal processes, driven by national governments, also extends to the interoperability regime within ASEAN.

ASEAN Ministerial Meetings represent the highest level of concerted decision-making in e-governance. Lack of intra-ASEAN standardisation and linkages can lead to partnerships with external actors. A lack of supranational authority could be detrimental in cases where there is a conflict amongst state policies. Research has also shown how the success of e-governance has a direct bearing on the quality of life of citizens. Stoiciu (2011) highlighted that resistance to change poses the primary challenge in the implementation of e-services. The author emphasised the importance of aligning individual coherent strategies and public policies in the e-government sector with international standards. Again, this demonstrates the important role of standards in e-governance, which will ensure bridging the digital divide and developing a citizen-oriented, equitable digital society.

This raises the pertinent question of if and how one can properly measure and quantify interoperability for an assessment of the success of e-government measures. Maheshwari and Janssen (2012) reminded us that measuring interoperability is not only a technological challenge but also a socio-technical matter. They also flagged the importance of standards for organisational interoperability, as most maturity models and frameworks are conceptual in nature. Furthermore, we should keep in mind that while operational aspects of interoperability should be given importance, it is important to examine what citizens use e-governance for, which will determine the significance and nature of the interoperability frameworks that emerge.

Kompella (2016) noted that e-governance systems should think beyond transactional effectiveness in interoperability and should develop capabilities to include various marginalised communities and their different interests and needs while conceptualising e-governance interoperability. Greater engagement in decision-making and transparency in information sharing is necessary if e-governance is effective in the truest sense of citizen engagement in governance.

The e-Government Interoperability Guide published by the United Nations Development Programme with the support of IBM and Oracle (UNDP, 2007) emphasised the importance of formulating an e-government interoperability framework to ensure efficient and effective governance, with increased deployment of information and communication systems. The framework asserted that a government interoperability framework (GIF) is necessary for a seamless flow of information; greater transparency and accountability; citizen-centric decision-making; and achieving better coordination amongst government agencies, programmers, and services. In its review of the various GIFs, UNDP identified the common principles of GIFs – scalability, reusability, flexibility, preference for open standards, preference for standards with market support, and preference for nationally legislated and adopted standards.

3. Methodology

This paper is based on qualitative analysis of primary data collection. The primary data were collected through a structured questionnaire comprising both closed and open-ended questions (Appendix). The questionnaire was designed in the English language. For this study, the purposive sampling method was used, and the data were collected from 347 respondents across AMS between August 2021 and September 2021. The survey was conducted in all 10 AMS. Data were collected using online Google Forms, which were distributed through social media, personal contacts, and various organisations based in AMS. The data were analysed using Microsoft Excel and basic statistical tools such as central tendency and percentage.

Data were collected on the respondents, including their name, age, educational qualification, etc., as well as their perception of national e-governance and ICT policies, e-governance in the socio-economic sector, e-governance standards and technology, and regional outlook.

4. ASEAN e-Governance Profiles by Country

ICT standards increasingly have significant influence over functions that are paradigmatic responsibilities of governments. The degree of openness in technical standards has public policy implications in several areas (Roztocki, 2019). This section of the paper discusses the e-governance profiles of individual AMS.

4.1. Brunei Darussalam

Brunei Darussalam is a small, extremely wealthy country in northern Borneo that resembles the Persian Gulf sheikdoms. Its enormous oil revenues give it one of the highest incomes in the world. Like many wealthy countries, Brunei has more mobile phones than people. Brunei's Sultan Hassanal Bolkiah called for the creation of a digital nation in 2000. Planning for the project did not begin until 2003 when the e-government Program Executive Council was established. In 2008, Brunei launched a five-year E-government Strategic Plan with the aim of modernising the civil service.

One of the most significant changes in the recent past in Brunei Darussalam's public administration is the introduction of Talian Darussalam 123 (TD123), Brunei's national non-emergency call centre. From the 181,000 calls received in 2014, the centre now receives more than 300,000 calls annually. The significant number of calls to the centre reflects the public knowledge of the service. Most of Brunei Darussalam's public complaints were about water and electricity supplies. Due to the intermediary nature of TD123, one of the several challenges the system faced is the lack of an explicit deadline or timeline given to departments to resolve the problem. The data collected from the public are valuable information that can help the government to plan social and economic development. Expanding the system and infrastructure could help the country achieve its smart nation initiatives/vision.

4.2. Cambodia

Cambodia is one of the countries within ASEAN that is lagging in its digital infrastructure as well as its e-government initiatives. There is a need for significant improvement for the country to catch up with regional digital integration efforts. The government recently began earnest efforts to catch up on its commitments to ASEAN's digital integration. In February 2022, the country began its transition to digital government with the launch of the Cambodian Digital Government Policy, 2022–2035, which aims to improve citizens' access to the government and increase public trust in the government. The government also took an initiative to improve its digital governance indicators, following the criteria set by the UN Department of Economic and Social Affairs. Currently, Cambodia ranks 129th in the EGDI ranking.

The government also launched a major initiative to bridge the digital divide in the mostly rural society. The digital transformation will include building a society with high levels of inclusiveness, trust, and security while preserving national identity. The vision document (Government of Cambodia, 2021) is cognizant of the importance of data-driven governance as well as focusing on creating digital citizens, especially in an economy severely hit by the coronavirus disease (COVID-19) pandemic. Cambodia is also emphasising defining standards in public services through digital technologies while maintaining the ownership of ministries and institutions. Government ministries and institutions are launching digital projects such as e-filing systems and a e-value-added tax (VAT) system. Cambodia is also implementing a national single window (NSW) system and formulated the E-Commerce Law and the Consumer Protection Law in 2019.

4.3. Indonesia

Indonesia achieved a high level of EGDI, ranking 88th in the UN E-Government Survey 2020. With a score of 0.6824 in the Online Services Index, it is one of the lower middle-income countries making significant progress in improving its EGDI values, moving up 19 places within its group. Indonesia has effectively utilised its digital social registry systems as gateways for social protection programs, providing cash transfers and emergency assistance directly to about 94.7 million of the poorest households. This digital registry system enhances transparency and credibility in the government's delivery of social protection initiatives. The national digital registry system in Indonesia, known as the Unified Database, stores names, addresses, and socio-economic data.

e-Government was introduced in Indonesia through Presidential Instruction No. 6/2001, which aimed to develop and utilise ICT in the country and establish a 'government online'. One notable e-governance initiative in Indonesia is Lapor, launched by President Susilo Bambang Yudhyono in 2011. Additionally, Indonesia adopted various electronic systems from the Republic of Korea in 2015, including an electronic patent system, a national financial management system, and a public security management system. However, access to digital governance varies based on socio-economic status, with a significant digital divide prevailing. The Ministry of Administrative Reform regularly assesses the maturity level of e-government and plans to establish a national e-service portal by 2025.

4.4. Lao PDR

Lao PDR lags other AMS in terms of digital interoperability and e-government initiatives. It exhibits a substantial gap compared with the average regional indices. In the UN EGDI, Lao PDR was ranked 167, indicating its lower level of progress in e-government implementation. Following the Lao E-Government Action Plan in 2006, the country embarked on the Lao National E-Government Project. The government has also started digitalising national ID systems, which improve citizens' access to public services. With a robust civil service and high women's representation in Parliament, without a quota system, Lao PDR stands to gain from the timely use of digital possibilities in governance and the economy. Lao PDR is the only country in the ASEAN region without a main digital citizens' portal for government services, and this needs immediate rectification. It will be interesting to see how the national digital strategy in Lao PDR develops in the coming years, as it has also proposed digital strategies at the subnational level.

4.5. Malaysia

Malaysia was ranked 33rd out of 131 countries in the Global Innovation Index 2020, second only to Singapore amongst AMS. The National Policy on Science, Technology and Innovation, 2021–2030 is expected to intensify local technology development and application efforts. The policy outlines six cores, along with 20 strategies and 46 initiatives, covering all sectors of life. The digital economy is an integral part of realising the Malaysian government's Twelfth Malaysia Plan, 2021–2025. The blueprint specifies six strategic thrusts, which include digital transformation in the public sector as well as the creation of an inclusive, secure, and ethical digital ecosystem. The government has established administrative governing bodies, such as the 4IR Council and the Strategic Change Management Office, to implement the blueprint.

The effectiveness of the use of ICT in governance in Malaysia is hindered by the absence of citizens' participation and the lack of accountability and transparency. Therefore, it is important to formulate e-citizen policies and e-literacy programmes to allay citizens' distrust on digital privacy issues. Citizens' participation is also dependent on local governments, whose involvement can be bettered as they are currently short of funding and the requisite IT skills. Inclusive development through digital inclusivity is an important component of Malaysia's Shared Prosperity Vision 2030. Malaysia was ranked 47th on the UN EGDI 2020, with an Online Service Index participation index of 0.85290, while the world average is 0.5620.

4.6. Myanmar

Myanmar's digital integration currently lags regional performance. However, the government is taking steps to improve this by developing biometric databases for implementing digital IDs, aiming to enhance citizens' access to public services. The Organisation for Economic Co-operation and Development (OECD) recognised Myanmar's national citizens' portal as the most comprehensive, given its recent establishment. This portal serves as a platform for government services provided by the responsible authority and offers unique services on its behalf, acting as a central service delivery platform with links to other online services. The launch of the Myanmar National Portal was a significant outcome of the country's first e-Governance Master Plan. While Myanmar has made progress in ICT infrastructure, there is room for improvement in ICT policies and standards to enhance interoperability. Myanmar also has low internet penetration and uneven mobile phone connectivity throughout the country. This is a challenge for the successful implementation of e-government services. With the political unrest in the country, there are also apprehensions regarding the safety of citizens from severe censorship in the online realm, which is already heavily policed through strong anti-defamation clauses in the Telecommunications Law, 2013.

4.7. Philippines

In the Philippines, the Department of Information and Communications Technology (DICT) is the primary government agency responsible for the adoption of e-government services. The DICT developed both the E-Government Masterplan and adopted the Philippine Digital Transformation Strategy in 2022. The master plan aims to achieve intergovernmental coordination and organisational interoperability through 'One Digitized Government'. The government considers this master plan to be aligned with the ASEAN ICT Masterplan 2020. The National Government Portal is the master plan's frontline project. The DICT has partnered with a blockchain company based in the United States to further the government's digital development agenda.

The Department of Science and Technology in the Philippines plays a role in supporting local governments by assisting them in establishing e-government systems for their respective local government units. This decentralisation effort is also an attempt to address the digital divide. Similarly, the Anti-Red Tape Authority is leading the Nehemiah Project, which aims to harmonise efficient measures of interrelated agencies. The Philippines is a signatory to the ASEAN Single Window agreement and launched its NSW platform in 2017. However, it still maintains two separate systems, contravening the purpose of a single window. The national QR code standard was launched to promote interoperability in payments to the government.

4.8. Singapore

Singapore is a trailblazer in successful e-government as well as a digital leader – not just in Southeast Asia but globally (Ke and Wei, 2004). In the ASEAN Digital Integration Index, Singapore fares better than the average regional score. Singapore's success is attributed to strong leadership and an effective strategic action plan, which took a centralised approach to funding and infrastructure. Singapore had suffered from high-profile cyberattacks and has continually upgraded and amended the country's personal data laws. President Halimah Jacob launched the Digital for Life Movement to address the digital divide. The Singpass digital app is emerging as the main gateway to access government services.

Singapore has also announced its first enterprise district, Punggol Digital District, which will be a technological hub for the digital economy. In its continuing efforts to make e-government interoperable, the country has also looked at blockchain technology – inviting companies to innovate and help create efficient interactions amongst the government, society, and businesses. Singapore is also a pioneer and role model in skill upgradation and skill sharing amongst its citizens. Programmes such as Skills Future Singapore and the Tech Skills Accelerator prepare working citizens to better adapt to the digital economy.

4.9. Thailand

Thailand's digital economy is regarded as the second largest in the ASEAN region and is estimated to contribute about 17% to the country's gross domestic product (GDP). In the EGDI ranking, Thailand improved significantly, moving up from 102 in 2014 to 57 in 2020. The Digital Government Act commits to achieving full digitalisation of all government services by 2022. The vision of Thailand's E-government 4.0, presented within the framework of the 3-year Digital Government Development Plan by the Electronic Government Agency, encompasses four key aspects. These include government integration, which involves integrating information and operations across various agencies and establishing a unified perspective of citizens within the government.

An important successful initiative of e-governance in this regard is the Village Broadband Internet Project (Net Pracharat), which expanded broadband high-speed internet access to remote villages. The Ministry of Digital Economy and Society also provided training to communities, in collaboration with the Ministry of Interior, in a phased manner – training community leaders who then propagate skills to the community. Thailand is considered very advanced regarding data protection and cyber protection compared with other AMS. In 2019, the government passed the Personal Data Protection Act and opened an 'anti-fake news' centre that allows access to digital data without warrant.

4.10. Viet Nam

Viet Nam is integrating its public administrative procedures and processes through an NSW. The NSW has successfully implemented 173 administrative procedures and involves 13 governmental agencies, including the Customs Administration under the Ministry of Finance. This development is seen as a positive step towards Viet Nam's alignment with the ASEAN vision of digital integration.

Viet Nam has also adopted a national digital transformation program, approved by the Prime Minister in June 2020, with a focus on placing people at the core of the transformation process. As part of this initiative, the issuance of National Digital Identity Smart Cards is under way, although multiple forms of identification are still being used throughout the country. While the citizen-centric approach and the proactive responsibility taken by the government are welcome, the country lags in its implementation as the digital strategies have to navigate multiple ministries. The government faces problems with coordination and an integrated approach because of the lack of common countrywide ICT and information standards. It also faces a silo mentality in bureaucracies, as each department/agency wants to keep their authority, power, and interest and is apprehensive about coordination because they believe it may interfere with their autonomy. Hence, interoperable e-government implementation is needed in Viet Nam.

5. Survey Findings

The online survey was conducted with 347 individuals from various AMS using Google Forms between August 2021 and September 2021. A structured questionnaire (Appendix) was designed to gather responses through a random sampling method. This section of the paper examines the survey results to comprehend the significance of e-governance in AMS, assess citizens' perceptions, and identify any challenges encountered.

5.1. Respondent profile

Table 7.1 shows the distribution of people across AMS and their nationalities. Most of the people were from Singapore (10.66%), followed by Brunei (10.37%), Thailand (10.37%), and Lao PDR (10.37%). The most diverse population in terms of nationality was found in Myanmar, Thailand, and Cambodia.

Table 7.1. Country Role and Nationality of Respondents

Country of residence	Nationality	Percentage
Brunei	**Brunei**	**10.37**
Cambodia	US	0.58
	Cambodia	8.36
	Total	**8.93**
Indonesia	**Indonesia**	**8.93**
Lao PDR	**Lao PDR**	**10.37**
Malaysia	**Malaysia**	**9.22**
Myanmar	UK	0.29
	Burma	8.93
	Myanmar	0.29
	Total	**9.51**
Philippines	**Philippines**	**7.49**
Singapore	**Singapore**	**10.66**
Thailand	UK	0.29
	India	0.29
	Thailand	9.80
	Total	**10.37**
Viet Nam	**Viet Nam**	**9.51**

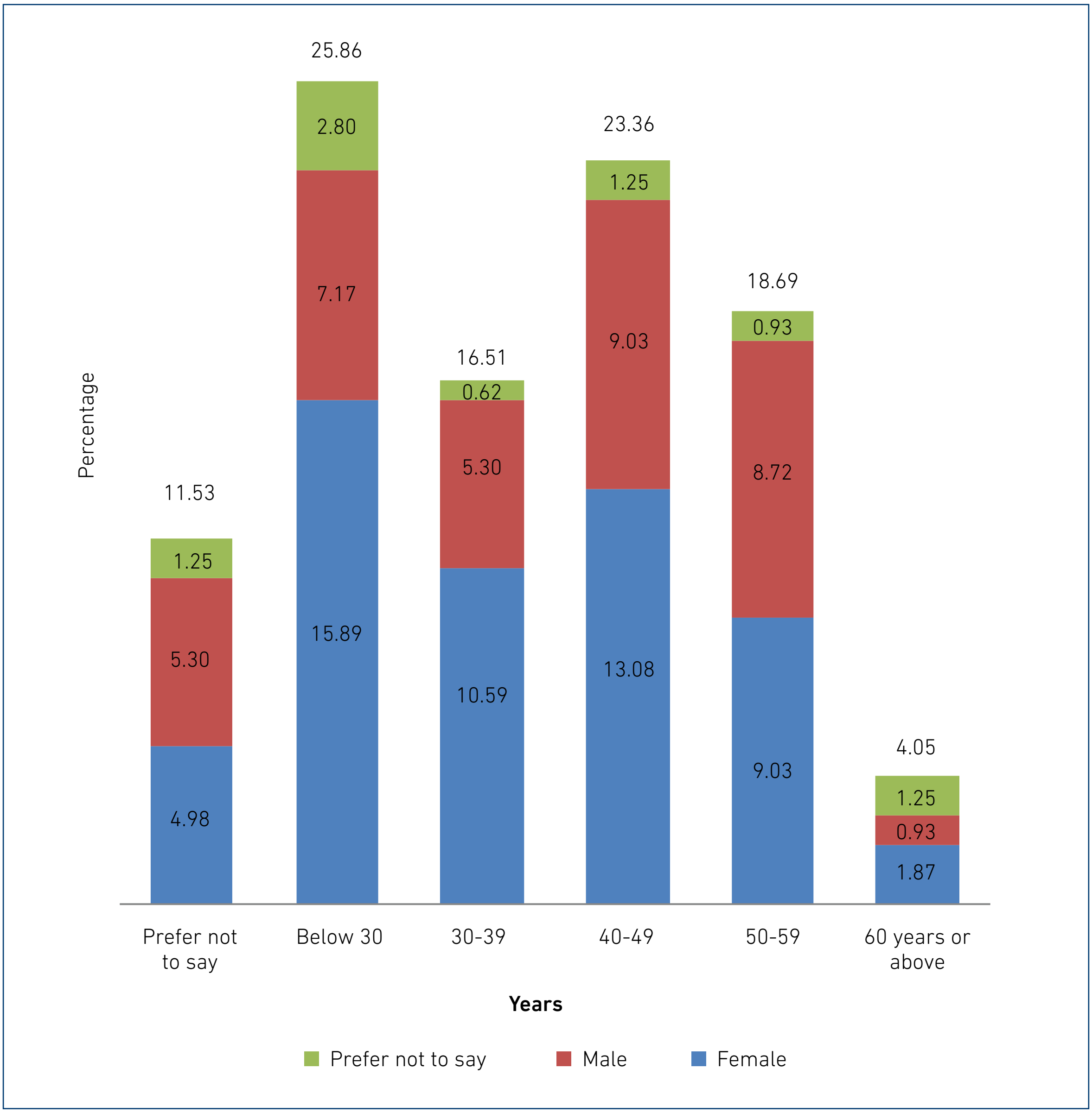
UK = United Kingdom, US = United States.

Note: Totals may not be accurate because of rounding.

Source: Author's calculation.

Figure 7.1 shows the distribution of the surveyed people according to their age and gender – 55.45% were female, 36.45% were male, and 8.10% said they prefer not to say. Most of the respondents were below 30 years of age (25.86%), of which 15.89% were female and 7.17% were male. Further, 23.36% were aged 40–49, of which 13.08% were female and 9.03% were male.

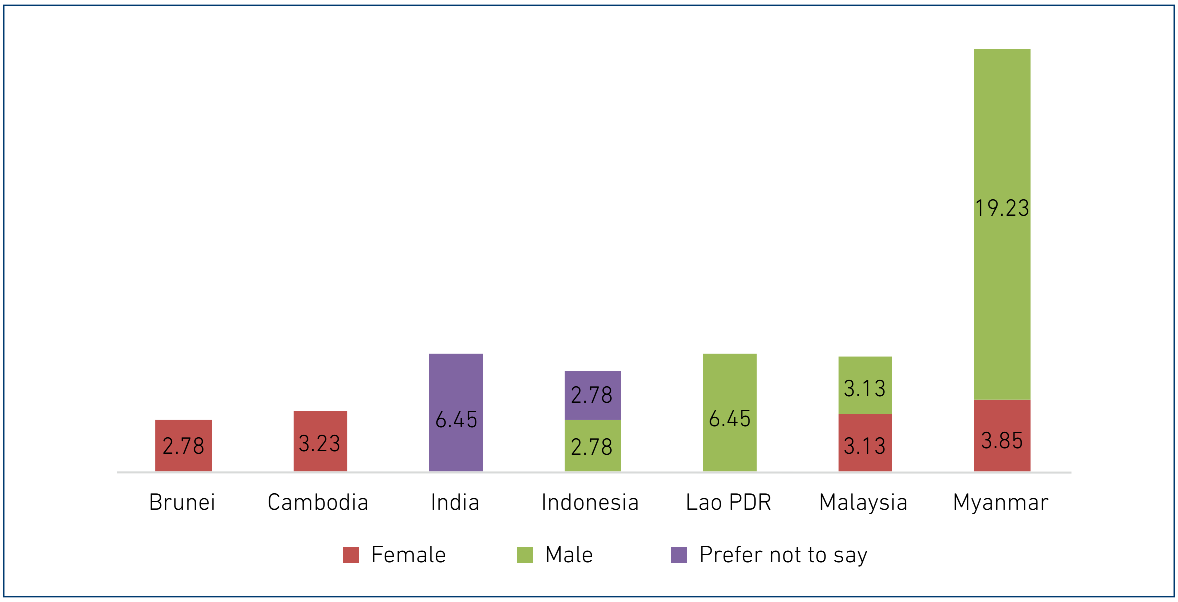
Figure 7.1. Respondents' Profile by Age and Gender
(%)



Source: Author's calculation.

Respondents reflected on the question about the use of public services via the internet/digital mode. Figure 7.2 shows the percentage of respondents not using public services via the internet/digital mode – 23.08% of respondents in the Philippines were not using the digital mode for public services, of which 19.23% were male. On the other hand, in Singapore, Thailand, and Viet Nam, all were using the internet/digital mode for public services. On average, 5.23% of respondents across ASEAN were not using the digital mode for public services; of this, there were more male (2.91%) than female (1.45%) respondents.

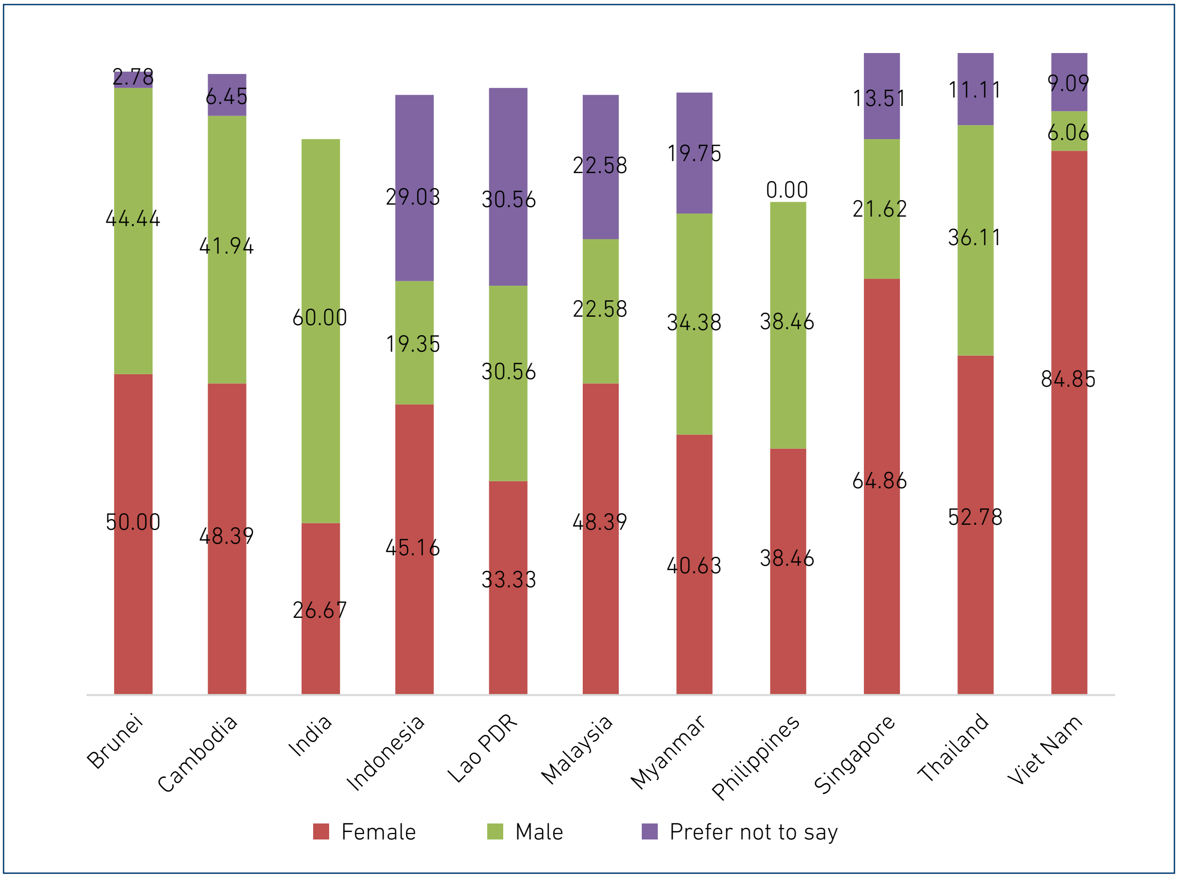
Figure 7.2. Respondents Not Using Digital Mode for Public Services
(%)



Note: The remaining countries did not record any responses.
Source: Author's calculation.

Figure 7.3 illustrates the percentage of respondents utilising the digital mode for public services, such as tax return submissions and driver's license renewals. The results indicate a significant adoption rate, with 94.77% of respondents overall and over 75% in each country opting for digital channels when accessing public services. Notably, 55.45% of the respondents were female, and 36.45% were male. The data highlights a substantial female presence, with 84.85% of females in Viet Nam utilising digital channels for public services. This suggests a notable comfort level amongst females in accessing online public services for various benefits.

Figure 7.3. Respondents Using Digital Mode for Public Services
(%)

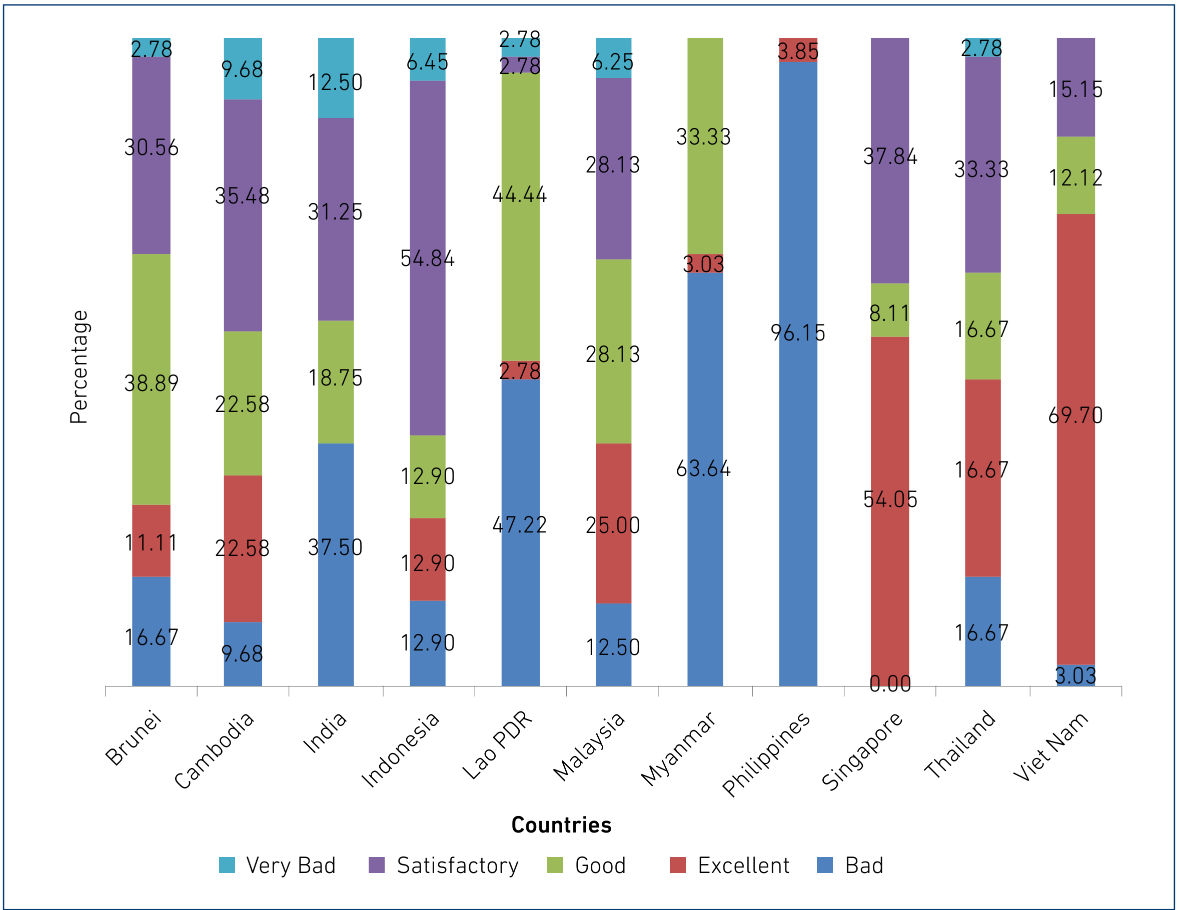


Source: Author's calculation.

5.2. National e-governance and ICT policies

Figure 7.4 shows the e-governance ratings by country. e-Governance services are rated as bad by 96.15% of internet users in the Philippines, 63.64% in Myanmar, and 47.22% in Lao PDR. On the other hand Singapore, Viet Nam, and Thailand have good e-governance services as the users seemed to be highly satisfied.

Figure 7.4. Rating of e-Governance Services by Country



Source: Author's calculation.

Table 7.2 shows the source of awareness of e-governance portals in ASEAN. Most of the respondents in almost all the countries cited advertisements as the main source of awareness, followed by social media. A few stated that news media and speeches of elected representatives also inform them about e-governance portals. In recent times, social media has become a crucial component for smartphone users and plays a significant role in spreading awareness.

Table 7.2. Source of Awareness of e-Governance Portals

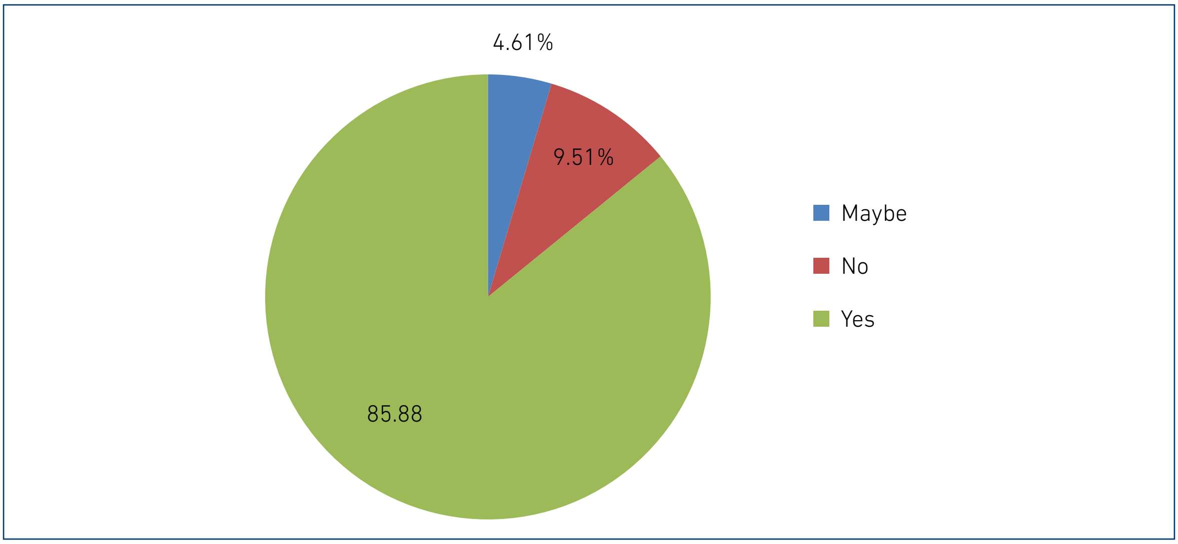
(%)

Country	Advertisements on TV/ in newspapers/ at public places	News media (news channel reporting/ broadcast)	Social media (Facebook/ Twitter)	Speeches of elected representatives (at public places/ in the media)
Brunei	47	33	75	33
Cambodia	52	29	19	10
Indonesia	26	29	55	10
Lao PDR	72	0	25	3
Malaysia	31	19	38	34
Myanmar	82	0	15	3
Philippines	69	0	27	4
Singapore	81	5	14	0
Thailand	53	31	36	3
Viet Nam	91	0	27	0

Source: Author's calculation.

Figure 7.5 highlights the percentage of respondents who use e-government portals. Most of the respondents (85.88%) said they use e-government portals, 9.51% said they do not, and 4.61% said maybe.

Figure 7.5. Percentage of Respondents That Used e-Government Portals



Source: Author's calculation.

Further, the respondents were asked about public policy areas covered by e-governance in their country (Table 7.3). According to respondents in Brunei, Lao PDR, Myanmar, the Philippines, Singapore, and Viet Nam, public service is given a lot of focus. Similarly, health was highlighted by respondents from Brunei, Cambodia, Lao PDR, Malaysia, and Viet Nam. Education was highlighted as a significant aspect by respondents from Brunei, Malaysia, and Viet Nam. The domain of economic affairs falls under e-governance in Indonesia, Malaysia, Singapore, Thailand, and Viet Nam. In Myanmar and the Philippines, 93.94% and 92.31% of respondents, respectively, mentioned public services. Additionally, in Malaysia, 46.88% of respondents stated that recreation was included within the scope of e-governance. Overall, the survey reveals that e-governance portals in Brunei, Malaysia, and Viet Nam have broader coverage in various areas.

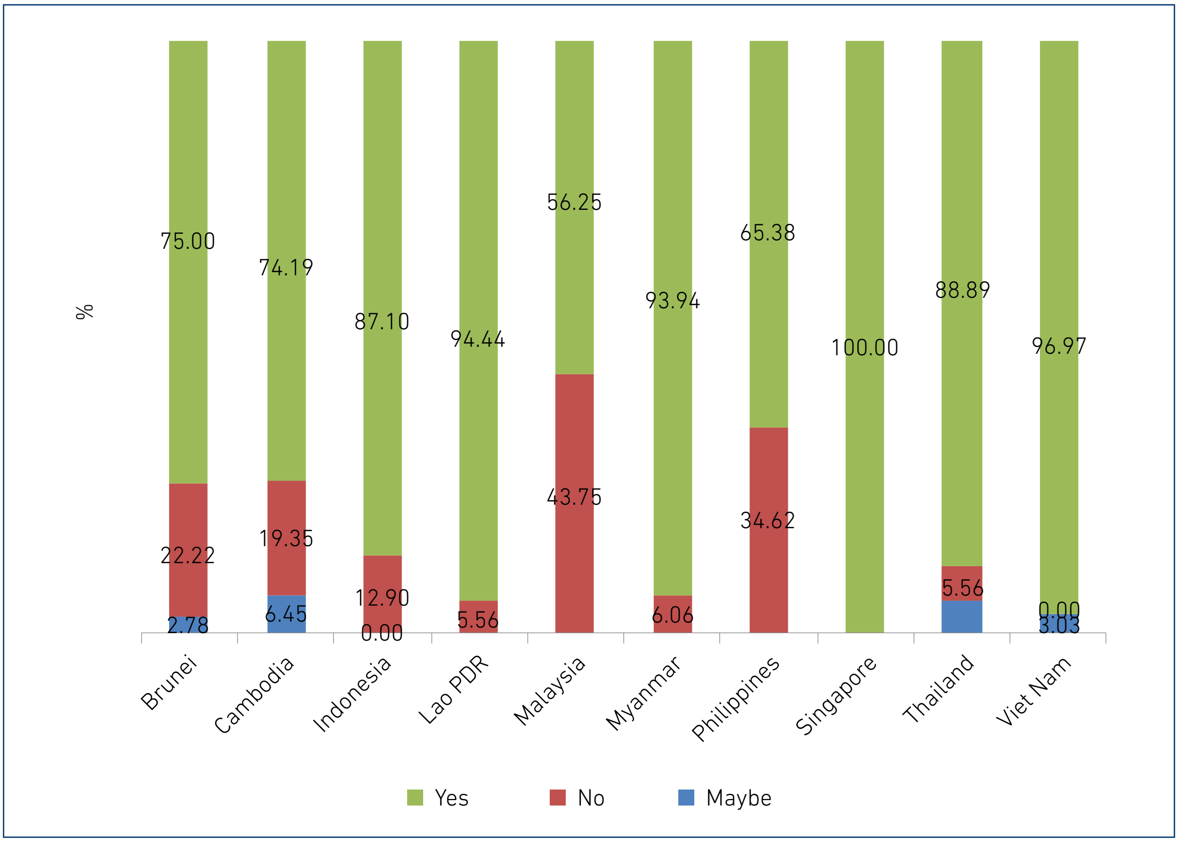
Table 7.3. Public Policy Areas Covered by e-Governance, by Country

Item	Brunei	Cambodia	Indonesia	Lao PDR	Malaysia	Myanmar	Philippines	Singapore	Thailand	Viet Nam	Grand Total
General public services	66.67	51.61	32.26	77.78	43.75	93.94	92.31	54.05	47.22	72.73	63.69
Public order and safety	44.44	32.26	38.71	0.00	28.13	0.00	7.69	5.41	36.11	6.06	20.17
Health	91.67	58.06	45.16	61.11	75.00	6.06	11.54	48.65	47.22	81.82	54.18
Education	75.00	35.48	38.71	33.33	62.50	3.03	3.85	45.95	41.67	66.67	42.36
Culture and religion	41.67	12.90	16.13	2.78	46.88	0.00	7.69	0.00	11.11	3.03	14.99
Economic affairs	38.89	9.68	51.61	0.00	62.50	0.00	7.69	43.24	61.11	78.79	36.02
Defence	36.11	12.90	12.90	27.78	34.38	12.12	3.85	8.11	13.89	24.24	19.02
Social protection	38.89	3.23	0.00	2.78	15.63	0.00	3.85	0.00	11.11	0.00	9.51
Environmental protection	19.44	0.00	9.68	8.33	15.63	0.00	7.69	0.00	8.33	12.12	8.93
Recreation	41.67	12.90	16.13	0.00	46.88	0.00	3.85	2.70	16.67	3.03	15.27
Housing and community amenities	33.33	6.45	16.13	5.56	28.13	0.00	7.69	2.70	13.89	0.00	13.26

Source: Author's calculation.

Figure 7.6 shows the responses to e-government services catering largely to one or very few sectors. The figure highlights that in Singapore 100% said yes, compared with 96.97% in Viet Nam, 94.44% in Lao PDR, 93.94% in Myanmar, 88.89% in Thailand, 87.10% in Indonesia, 75.00% in Brunei, 74.19% in Cambodia, 65.38% in the Philippines, and 56.25% in Malaysia. This shows that e-government services in AMS need to include a wider range of sectors.

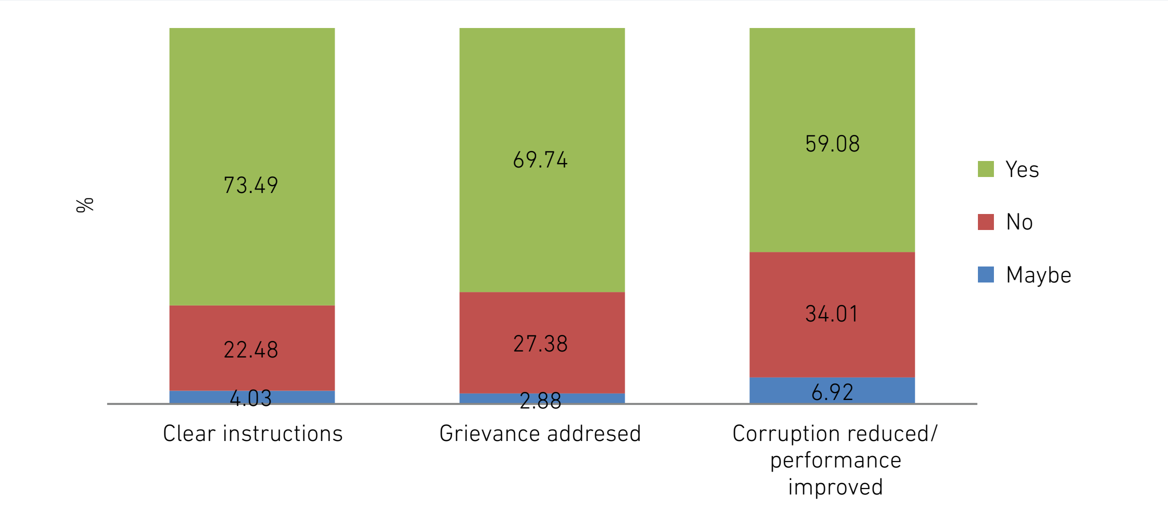
Figure 7.6. e-Government Services Catering Largely to One or Very Few Sectors
(%)



Source: Author's calculation.

Figure 7.7 shows the performance of e-government portals. It was found that 73.49% of respondents from all the AMS said that e-government portals provide clear instructions. Further, 69.74% of the respondents said that grievances were addressed through e-government portals and 59.08% said that corruption was reduced and performance improved due to e-government portals. The performance of e-government portals in the AMS was good, but the governments need to focus on optimising their e-government portals for better service delivery to citizens.

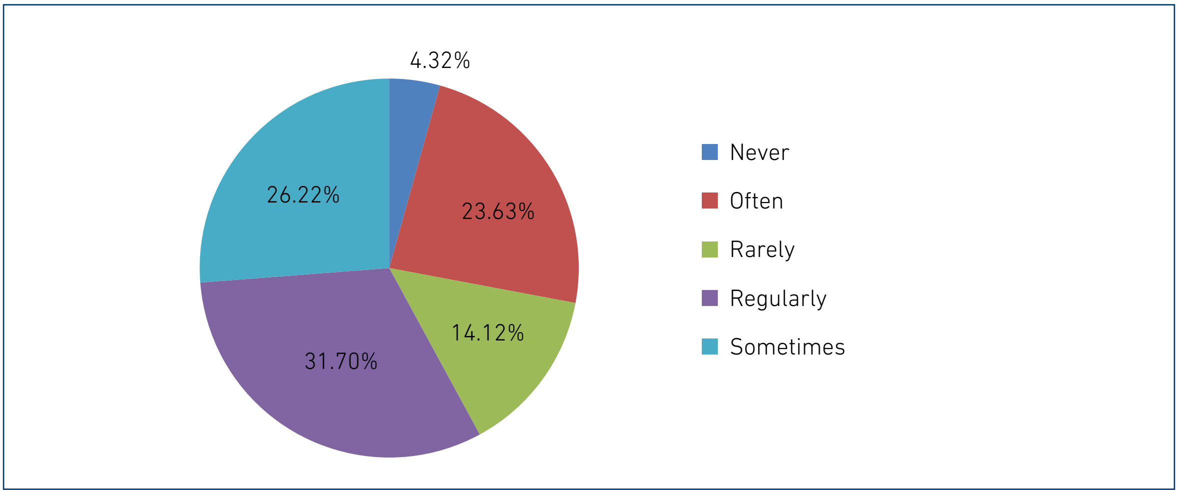
Figure 7.7. **Performance of e-Government Portals**
(%)



Source: Author's calculation.

Figure 7.8 highlights the frequency of visits to government offices by the respondents. It can be seen that 31.70% of the respondents visit regularly, 26.22% visit sometimes, 23.63% visit often, 14.12% visit rarely, and only 4.32% said they never visit. This shows that the e-government portals have limitations; hence, visits to government offices are required for the completion of government-related work.

Figure 7.8. **Visits to Government Offices**
(%)



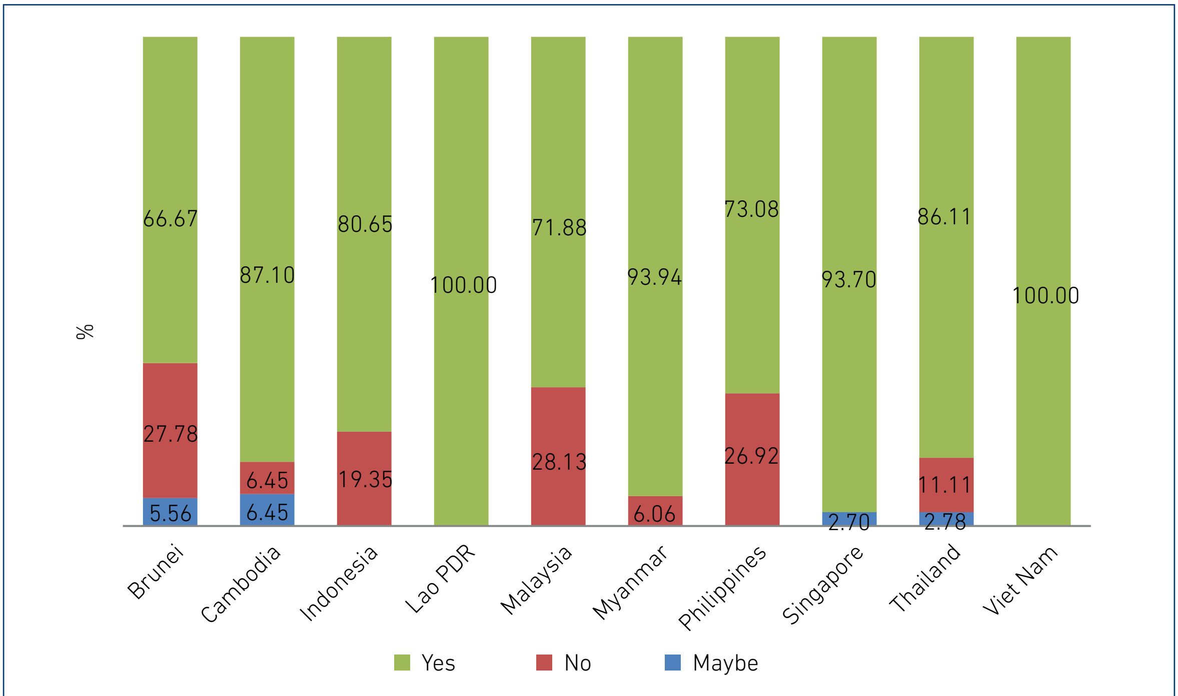
Source: Author's calculation.

5.3. e-Governance in the Socio-Economic Sector

The respondents provided ratings regarding the digital divide between urban and rural areas in their respective countries. A small percentage of respondents from Brunei (6.09%), Indonesia (10.87%), Malaysia (9.80%), the Philippines (6.67%), and Thailand (5.98%) indicated that the digital divide between urban and rural sectors was minimal. On the other hand, the majority of respondents from each country acknowledged the presence of some degree of digital divide between these sectors. However, a considerable proportion of respondents from Brunei (39.13%), Cambodia (33.98%), Indonesia (14.13%), Malaysia (37.25%), Myanmar (30.19%), the Philippines (63.33%), Singapore (17.24%), Thailand (40.17%), and Viet Nam (4.95%) expressed that the digital divide was significant. Overall, the analysis demonstrates that the rural sector, to some extent, has been neglected in terms of access to e-governance within the ASEAN region.

Figure 7.9 shows gender biases by country, i.e. if the e-governance services favour one gender over other. All the respondents from Viet Nam and Lao PDR agreed that digital services employ gender preference. More than 25% of respondents from Brunei, Malaysia, and the Philippines said that digital services in their countries were not gender-biased.

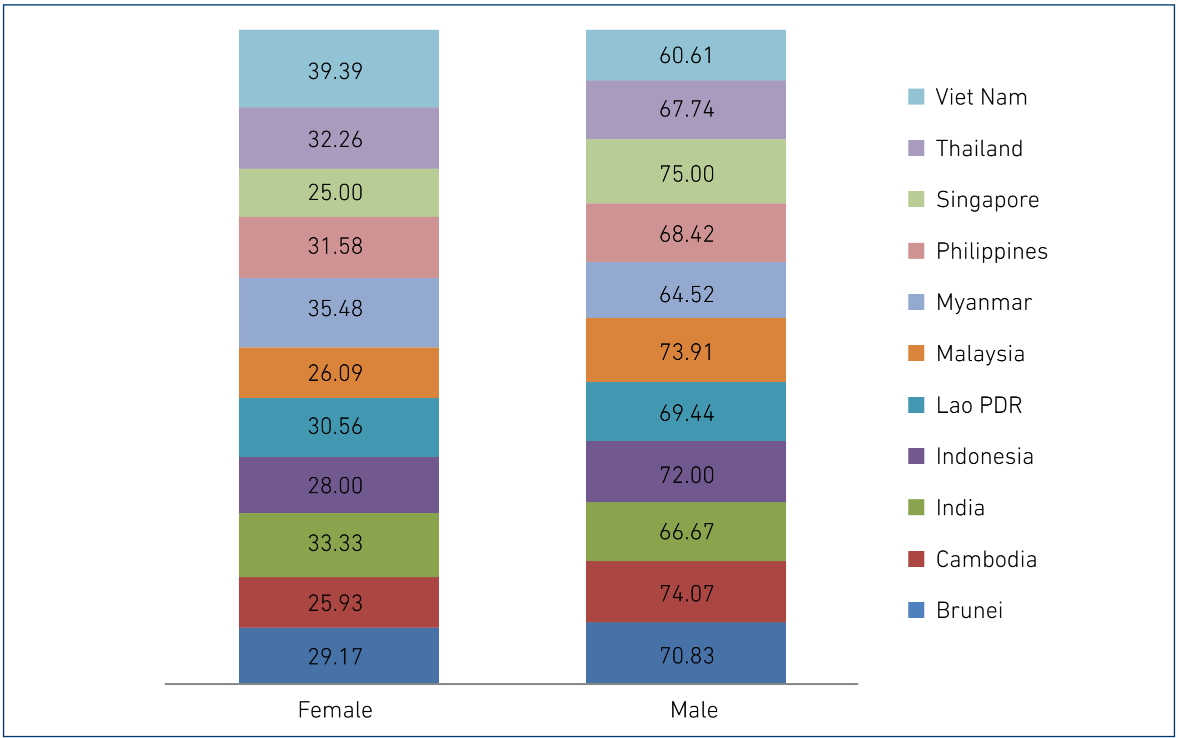
Figure 7.9. Gender Biases of Digital Services
(%)



Source: Author's calculation.

Further, the respondents revealed the gender that was given preference. As shown in Figure 7.10, most of the respondents from AMS said that males were given preference over females. Singapore, Malaysia, Indonesia, Cambodia, and Brunei are more gender-biased, as more than 70% of respondents said that males were given preference over females.

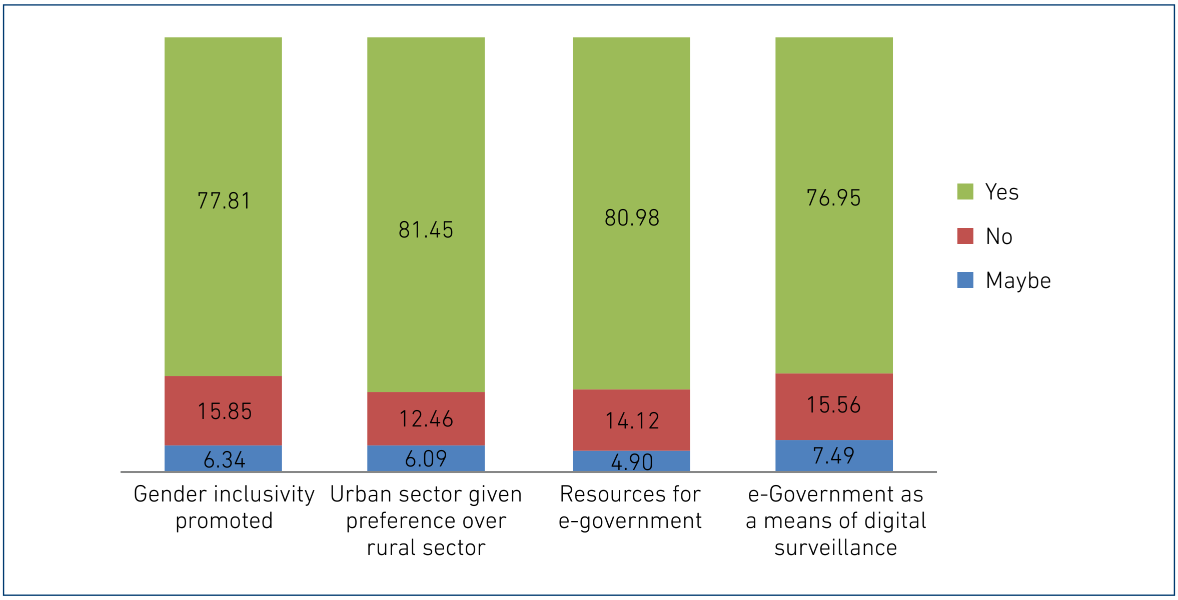
Figure 7.10. Favoured Gender
(%)



Source: Author's calculation.

The respondents were asked if e-governance helped promote gender inclusivity. As shown in Figure 7.11, 77.81% of respondents said yes, 15.85% said no, and the remainder said maybe. Similarly, 81.45% said that e-governance gave preference to the urban sector rather than the rural sector, and 80.98% said that the government had enough resources at their disposal to provide efficient e-government services. Further, 76.95% agreed that e-government portals are a means of digital surveillance. This shows that most of the respondents had a positive outlook towards the effectiveness of e-government services in ASEAN. However, governments need to improve their implementation strategies.

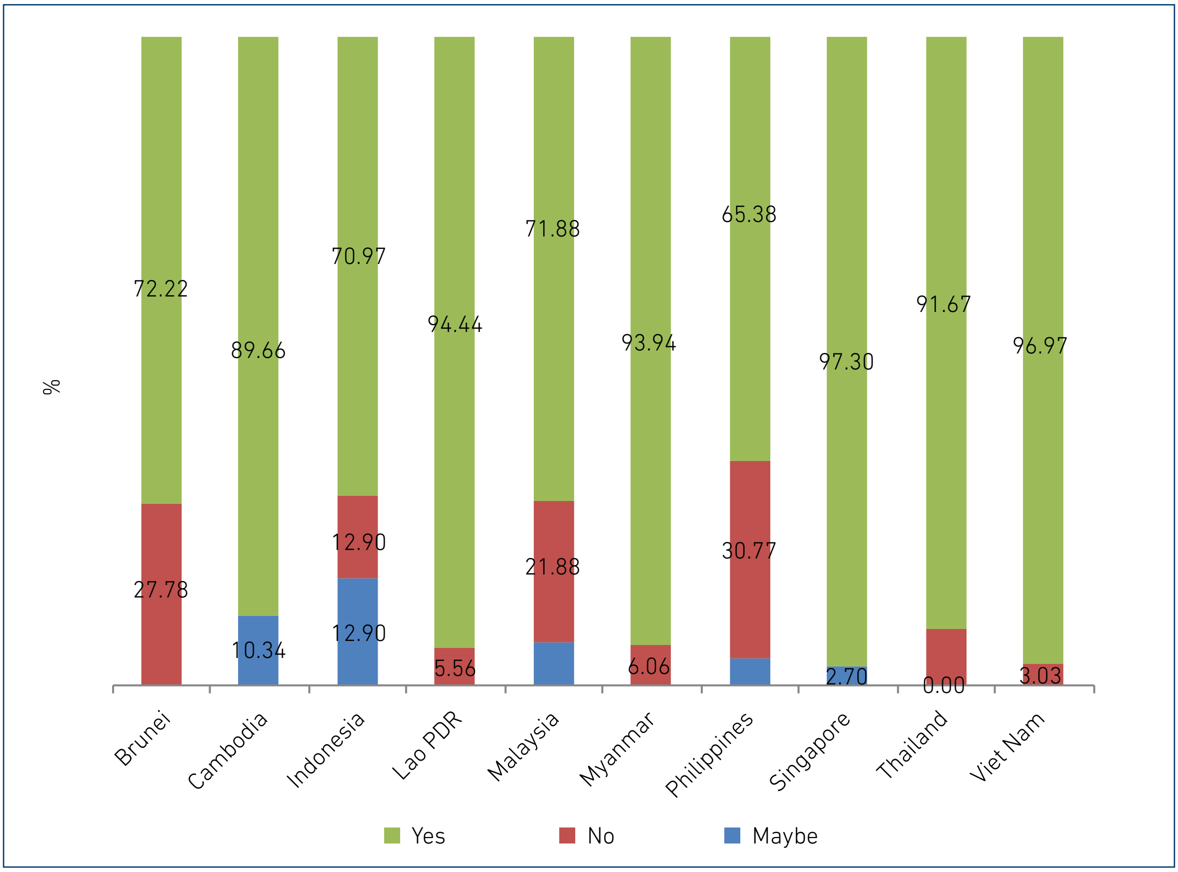
Figure 7.11. Respondents' Perspective of e-Government Services
(%)



Source: Author's calculation.

Figure 7.12 highlights the country-wise perception of respondents regarding the internal political instability affecting the efficiency of e-governance. Most of the respondents in all countries believed that internal political instability hinders the efficiency of e-governance. However, more than 20% of the respondents in Brunei, Malaysia, and the Philippines did not agree with this notion.

Figure 7.12. **Internal Political Instability and e-Governance**
(%)



Source: Author's calculation.

In response to a question about the robustness of their country's STI industry, 65.61% of the respondents from AMS rated it average. Similarly, most respondents from Brunei, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Singapore, Thailand, and Viet Nam rated their STI industry average. However, the STI industry in their country was considered poor by 30.30% of respondents from Myanmar, 30.55% from Thailand, and 65.39% from the Philippines.

5.4. e-Governance, Standards, and Technology

Most of the respondents (78.39%) said they were aware of monetary incentives such as tax rebates or preferences in schemes given to local tech companies. Further, 66.28% of the respondents said they were aware of eASEAN – a framework agreement to promote digital coordination in the economy, society, and government. According to 77.52% of respondents, the government is investing in research and development related activities on e-governance. Some 87.90% think that their respective governments should seek external assistance from other countries in the technological domain.

According to the respondents, e-governance standards are generally perceived as being non-discriminatory. A majority of 88.27% expressed the opinion that the adoption of open standards in e-governance would contribute to enhancing efficiency in interoperability. Additionally, it was noted that the regulations governing technology procurement for e-governance within ASEAN are strict. Both standardisation and regulation were deemed crucial for ensuring smooth utilisation of e-governance as an internal tool. The respondents further emphasised that there is still a considerable amount of work for the government to undertake to enhance technological innovation in this domain.

According to the respondents, the development of mutually recognised standards of interconnectivity and interoperability for national information infrastructure is deemed realistic and important for ASEAN. They emphasised that data-sharing agreements, coupled with effective e-governance practices, play a significant role in facilitating better intergovernmental coordination amongst AMS. Recognising the availability of considerable resources within ASEAN, investing in technological developments, and promoting interoperability in e-governance are seen as crucial. This approach could foster the adoption of open source solutions and open standards, thereby enhancing the development of efficient and effective public services within the region.

6. Recommendations/Suggestions

Institutional Approach to E-Governance:
A study by Fountain (2014) on the effects of e-governance on political institutions introduced the concept of e-government as a 'digitally mediated institution' and argued for the efficacy of extending the institutional approach to account for the study of e-government. The dimensions of digitally mediated institutions differentiate them from other types of institutions. These dimensions include sunk costs incurred in the development of large-scale, socio-technical systems in public organisations; the rigidity of many interfaces, systems architecture, code, and digital infrastructure; the pressure that such systems exert on decision-makers to re-engineer and restructure to realise a return on investment in cyberinfrastructure; and network dynamics, including a strong tendency toward interoperability (Fountain, 2014).

An institutional approach that examines the interactions amongst individuals, technologies, and structures in political environments characterised by conflicts over ideas, rights, and resources is valuable for studying e-governance. In the context of e-governance in ASEAN, such a study should focus on the temporal aspects of digitally mediated institutional development. This includes exploring policy feedback, conventions, path dependence, and key dimensions of long-term institutional development such as timing, sequencing, and gradual patterns of change. According to Fountain (2014), the potential of networked systems lies in their interoperability, which necessitates the establishment of conventions or standards for coordinated and shared benefits. An institutional approach also emphasises how the importance of interoperability extends beyond benefits to political actors to civil society, such as citizens' users of such systems.

Comparison of Vision Documents:

Perform a thorough comparison of the e-governance vision documents of ASEAN as a regional organisation as well as the e-government initiatives of individual AMS to gauge implementation and compliance. The review of the vision documents published by ASEAN as well as individual AMS across timelines reflects an awareness of the need for interoperability, especially of standards. However, implementation and compliance seem to lag in comparison. It would be beneficial to investigate further whether increased awareness of interoperability standards and their implementation – especially at the local government level of individual countries – can aid in the adoption of e-governance at the regional level as well.

User-Centric E-Government Services:

Emphasise the user centricity, transparency, and accessibility of cross-border e-government services. Research on e-governance in the EU has shown that the removal of linguistic and interoperability barriers enables Europeans to experience full cross border citizenship and entrepreneurship (European Commission, 2021). Policymakers and implementers in the ASEAN region need to be aware of where digital interoperability is achieved: is it just for business-centric initiatives or is it also a priority for citizen-centric cross-border initiatives? The accessibility and outreach of regional initiatives need to reach the most disadvantaged citizens as well. The question of accessibility is interlinked with transparency and security enablers that protect and do not violate citizens' privacy.

Conceptual Rigour in ASEAN's Context:

Employ conceptual rigour to understand the particularity of the ASEAN experience of interoperable digital governance. While the e-governance benchmark of the EU and other conceptual tools are important, there is a need to develop concepts that talk specifically about the ASEAN region and its organisational culture and aims. Concepts must be developed to address interoperability that speaks to the diversity of political cultures of individual AMS. Further, as Postill (2012) noted, this debate should not be reduced to that of a 'community–network' dichotomy. More conceptual nuance is necessary to understand the findings of this study on e-governance in ASEAN.

Promoting Awareness and Utilisation:

The interoperability standards and specifications might strengthen social and territorial cohesion by making public services more accessible, while improving crisis management through expanding access to e-health, e-education, and training. According to the survey findings, TV advertisements and social media are the main source of awareness regarding e-governance portals. Therefore, it is suggested that the ASEAN government collaborate to establish a comprehensive online platform that offers e-health services, e-education resources, training programs, and remote work opportunities for its citizens. To ensure widespread awareness and utilisation of this portal, effective promotional strategies can be employed, such as advertising through television and leveraging social media platforms.

Extending E-Governance Initiatives:

The survey revealed that respondents from Singapore expressed satisfaction with e-government services that cater to diverse sectors. This highlights the importance for governments of extending e-governance initiatives to a wider range of public sectors. To address the challenges in achieving this, it is crucial to establish a robust architecture governance framework that addresses all bottlenecks and impediments hindering the success of e-governance initiatives across sectors. Implementing a strategic framework that defines and guides the implementation of e-government can be advantageous in this regard.

Gender Mainstreaming and Local Content:

Ensure gender mainstreaming in e-governance services, connect public administration reform plans and programmes to e-government strategies, and guarantee that women and men stakeholders and civil employees are included in their creation and execution. Government should place special emphasis on the recruitment of women and men to government institutions at the national and local levels, as well as throughout a variety of programme areas, in terms of both their numbers and the positions they occupy. Gender equality in appointments, promotions, study tours, and duty assignments, amongst other things, may be tracked using ICT. Encourage the creation and distribution of local content in local languages on e-governance portals, particularly for women and low-income and vulnerable groups. Local material should address concerns connected to public services as well as existing gender inequities.

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Appendix 1: Questionnaire

Part I – Basic Information

1. Name:

2. Age:
   a. Below 30 years
   b. 30¬–40 years
   c. 41–50 years
   d. 51–59 years
   e. 60 years or above
   f. Prefer not to say

3. Email ID:

4. Country of Residence:

5. Nationality

6. Education Qualification:

7. Please specify your gender:
   a. Female
   b. Male
   c. Prefer not to say
   d. Other...

8. Please specify your occupation:

9. Do you use public services through internet/digital mode?
   a. Yes
   b. No
   c. Maybe

Part II – National Policy of E-governance and ICT

10. How would you rate e-governance services of your country?
    a. Excellent
    b. Good
    c. Satisfactory
    d. Bad
    e. Very Bad
    f. Other...

11. How were you made aware of e-governance portals in your country?
    a. Advertisements
    b. Social media
    c. News
    d. Speeches of the elected representatives
    e. Other...

12. Have you accessed any of the e-government portals?
    a. Yes
    b. No
    c. Maybe
    d. Other...

13. Which public policy areas does e-governance in your country cover?
    a. General Public Services
    b. Defence
    c. Public Order and Safety
    d. Economic Affairs
    e. Environment Protection
    f. Housing and Community Amenities
    g. Health
    h. Recreation, Culture, and Religion
    i. Education
    j. Social Protection
    k. Other...

14. Do e-government services in your country cater to largely one or very few sectors?

a. Yes
b. No
c. Maybe

15. If yes, could you specify which sectors do they largely cater to?

16. Are the instructions on the e-government portals clear for you to follow?
    a. Yes
    b. No
    c. Maybe
    d. Other…

17. Has your grievance been addressed successfully through e-government portals?
    a. Yes
    b. No
    c. Maybe

18. Do you still visit government offices despite the presence of e-government portals?
    a. Regularly
    b. Often
    c. Sometimes
    d. Rarely
    e. Never
    f. Other…

19. Has corruption reduced and performance, efficiency, and transparency improved due to e-governance?
    a. Yes
    b. No
    c. Maybe
    d. Other…

Part III – E-Governance in Socio-Economic Sector

20. Rate the digital divide between the urban and rural sectors in your country? 1 as least and 5 as the most
    1 2 3 4 5

21. Have any specific measures been taken by your government to bridge the digital divide?

22. Are the digital services gender-mainstreamed? Is any particular gender given preference in your country?
    a. Yes
    b. No
    c. Maybe
    d. Other…

23. If yes, could you specify the gender that is given preference?

24. Has e-governance helped promote inclusivity of all genders?
    a. Yes
    b. No
    c. Maybe
    d. Other...

25. Has the urban sector been prioritized over rural areas in terms of e-governance preferences?
    a. Yes
    b. No
    c. Maybe
    d. Other...

26. Are you aware of any cases of racism or sexism: where a person was denied services or access to e-governance due to their race or gender?

27. Do you think your government has enough resources at their disposal to provide efficient e-government services?
    a. Yes
    b. No
    c. Maybe
    d. Other...

28. Do you think the internal political instability in your country hinders the efficiency of e-governance?
    a. Yes
    b. No
    c. Maybe
    d. Other...

29. Do you feel that the e-government portals are a means of digital surveillance?
    a. Yes
    b. No
    c. Maybe
    d. Other...

Part IV – E-Governance and Technology

30. How strong and robust do you think is the science, technology, and innovation industry in your country? 1 as the least and 5 as the most.
    1 2 3 4 5

31. Are you aware of any specific incentives given to the local tech companies?
    a. Yes
    b. No
    c. Maybe
    d. Other...

32. Do you think your government is investing in research and development towards e-governance?
    a. Yes
    b. No
    c. Maybe
    d. Other...

33. Do you think that your government will seek external assistance (assistance from other countries) in the technological domain?
    a. Yes
    b. No
    c. Other...

34. If yes, which country or region are they likely to seek assistance from?
    a. United States of America
    b. China
    c. European Union
    d. African nations
    e. Countries within ASEAN
    f. Oceania (Australia and New Zealand)
    g. Other Asian countries like Japan and the Republic of Korea
    h. India
    i. Russia
    j. Other...

35. Are the standards of e-governance non-discriminatory in nature?
    a. Yes
    b. No
    c. Maybe
    d. Other...

36. Do you feel that open standards of e-governance will help promote efficiency in interoperability?
    a. Yes
    b. No
    c. Maybe
    d. Other...

37. Are the regulations in your country for procurement of technology for e-governance stringent?
    a. Yes
    b. No
    c. Maybe
    d. Other...

38. Has the standardisation of e-governance promoted seamless sharing of information across departments?
    a. Strongly Disagree
    b. Disagree
    c. Neutral
    d. Agree
    e. Strongly Agree

39. Can standardization and regulations ensure the seamless use of e-governance as an internal tool?
    a. Yes
    b. No
    c. Maybe
    d. Other...

40. Do you think that your government still has a significant amount of work pending to improve the technological innovations?
    a. Yes
    b. No
    c. Maybe
    d. Other...

Part V – Regional Outlook

41. Are you aware of eASEAN – a Framework Agreement to promote digital coordination on the economy, society, and government?
    a. Yes
    b. No
    c. Maybe
    d. Other...

42. Is it realistic for ASEAN to develop and harmonise standards for inter-connectivity and interoperability of national information infrastructures?
    a. Yes
    b. No
    c. Maybe
    d. Other

43. Will there be an increased need for robust interoperability amongst ASEAN Member States in a post-pandemic world?
    a. Strongly Disagree
    b. Disagree
    c. Neutral
    d. Agree
    e. Strongly Agree

44. Will data-sharing agreements along with effective e-governance help ASEAN Member States in better intergovernmental coordination?
    a. Yes
    b. No
    c. Maybe
    d. Other...

45. Will data sharing agreements along with effective e-governance help ASEAN Member States in ensuring the transparency and accountability of governments?
    a. Yes
    b. No
    c. Maybe
    d. Other...

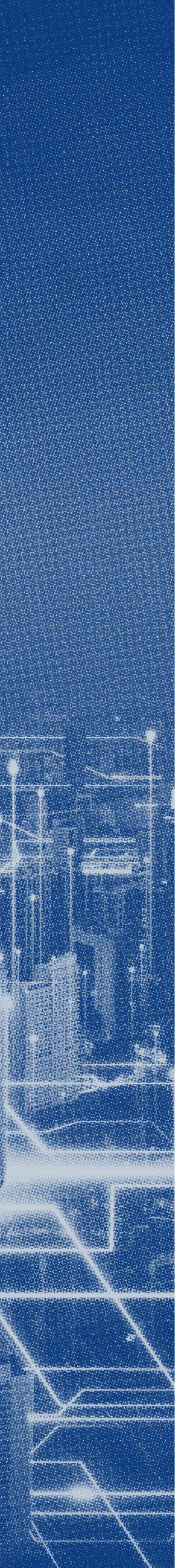
46. Does ASEAN have considerable resources at its disposal to invest in technological developments?
    a. Yes
    b. No
    c. Maybe
    d. Other...

47. Will interoperability of e-governance enhance open source solutions and open standards when building public services?
    a. Yes
    b. No
    c. Maybe
    d. Other...

48. Can digital connectivity and the interoperability of regulatory systems have far-reaching implications for regional integration?
    a. Strongly Disagree
    b. Disagree
    c. Neutral
    d. Agree
    e. Strongly Agree

49. Do you agree that the lack of cohesion in the way the data are shared and managed between governments in ASEAN is preventing and undermining interoperability?
    a. Strongly Disagree
    b. Disagree
    c. Neutral
    d. Agree
    e. Strongly Agree

50. How do you see the road ahead for ASEAN in propelling robust e-governance and interoperability?



Chapter 8

Do Online Public Services Improve Firm Performance? Evidence from Viet Nam

Duc Anh Dang*

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1. Introduction

e-Government[1] and online public services should, in theory, reduce the costs to businesses and individuals related to finding information and administrative procedures. The reduction in information and administrative costs can occur by decreasing the time and resources that businesses spend on searching and gathering information, reducing the time for submitting application forms and administrative procedures, and minimising face-to-face interactions with government officials. Similarly, publicised procurement and investment information can increase competition in government procurement by making information about government tenders, bidding processes, and contract awards more widely available and transparent. This can reduce the costs of submitting bids, and attract bidders of higher quality, all of which may decrease corruption (Kochanova, Hasnain, and Larson, 2020). e-Invoicing can lead to lower printing, storage and administrative costs, and more secure and accessible information storage (Bellon et al., 2019). All of these will lower business costs and eventually increase the probability of a firm's growth and investment.

e-Government also increases transparency, which is one of the most crucial factors highlighted by academics and development practitioners in distinguishing between environments conducive to developing the private sector. The benefits of transparency are reflected in its ability to reduce risk and uncertainty for investors (Drabek and Payne, 2002; Gelos and Wei, 2005), allowing them to engage in long-term planning, predict legal and macroeconomic changes that may affect their business, and reduce adjustment costs (Broz, 2002; Stasavage, 2003) and the need for self-insurance (Aizenman and Marion, 1993; Feng, 2003).

However, investments in e-government might not bring the expected returns if countries lack the human capital, technology, and good institutions to fully exploit the advantages of information and communication technology (Yilmaz and Coolidge, 2013; Lewis-Faupel et al., 2016; World Bank, 2016). e-Government may fail if businesses do not have access to reliable internet services, if they have to invest considerable time and resources to adapt to new electronic platforms, or if public officials retain discretion in determining what information has been publicised and thus limit competition (Kochanova, Hasnain, and Larson, 2020).

This paper examines whether the use of online public information provided by local governments can improve the business environment and firm performance. Most countries have invested heavily in e-government over the past 2 decades to improve the delivery of a variety of services to citizens and the business community. However, very little is known about the returns on firms' performance. We aim to fill this gap by examining the effects of online public services on the firms' employment and investment.

[1] e-Government is defined as 'the use of information and communications technologies (ICTs), and particularly the Internet, to achieve better government' (OECD, n.d.: 2).

Using data from the Vietnam Enterprise Survey and the Provincial Competitiveness Index, we test whether better online public services at the provincial level are more or less likely to make firms invest and hire more workers. The variables proxied for online public services are built using data from surveys that asked businesses about their impression of the openness and quality of provincial webpages. The index ranks provinces based on detailed data on how businesses perceive budget, land and labour policies, recruitment opportunities, local investment incentives and regulations, the provincial gazette of local decisions and circulars, and mechanisms to facilitate online business registration and licensing.

To mitigate the potential biases from omitted variables, we use fixed effects estimation and control for provincial characteristics. We find that better quality websites are associated with a higher level of investment. As better e-government enables the public to be informed about what the government is working on and the policies that are enforced, firms can gain a better understanding of the decisions that are made by local governments and how they will be implemented through transparency, giving investors a better chance of predicting the direction and risk of long-term strategies and increasing their ability to make informed investment decisions. At the same time, a higher percentage of firms accessing provincial government websites also increases firms' investment. These relationships are more profound for foreign firms, firms in industrial zones, and large firms. At the same time, state-owned enterprises invest and employ more when budget documents are published in a timely manner.

The remainder of the chapter is organised as follows. Section 2 provides the institutional context. Section 3 describes the empirical framework and gives an overview of the data used in the analysis. Section 4 describes the results of the analysis. The last section concludes.

2. Background

Since the early 2000s, the Vietnamese government has prioritised e-government (AfD, 2019). The government has, however, accelerated its efforts to modernise and digitise its bureaucracy since 2015. Vietnamese digital government has therefore undergone a significant improvement. Viet Nam was ranked 89th out of 193 nations in the 2016 United Nations E-Government Survey, up 10 places from 2014 (Vietnam News Agency, 2018). Viet Nam's overall rank on the World Economic Forum's Networked Readiness Index (2016) was 79th out of 139 nations, up six places from 2015. In terms of telecommunications affordability, Viet Nam placed third out of 139 nations, particularly in terms of the price of fixed broadband internet and competition in the internet and telephone sectors, which both ranked first. The Vietnamese government's digitisation process is very similar to that of China, although China began the process far earlier, in the mid-1980s. In both cases, the emphasis is on using information and communication technology to increase administrative and management capability while delivering public services through e-government apps. All ministries and provinces had their own local government service platform by the end of 2020 (Vietnam News Agency, 2021).

In 2019, the National Public Service Portal (www.dichvucong.gov.vn) was launched, connecting and integrating with the public service portal and electronic one-stop-shop system in ministries and municipalities. The portal provides information about administrative procedures and public services online, as well as supporting the implementation, monitoring, and evaluation of administrative procedures and online public services, and receiving and processing complaints and petitions from individuals and organisations across the country.

According to the plan, by 2020, the National Public Service Portal will have integrated at least 30% of critical online government services, and it will gradually improve – each year integrating 20% of online government services at the highest level (levels 3 and 4).[2,3] Some 1,955 administrative procedures are available on the National Public Service Portal, and 507,171 documents online applications had been submitted through the National Public Service Portal as of September 2020. As a result, Viet Nam has seen a considerable shift in the provision of online public services, particularly high-level online public services (levels 3 and 4), with a significant increase in the number of users compared with prior years. This significant achievement is due to the use of information technology in governmental agency activities, which has resulted in the provision of high-quality online public services on a broad scale in both ministries and local governments to benefit citizens and businesses (Hoang, 2021). Nonetheless, Viet Nam's e-government development has some drawbacks. On a technological level, municipal government websites and portals are not yet synchronised, and website address forms diverge. The effectiveness of using online government services is low, and the number of online processing dossiers is still small (Tuan, 2020).

3. Empirical Methodology

3.1. Data description

To examine the relationship between online public services and firm performance, this paper uses two main data sets: business perception about online public services provided by local governments and firm data from the Vietnam Enterprise Survey. We first describe online public service data and then the firm-level data.

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[2] In Viet Nam, online public services are divided into four levels based on the duties that can be completed digitally. The first level allows citizens online access to all relevant information, such as procedures, required papers, and service costs to public services offered. The second level allows citizens to download the necessary paperwork, which they can print and fill out later. At the third level, they can fill out and submit documents online, but they must still pay fees on the spot to the appropriate government agencies. At the fourth level, service payments can be made online.

[3] Prime Minister Decision No. 274/QD-TTg dated 12 March 2019 on the Approval of Scheme for National Public Service Portal.

Online public service data [4]

The Provincial Competitiveness Index (PCI) is used to assess the quality of online public services. It is a composite index of provincial economic governance that the Vietnam Chamber of Commerce and Industry has calculated every year since 2006. The PCI is based on a questionnaire sent to a random sample of businesses in each province. The poll includes several questions about businesses' impressions of local economic governance as well as concrete measurements of their experience with it. The PCI has the advantage of focusing on areas of local governance that are under the jurisdiction of the provincial government.

The index is based on an annual survey of about 8,500 private businesses, as well as factual data from provincial statistical agencies. As it was created to compare governance across Viet Nam's 63 provinces over time, the PCI contains a lot of geographic variation to exploit. Province samples are stratified to ensure that they accurately reflect provincial populations in terms of age, industry, and legal form. In addition, the PCI permits longitudinal analysis, allowing researchers to track changes in local government over time and see how they influence investment decisions (Malesky and Merchant-Vega, 2009).

The variables proxied for online public services are constructed using information from the surveys asking about the business perception of the openness and quality of provincial webpages based on a 50-point scale. The PCI ranks provinces based on detailed information about businesses' perception of access to budget information, land and labour policies, recruitment possibilities, local investment incentives and regulations, the provincial gazette of local decisions and circulars, and mechanisms to facilitate online business registration and licensing. Besides the aggregate score, we use several sub-indicators to measure the quality of a website. The first is the percentage of firms that have accessed provincial government websites. This indicator captures the usefulness of the provincial government's websites to businesses in the context of the internet and websites being the most effective means of communication in an increasingly connected Viet Nam. The second is the question asking whether online budget documents have enough detail for use in business activities and whether they are published right after being approved. These indicators measure how transparent the local budgets are and the equality of treatment for businesses in Viet Nam.

Access to publicised information could be important and benefit firms in many cases. For example, while all land and provincial planning information is legally required to be open to the public, obtaining such information might be difficult. In the case of Viet Nam, this can harm private sector growth because businesses are not well positioned to take advantage of provincial initiatives. New legislation, implementing documents, provincial rulings, and online governmental services are all examples of information access. When changes in the legal system are not publicly available, a company may

[4] Data on the PCI can be downloaded from PCI (n.d.).

run smoothly for several years until finding itself in breach of the law due to ignorance. In most circumstances, such ignorance will not cost the company much money, but there is always the risk that some officials might take advantage of the information asymmetry to obtain unauthorised payments (Malesky, McCulloch, and Nguyen, 2015). On the other hand, a company may be eligible for savings, investment possibilities, or tax refunds but never make use of them because it is unaware of them. Lack of transparency can also hinder investment by affecting predictability, or the idea that provincial rules and regulations are executed in a way that allows businesses to forecast and plan for new developments (Hollyer, Rosendorff, and Vreeland, 2011).

Firms can gain a better understanding of the decisions that are made and how they will be implemented through transparency, giving them a better chance of predicting the direction and risk of long-term strategies and increasing their ability to make informed investment decisions (Gelos and Wei, 2005). Publicised information can also have an indirect impact on investment by affecting the equitable utilisation of provincial resources. Lack of information disclosure regarding resources can lead to serious inefficiencies that go beyond a simple transfer of resources from one party to another. Consider the issue of provincial planning, for example. The influence of infrastructure and land conversion plans is restricted if only a few insiders have access to the details. The real estate market's lack of openness is one of the reasons its influence may be limited. Only a few well-informed insiders know where future infrastructure projects and industrial zones will be built. Insiders can then benefit by purchasing land ahead of schedule (Malesky, McCulloch, and Nguyen, 2015).

Table 8.1 presents a summary of the statistical description of different measures of online public services. For example, 67% of firms have accessed provincial government websites. Information on the share of firms that have accessed the provincial budget online and how they felt about the quality of that information shows that nearly 82% of firms thought that the quality of the budget information was good enough for their business purposes. Further, 71% believed that budget documents are published in a timely manner.

Table 8.1. Descriptive Statistics

Variables	N	Mean	SD	Min	Max
Dependent variables					
ln(Investment)	71,802	7.8	3.7	-2.3	18.6
ln(Employment)	71,802	4.0	1.7	0.0	11.3
Online public services					
Openness of province webpage score	71,802	33.4	6.3	15.0	44.0
Firms have accessed province websites (%)	71,802	66.7	7.5	47.0	87.0
Budget documents have enough details for use (%)	71,802	81.8	7.2	53.0	97.0
Budget documents are published in a timely manner (%)	71,802	71.3	9.5	46.0	95.0

Variables	N	Mean	SD	Min	Max
Firm-level controls					
Firms in industrial parks=1	71,802	0.2	0.4	0	1
Foreign investment firms=1	71,802	0.1	0.2	0	1
State own firms=1	71,802	0.2	0.4	0	1
Private firms=1	71,802	0.7	0.4	0	1
Small firms=1	71,802	0.49	0.50	0	1
Medium firms=1	71,802	0.33	0.47	0	1
Large firms=1	71,802	0.18	0.38	0	1
Province-level variables					
Landlines per capita (%)	71,802	9.9	4.9	1.9	28.4
Internet access per capita (%)	71,802	121.3	49.4	1.5	250.0
Mobile phones per capita (%)	71,802	23.0	29.5	1.2	129.9
ln(Population)	71,802	7.6	0.8	5.7	9.0

Source: Author's calculations.

Enterprise survey data [5]

The second main data set used in this paper is drawn from the Vietnam Enterprise Survey. The survey has been conducted annually since 2000 by Viet Nam's General Statistics Office. These surveys cover a sample of representative enterprises. The firms can be tracked over time via a unique firm identifier. This means that we can follow each firm over time to observe whether they grow, enter, or exit. The Vietnam Enterprise Survey provides comprehensive information about firms and their activities, including information on firm demographics, ownership, business activities, employment, wages, assets, capital, business performance, revenue, and profit. We examine the relationship between the online public services provided and a firm's performance in 2014–2015.

Table 8.1 shows the characteristics of the firms in the survey. Most firms are private and operate outside industrial zones.

[5] Information about the Vietnam Enterprise Survey can be found at General Statistics Office (n.d.).

3.2. Empirical model

Our analysis will rely on a examination of the relationship between the online public services provided and several measures of firm-level performance, such as the firm's investment and employment. We regress firms' performance on the online public services according to the following equation:

$$y_{ipt} = \alpha_i + \beta EG_{pt} + \theta X_{ipt} + \rho Z_{pt} + \sigma_t + \varepsilon_{ipt} \quad (1)$$

where y_ipt is outcome variables (which measure ln employment and ln investment for firm i in province p at time t). The key variable EG_{pt} denotes different measures of online public services in province p at time t (which are the openness of the provincial government's webpage score, the percentage of firms that have accessed the provincial government's websites, the percentage of firms that believe that budget documents have enough detail for use, and the timely publication of budget documents). X_{ipt} denotes firm characteristics, including industrial zone dummies, and dummies for firm ownership (which include private firms, firms with state capital, and firms with foreign capital). Z_{pt} denotes provincial characteristics such as the number of citizens, and the number of landlines, mobile numbers, and internet subscribers per capita. α_i and σ_t are firm and time fixed effects. The parameter β is the reduced-form estimate of the effects of the online public services. We expect that β is positive. As firms are nested within provinces, meaning that individual firms within provincial borders cannot be treated as independent draws from the underlying population, their errors may therefore be correlated. To address this problem, we cluster robust standard errors at the provincial level in all regressions.

Two major challenges affect the analysis relationship between the online public services provided and a firm's performance in Equation (1): (i) reversed causality (i.e. while online public services might support firms' performance, it could also be the case that more productive firms may affect the online public services provided); and (ii) omitted variable biases (i.e. other unaccounted unrelated factors might affect the estimated β).

Reversed causality is less of a challenge for our analysis because we focus on the adoption of online public services at the provincial level: it is unlikely that firms' employment and investment performance have a direct impact on the online public services provided in their province. The use of an aggregate measure at the provincial level also reduces the risk of measurement error.

The underlying and difficult-to-measure historical or socio-cultural features of a province may be associated with both the quality of provincial online public services and firm performances. If this is the case, we may fail to differentiate the potential association between historical or socio-cultural features and the performance of firms, and a causal relationship between the quality of online public services and firm performances. To mitigate this problem, firm (α_i) fixed effects are employed, so that the analysis can isolate the relationship between annual changes in the business perceptions of the performance of both online public services and firms.

Firm fixed effects address time-invariant confounders. However, they do not entirely remove the potential for omitted variable bias. Unobserved time-varying factors at the provincial level could lead to bias if they are correlated with the performance of both online public services and firms. In particular, the quality of infrastructure and the size of the provincial market both change over time in ways that could be correlated with the performance of both public information and firms. To address this possibility, we include some provincial characteristics as control variables. Telecommunications infrastructure is measured by the total number of landlines, mobile numbers, and internet subscribers per capita. Market size is captured simply by the population within the province. Time-variant measures, such as a province's gross domestic product (GDP) per capita, were not included as control variables because of endogeneity concerns. Provincial GDP is mechanically correlated with firm investment because GDP includes investment in its construction. Introducing such variables would bias all variables in the model, including the endogenous covariates. Although we added firm and provincial characteristics and the results are robust, we cannot completely exclude the potential issues of omitted varying variables that may bias our results.

4. Empirical Results

In this section, we present the main results of our empirical estimation. We first document the findings of the relationship between the performance of both online public services and firms, and then explore this relationship through different subsamples.

Table 8.2 and Figure 8.1 report the results of some ordinary least squares regressions. Our dependent variables are ln(Employment) and ln(Investment). Our key explanatory variables are the different measures of the quality of online public services. All models include time dummies. To deal with potential contamination of the models by unobservable firm characteristics that may correlate with both online public variables and firm outcomes, we use fixed effects estimation to control for potential time-invariant firm-specific omitted variables that may bias our results.

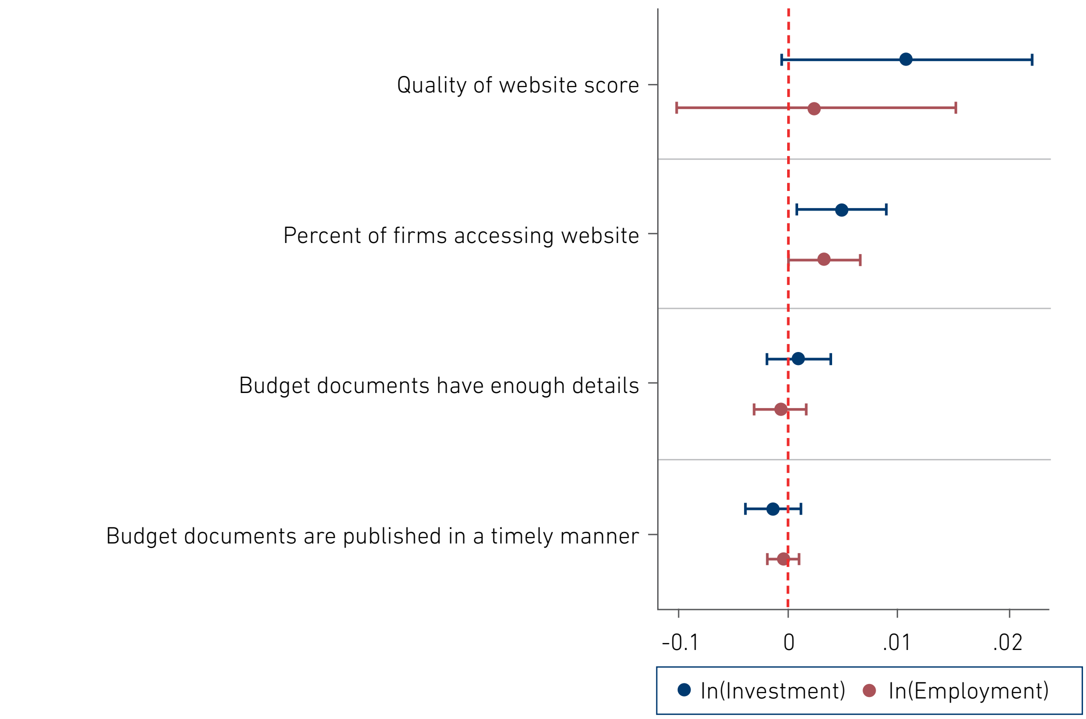
Table 8.2. Online Public Information and Firms' Performance

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	ln(Investment)				ln(Employment)			
Quality of website score	0.011*				0.002			
	(0.006)				(0.006)			
Firms accessing website		0.005**				0.003**		
		(0.002)				(0.002)		
Budget documents have enough details			0.001				-0.001	
			(0.001)				(0.001)	
Budget documents are published in a timely manner				-0.001				-0.000
				(0.001)				(0.001)
Firms in industrial zones	0.129*	0.133*	0.132*	0.133*	0.013	0.014	0.014	0.014
	(0.069)	(0.069)	(0.070)	(0.070)	(0.038)	(0.038)	(0.038)	(0.039)
Private firms=1	-0.213***	-0.213***	-0.218***	-0.217***	-0.109***	-0.107***	-0.109***	-0.110***
	(0.070)	(0.068)	(0.071)	(0.071)	(0.029)	(0.029)	(0.028)	(0.028)
Foreign firms=1	0.316	0.328	0.312	0.315	-0.022	-0.012	-0.023	-0.022
	(0.438)	(0.439)	(0.439)	(0.438)	(0.393)	(0.388)	(0.391)	(0.392)
Observations	71,802	71,802	71,802	71,802	71,802	71,802	71,802	71,802
R-squared	0.009	0.009	0.009	0.008	0.008	0.007	0.008	0.007
Number of firms	48,845	48,845	48,845	48,845	48,845	48,845	48,845	48,845
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummy effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Standard errors are robust to heteroskedasticity and clustered at the province level. *** Significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Source: Author's calculations.

Figure 8.1. Relationship with Firm Performance



Note: See Tables A1 and A2 for the detailed regression results.
Source: Author's construction.

In columns (1)–(4) of Table 8.2, the dependent variable is ln(Investment). The results in column (1) show that better website quality is associated with a higher level of investment. At the same time, a higher percentage of firms accessing provincial government websites also increases firms' investment, as shown in column (2). For other covariates, we also find firms in industrial zones to be significantly more invested than firms outside industrial zones. In addition, private firms invest less than other firms. Firms with foreign capital tend to invest more, but the coefficients are not statistically significant. The results in columns (3) and (4) show that information on the budget document does not affect firm investment. In columns (5)–(8), we look at the firm performance measured by the number of workers employed and find that a higher percentage of firms accessing provincial government websites is positively correlated with higher employment. The coefficients of the other main explanatory variables are not statistically significant. The findings from this table indicate that online public information may incentivise firms' investment and expand their activities by hiring more workers. This finding confirms the results of previous PCI reports (Malesky, 2009), which have consistently found information transparency to be the most influential sub-index in firm decision-making. Similarly, the PCI (2016) found that almost 77% of firms responded that contracts, land, and other economic resources are mainly in the hands of firms with close links to local authorities (VCCI and USAID, 2017). Online public information may help firms without linkages to local authorities to procure public projects.

We also check the robustness of our results to the inclusion of other provincial characteristics such as ln(Population), the number of landlines per capita, internet access per capita, and mobile phones per capita, which are likely to influence firms' performance. The results are presented in Table 8.3 and Figure 8.2. Controlling for these variables in the regressions, we still find that our results for the relationship between the quality of a website and firms' performance are almost the same. In the fully specified model in column (1), the magnitude of the coefficient shows that a one-score change in the 50-point index is associated with a 1.3% increase in firm investment. Otherwise, one standard deviation of the provincial government webpage score results in an 8.2% increase in firm investment. The coefficient of accessing the website drops in magnitude to 0.004, but remains statistically significant, as shown in column (2). At the same time, not only is the coefficient statistically significant, but the effect is quite large. The coefficient suggests that if the number of firms accessing provincial government websites increases by 10 percentage points, that results in 4% higher firm investment. As we add other controls, all the main coefficients in columns (4)–(8) are still insignificant although the magnitudes are almost the same.

Table 8.3. Online Public Information and Firms' Performance—Additional Controls

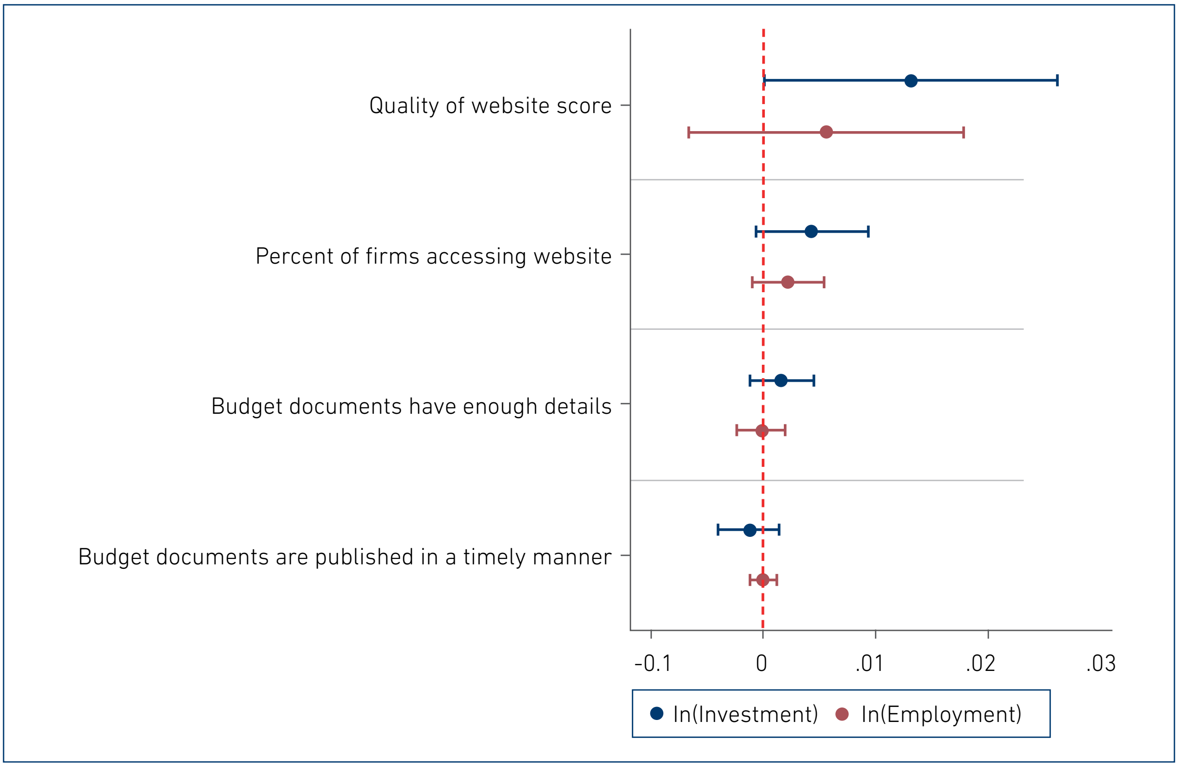
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	ln(Investment)				ln(Employment)			
Quality of website score	0.013**				0.006			
	(0.007)				(0.006)			
Firms accessing website		0.004*				0.002		
		(0.002)				(0.002)		
Budget documents have enough details			0.002				-0.000	
			(0.001)				(0.001)	
Budget documents are published in a timely manner				-0.001				0.000
				(0.001)				(0.001)
Other variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	71,802	71,802	71,802	71,802	71,802	71,802	71,802	71,802
R-squared	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	ln(Investment)				ln(Employment)			
Number of firms	48,845	48,845	48,845	48,845	48,845	48,845	48,845	48,845
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummy effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Standard errors are robust to heteroskedasticity and clustered at the province level. *** Significant at the 1% level, ** significant at the 5% level, * significant at the 10% level. Other variables include dummies for firms' ownership, industrial zone dummies, ln(Population), the number of landlines per capita, the number of internet subscriptions per capita, and the number of mobile phone subscriptions per capita.

Source: Author's calculations.

Figure 8.2. Relationship with Firm Performance—Adding Provincial Controls



Note: See Tables A1 and A2 for the detailed regression results.

Source: Author's construction.

Heterogeneity

So far, we have pooled all firms into the same regression models. While we have held constant, time-invariant factors at the firm level, the assumption has been that the effect of online public services on investment is homogenous across units. However, the effect of online public services on firms' performance may vary according to the firm's size. Large firms may have privileged access to decision-makers, which is not available to smaller firms. Consequently, general online information may matter much less for their business than their ability to lobby for exceptions to a specific regulation that may be affecting their operations. Regarding the specific question of information, large firms may benefit less from online information, as they may have proprietary information channels of their own (Malesky, McCulloch, and Nguyen, 2015).

To test these possibilities, we ran separate regressions for different firm sizes. The regressions exploring the relationship between online public services and firm performance with firm size, estimated using fixed effects and the same specification as for the regressions presented in Table 8.3, are presented in Tables 8.4–8.6 and Figures 8.3 and 8.4.[6] The results in Table 8.4 confirm that the impacts of online public services differ according to firm size. The magnitude of the coefficients on the quality of a website in columns (1) and (5) is both larger than those in the corresponding columns in Table 8.3. They indicate that the impacts of online public services on firm performance are more profound for small firms and support the hypothesis that larger firms are less reliant on public information than smaller ones. However, the magnitude of the coefficients is not much different. The findings in columns (1) and (2) of Table 8.5 also show that medium-sized firms may find the quality of the website less valuable than other firms. However, the results in Table 8.6 indicate that for large firms, online public services have a bigger impact on investment decisions. Not only is the magnitude of coefficients larger, but the details of provincial budget documents also lead to higher firm investment.

Table 8.4. Online Public Information and Firms' Performance—Small Firms

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	ln(Investment)				ln(Employment)			
Quality of website score	0.017**				0.004*			
	(0.008)				(0.002)			
Firms accessing website		0.003				0.001		
		(0.003)				(0.001)		
Budget documents have enough details			0.000				-0.001	
			(0.002)				(0.001)	

[6] To save space, we do not report all the estimated coefficients.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	ln(Investment)				ln(Employment)			
Budget documents are published in a timely manner				-0.001				0.000
				(0.002)				(0.000)
Other variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	71,802	71,802	71,802	71,802	71,802	71,802	71,802	71,802
R-squared	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009
Number of firms	48,845	48,845	48,845	48,845	48,845	48,845	48,845	48,845
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummy effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Small firms have up to 50 employees. Standard errors are robust to heteroskedasticity and clustered at the province level. *** Significant at the 1% level, ** significant at the 5% level, * significant at the 10% level. Other variables include dummies for firms' ownership, industrial zone dummies, ln(Population), the number of landlines per capita, the number of internet subscriptions per capita, and the number of mobile phone subscriptions per capita.

Source: Author's calculations.

Table 8.5. Online Public Information and Firms' Performance—Medium-Sized Firms

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	ln(Investment)				ln(Employment)			
Quality of website score	0.013**				0.006			
	(0.007)				(0.006)			
Firms accessing website		0.004*				0.002		
		(0.002)				(0.002)		
Budget documents have enough details			0.002				-0.000	
			(0.001)				(0.001)	
Budget documents are published in a timely manner				-0.001				0.000
				(0.001)				(0.001)
Other variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	71,802	71,802	71,802	71,802	71,802	71,802	71,802	71,802
R-squared	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	ln(Investment)				ln(Employment)			
Number of firms	48,845	48,845	48,845	48,845	48,845	48,845	48,845	48,845
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummy effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Medium-sized firms have 50–300 employees. Standard errors are robust to heteroskedasticity and clustered at the province level. *** Significant at the 1% level, ** significant at the 5% level, * significant at the 10% level. Other variables include dummies for firms' ownership, industrial zone dummies, ln(Population), the number of landlines per capita, the number of internet subscriptions per capita, and the number of mobile phone subscriptions per capita.

Source: Author's calculations.

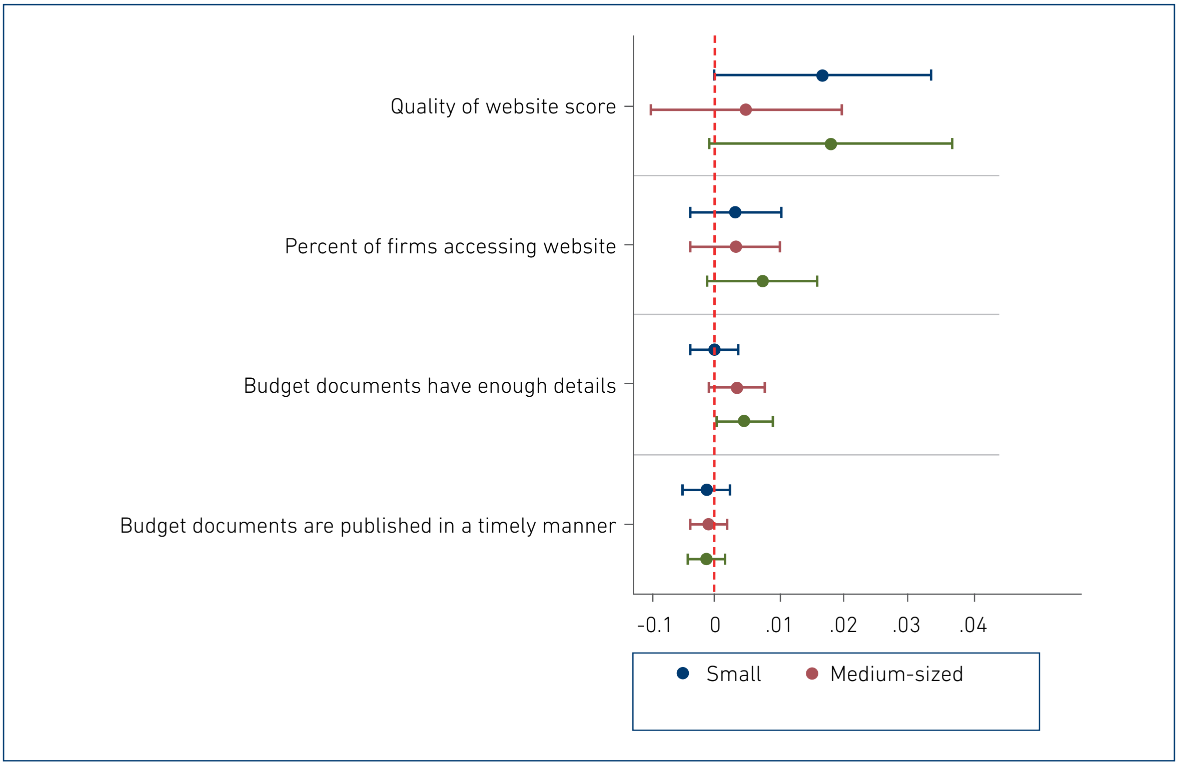
Table 8.6. Online Public Information and Firms' Performance—Large Firms

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	ln(Investment)				ln(Employment)			
Quality of website score	0.013**				0.006			
	(0.007)				(0.006)			
Firms accessing website		0.004*				0.002		
		(0.002)				(0.002)		
Budget documents have enough details			0.002				-0.000	
			(0.001)				(0.001)	
Budget documents are published in a timely manner				-0.001				0.000
				(0.001)				(0.001)
Other variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	71,802	71,802	71,802	71,802	71,802	71,802	71,802	71,802
R-squared	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009
Number of firms	48,845	48,845	48,845	48,845	48,845	48,845	48,845	48,845
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummy effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Medium-sized firms have 50–300 employees. Standard errors are robust to heteroskedasticity and clustered at the province level. *** Significant at the 1% level, ** significant at the 5% level, * significant at the 10% level. Other variables include dummies for firms' ownership, industrial zone dummies, ln(Population), the number of landlines per capita, the number of internet subscriptions per capita, and the number of mobile phone subscriptions per capita.

Source: Author's calculations.

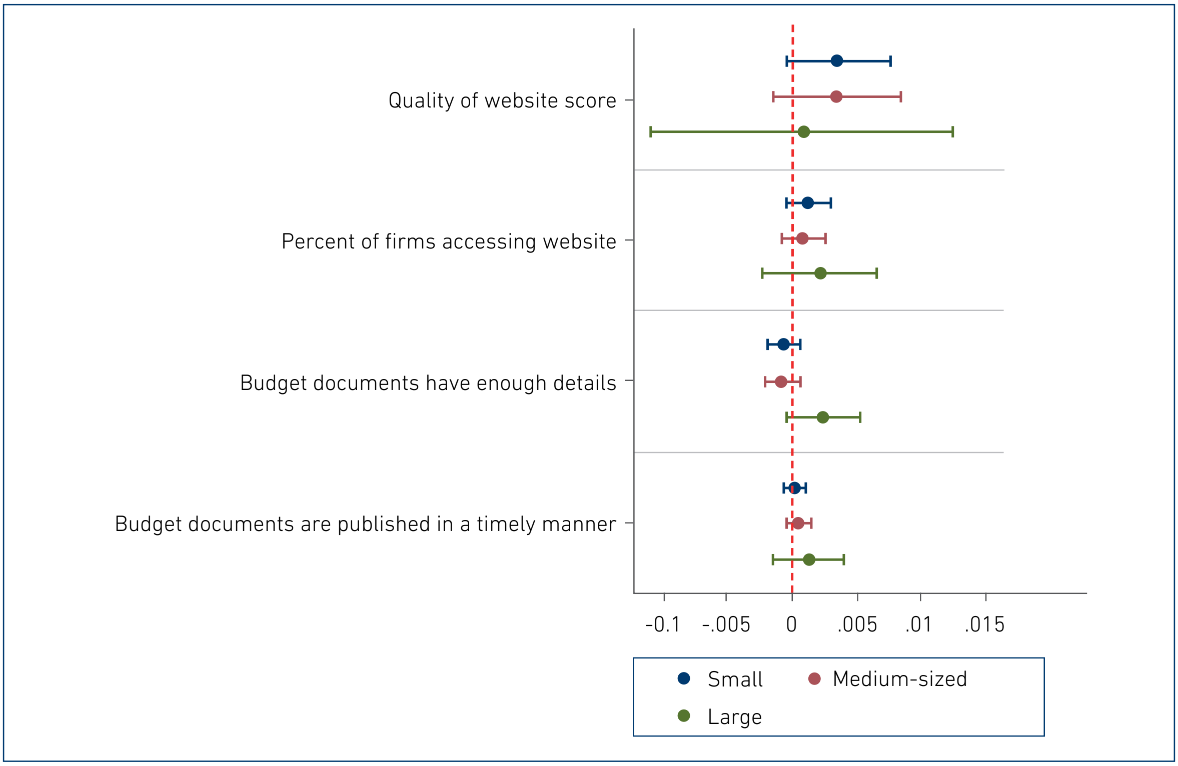
Figure 8.3. **Relationship with Firm Investment by Firm Size**



Note: See Tables A1 and A2 for the detailed regression results.

Source: Author’s construction.

Figure 8.4. **Relationship with Firm Employment by Firm Size**



Note: See Tables A1 and A2 for the detailed regression results.
Source: Author's construction.

State-owned enterprises with more inside information may find online public information and services less attractive. We examine whether state-owned firms invest and employ more when there is more public information. The results shown in Tables 8.7 and 8.8 and Figures 8.5 and 8.6 confirm our conjectures. The results in columns (1)–(3) of Table 8.7 indicate that the quality of the website information does not correlate with firm investment and employment. However, the findings in columns (4) and (8) show that firm investment and employment are higher when the budget documents are published right after approval. This demonstrates that state-owned enterprises, which are more likely to benefit from the provincial budget, find budget documents useful. In contrast, the relationships are not statistically different from zero for the domestic private firms, as shown in Table 8.8. They show that online public information has almost no effects on private firms' employment and investment.

Table 8.7. Online Public Information and Firms' Performance—State-Owned Firms

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	ln(Investment)				ln(Employment)			
Quality of website score	-0.005				-0.005			
	(0.010)				(0.004)			
Firms accessing website		-0.003				0.001		
		(0.003)				(0.001)		
Budget documents have enough details			-0.000				0.001	
			(0.002)				(0.001)	
Budget documents are published in a timely manner				0.003***				0.003***
				(0.001)				(0.001)
Other variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,284	4,284	4,284	4,284	4,284	4,284	4,284	4,284
R-squared	0.024	0.024	0.025	0.024	0.026	0.029	0.028	0.028
Number of firms	2,989	2,989	2,989	2,989	2,989	2,989	2,989	2,989
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummy effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Standard errors are robust to heteroskedasticity and clustered at the province level. *** Significant at the 1% level, ** significant at the 5% level, * significant at the 10% level. Other variables include dummies for firms' ownership, industrial zone dummies, ln(Population), the number of landlines per capita, the number of internet subscriptions per capita, and the number of mobile phone subscriptions per capita.

Source: Author's calculations.

Table 8.8. Online Public Information and Firms' Performance—Private Firms

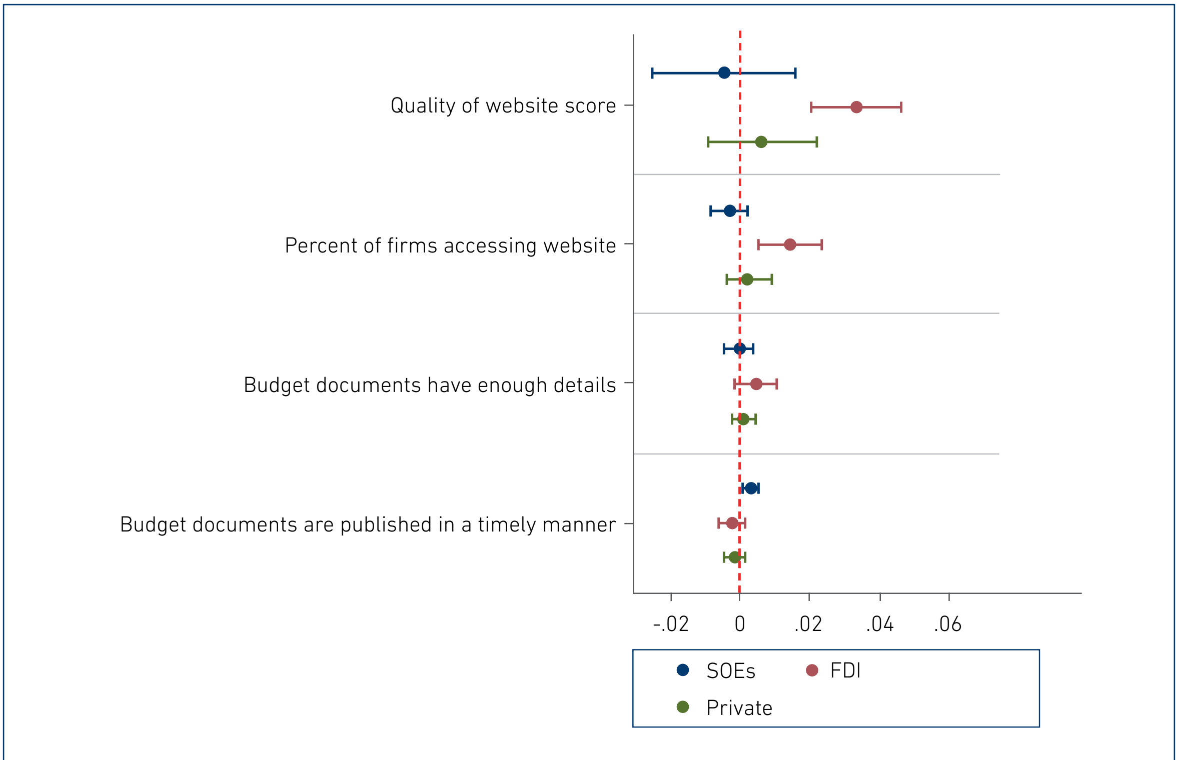
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	ln(Investment)				ln(Employment)			
Quality of website score	0.006				-0.006**			
	(0.008)				(0.003)			
Firms accessing website		0.002				0.001		
		(0.003)				(0.001)		
Budget documents have enough details			0.001				0.000	
			(0.002)				(0.001)	
Budget documents are published in a timely manner				-0.001				-0.000
				(0.002)				(0.001)

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	ln(Investment)				ln(Employment)			
Other variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	52,047	52,047	52,047	52,047	52,047	52,047	52,047	52,047
R-squared	0.009	0.009	0.009	0.009	0.009	0.003	0.003	0.003
Number of firms	38,070	38,070	38,070	38,070	38,070	38,070	38,070	38,070
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummy effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Standard errors are robust to heteroskedasticity and clustered at the province level. *** Significant at the 1% level, ** significant at the 5% level, * significant at the 10% level. Other variables include dummies for firms' ownership, industrial zone dummies, ln(Population), the number of landlines per capita, the number of internet subscriptions per capita, and the number of mobile phone subscriptions per capita.

Source: Author's calculations.

Figure 8.5. Relationship with Firm Investment by Firm Ownership

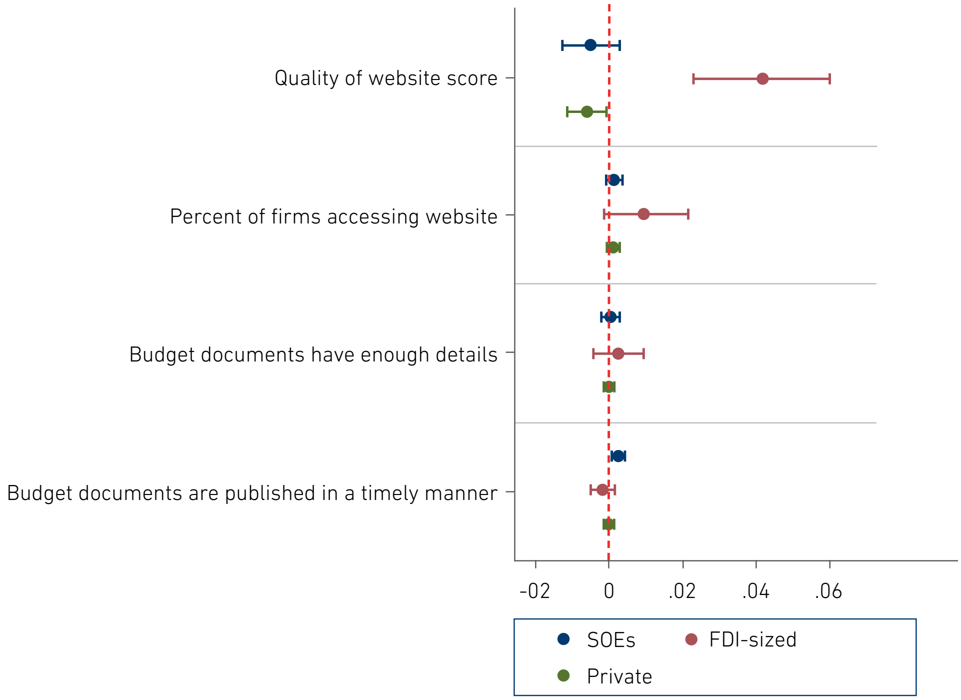


FDI = foreign direct investment, SOE = state-owned enterprise.

Note: See Tables A1 and A2 for the detailed regression results.

Source: Author's construction.

Figure 8.6. **Relationship with Firm Employment by Firm Ownership**



Note: See Tables A1 and A2 for the detailed regression results.
Source: Author's construction.

Foreign firms lack location-specific knowledge and contacts in their competition with domestic actors. In this case, online information may be important for ensuring that foreigners can compete equally in domestic markets. The findings in Table 8.9 demonstrate a fascinating pattern. The first two columns show that when we disaggregate by ownership, we find that the effect of online information is most pronounced amongst foreign firms. The magnitude of the coefficients of the main explanatory variables is much higher compared with those when we run the full sample. A one-unit change in the quality of website scores is associated with a 3.3% increase in investment amongst foreign firms. Additionally, a 10 percentage point increment in the number of foreign firms accessing provincial government websites results in 14% higher firm investment. Similarly, the effects are substantial for employment, as shown in columns (2) and (6). These results appear to confirm the idea that online information helps foreign firms to overcome their lack of connections and local knowledge in an opaque emerging market.

Table 8.9. Online Public Information and Firms' Performance—Foreign Investment Firms

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	ln(Investment)				ln(Employment)			
Quality of website score	0.033***				0.042***			
	(0.006)				(0.009)			
Firms accessing website		0.014***				0.010*		
		(0.004)				(0.006)		
Budget documents have enough details			0.005				0.003	
			(0.003)				(0.003)	
Budget documents are published in a timely manner				-0.003				-0.002
				(0.002)				(0.002)
Other variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,284	4,284	4,284	4,284	4,284	4,284	4,284	4,284
R-squared	0.024	0.024	0.025	0.024	0.026	0.029	0.028	0.028
Number of firms	2,989	2,989	2,989	2,989	2,989	2,989	2,989	2,989
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummy effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Standard errors are robust to heteroskedasticity and clustered at the province level. *** Significant at the 1% level, ** significant at the 5% level, * significant at the 10% level. Other variables include dummies for firms' ownership, industrial zone dummies, ln(Population), the number of landlines per capita, the number of internet subscriptions per capita, and the number of mobile phone subscriptions per capita.

Source: Author's calculations.

We also ran a separate regression for firms located in industrial zones and firms outside industrial zones. The results are reported in Table 8.10 and Figures 8.7–8.8. In regressions in columns (1)–(3), we find a positive and significant relationship between the quality of website score and the share of firms accessing the website to firms' performance for firms locating in industrial zones. At the same time, the magnitude of the main coefficients is much higher than the magnitude of the full sample.

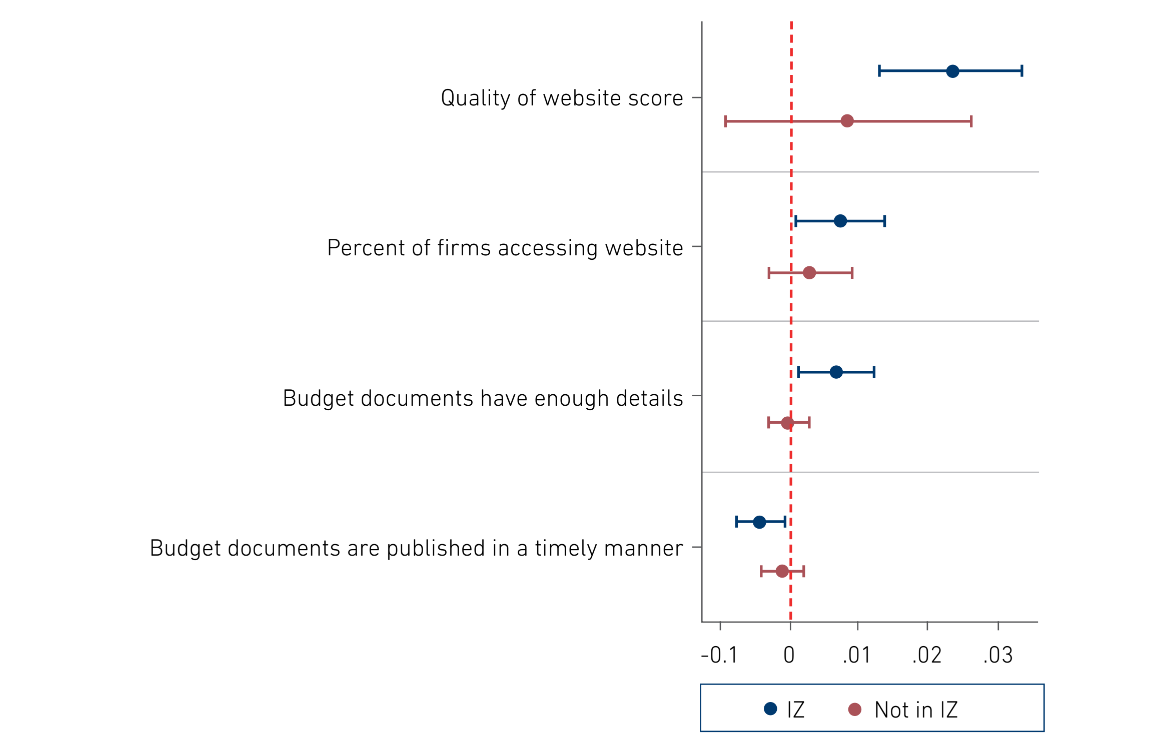
Table 8.10. Online Public Information and Firms' Performance—Firms in Industrial Zones

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	ln(Investment)				ln(Employment)			
Quality of website score	0.024***				0.023***			
	(0.005)				(0.008)			
Firms accessing website		0.008**				0.004		
		(0.003)				(0.004)		
Budget documents have enough details			0.007**				0.000	
			(0.003)				(0.002)	
Budget documents are published in a timely manner				-0.004**				-0.001
				(0.002)				(0.001)
Other variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	52,047	52,047	52,047	52,047	52,047	52,047	52,047	52,047
R-squared	0.009	0.009	0.009	0.009	0.009	0.003	0.003	0.003
Number of firms	38,070	38,070	38,070	38,070	38,070	38,070	38,070	38,070
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummy effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Standard errors are robust to heteroskedasticity and clustered at the province level. *** Significant at the 1% level, ** significant at the 5% level, * significant at the 10% level. Other variables include dummies for firms' ownership, industrial zone dummies, ln(Population), the number of landlines per capita, the number of internet subscriptions per capita, and the number of mobile phone subscriptions per capita.

Source: Author's calculations.

Figure 8.7. **Relationship with Firm Investment by Firms Inside and Outside Industrial Zones**

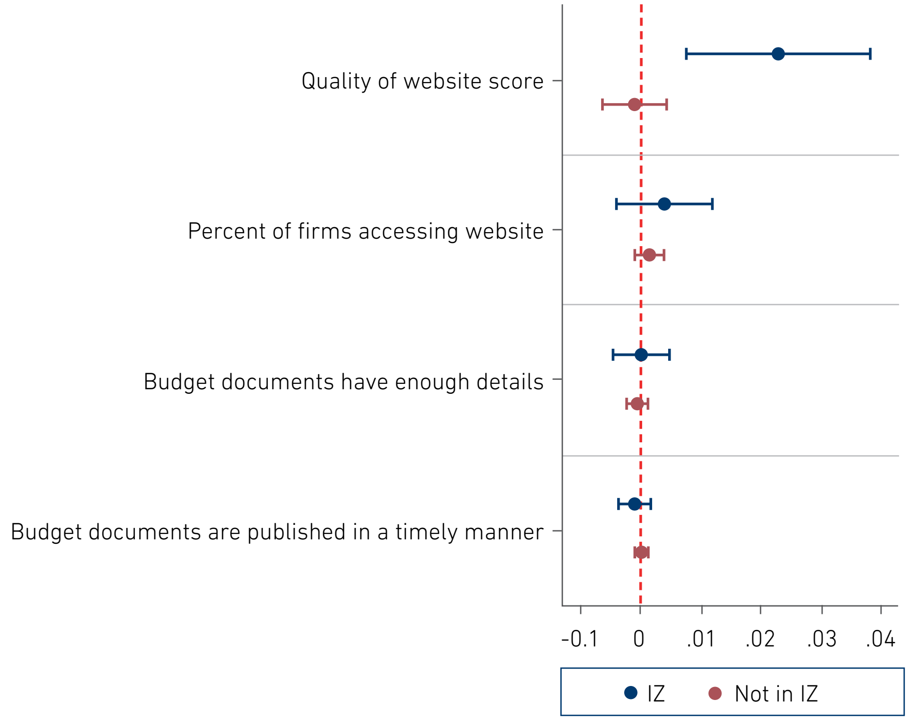


IZ = industrial zone.

Note: See Tables A1 and A2 for the detailed regression results.

Source: Author's construction.

Figure 8.8. Relationship with Firm Employment by Firms Inside and Outside Industrial Zones



IZ = Industrial Zone

Note: See Tables A1 and A2 for the detailed regression results.

Source: Author's construction.

5. Conclusion

This empirical study has sought to examine the relationship between online public services and firms' performance. While many countries have invested substantially in e-government to better deliver a variety of services to citizens and the business community, empirical studies investigating its effects on firm activities are scarce. Using data from a business perception survey about online public services and the Vietnam Enterprise Survey, we tested whether better online public services at the provincial level are more or less likely to make firms invest and hire more workers. To mitigate the potential biases from omitted variables, we used fixed effects estimation and controlled for provincial characteristics. We find that better website quality is associated with a higher level of investment. At the same time, a higher percentage of firms accessing provincial government websites also increases firms' investment. These relationships are more profound for foreign firms, firms in industrial zones, and large firms. At the same time, state-owned enterprises invest and employ more when budget documents are published in a timely manner.

As more advanced digital government and online public services are an inevitable trend amongst countries worldwide, the impacts of online public services on firms' performance examined in this study also provide insight into understanding the digital transformation process in emerging countries, including the Association of Southeast Asian Nations (ASEAN) Member States. As better e-government enables the public to be informed about what the government is working on and the policies that are enforced, firms can gain a better understanding of the decisions made by local governments, giving them a better chance of predicting the direction and risk of long-term strategies and increasing their ability to make informed investment decisions. This suggests that local governments should increase investment in raising the standard of online public services, enhancing the delivery of government services, making it easier for citizens to comply with legal requirements, and enhancing citizen engagement and public trust, thereby increasing cost-effectiveness for the government and raising citizens' standard of living.

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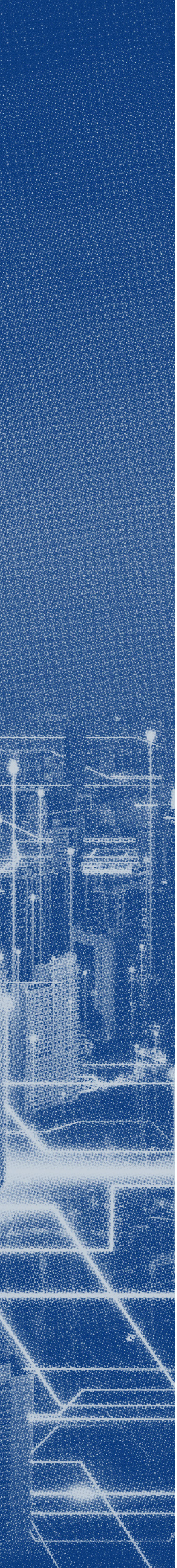


Chapter 9

Digital Government in Promoting Trade: The Case of Cambodia

Reth Soeng
Thach Kao

1. Introduction

Digital transformation has become a popular buzzword in government policy documents, private sector businesses, and the media. Although it is relatively new and has not yet been well understood, especially in the developing world where new technology system adoptions are at a nascent stage, everybody seems enthusiastic and willing to adopt it without much hesitation. This may be because digitalisation is viewed as an important driver for promoting national economic activities and inclusiveness; enhancing internal business processes, efficiency, and productivity; promoting inclusiveness; and boosting international commercial activities, i.e. international trade, and foreign direct investment (FDI).

As the main component of the digital transformation, digital government will affect all aspects of economic, social, and political activities by improving public services to citizens, domestic and international investors, cross-border traders, and the entire society. With easy access to large amounts of public information, economic agents and society can conduct operations from anywhere through reliable government websites and platforms in a time-efficient, convenient, transparent, and round-the-clock manner. This will generate significant social and economic benefits through cost reduction and efficiency gains.

The concept of digital government was introduced in the late 1990s, after electronic government was set in motion following the arrival of the internet in the early 1990s (Kong, 2019). As the concept of digital government continues to evolve, it is important to have a working definition of it: 'the introduction, application, and use of digital technologies and data in government and its external relationships, including citizens, businesses, civil society and other non-governmental organizations, and other international organizations' (Lips, 2020: 3). Veit and Huntgeburth (2014) defined digital government as the use of information and communication technology (ICT) in government to transform the relationship between government and society in a positive manner.

The Government of Cambodia has made great efforts to transform the country into a digital society by developing the relevant digital policy documents and frameworks for a successful digital transformation (Government of Cambodia, 2021). Cambodia launched its digital policy initiatives in the 1990s, when email and the internet were introduced in the country. Subsequently, institutions responsible for ICT development were established and ICT policy frameworks and related policy papers were drafted and approved. In 2016, the government began implementing its Telecom/ICT Development Policy 2020 to serve as a roadmap and mechanism for the successful development of the ICT sector. Based on the ICT policy, Cambodia envisages becoming a competitive, information-based society that can provide ICT-based solutions for transforming the country into a knowledge-based economy to enhance economic growth and equitable development. Recent data from the Ministry of Post and Telecommunications (Government of Cambodia, n.d.) showed that, as of March 2021, broadband service coverage in urban and rural areas was 92.20%, while the mobile penetration, internet penetration, and broadband internet penetration rates were 125.51%, 106.23%, and 87.76%, respectively. This offers a favourable opportunity for accelerating digital transformation and digital government in Cambodia.

Digital transformation has exerted impacts on both the public and private sectors. It could significantly reduce bureaucracy, lengthy processes, and red tape, providing tremendous opportunities to increase the efficiency and effectiveness of public service delivery, cost reduction, and the improvement of internal business process. Curtis (2019) indicated that digital transformation should empower services to be available online round the clock, allowing the public to access them from anywhere; and enable employees to explore new and more efficient ways of working and provide them with the necessary tools and support. Recent studies have shown that digital transformation creates many benefits (Komarčević, Dimić, and Čelik, 2017). With digital transformation, the operating income of firms is expected to increase from 5% to 15%, their operating costs are expected to fall by between 10% and 20%, and internal business (efficiency) is set to improve by more than 30%. This empirical evidence suggests that digital transformation brings about economic and social benefits in both the public and private sectors.

The main purpose of this chapter is threefold. First, this study was undertaken to critically review Cambodia's digital policy frameworks, with particular emphasis on the Digital Economy and Society Policy Framework, 2021–2035 (Government of Cambodia, 2021) and the Digital Government Policy, 2022–2035 (Government of Cambodia, 2022). Second, it discusses the challenges and opportunities of digital government and explores ways to address them. Third, the study examines the economic impact of digital government by empirically assessing the relationship between digital government (proxied by e-government) and international trade between Cambodia and its trading partners, using panel data analysis over 2003–2018. The primary research methodology for this study involves a comprehensive examination of documents, policy initiatives, and reports from Cambodia's government and public agencies, as well as theoretical and empirical literature on digital government, technical reports, and publications by international organisations such as the World Bank and the Asian Development Bank.

The remainder of the chapter is structured as follows. Section 2 discusses the developments of Cambodia's digital policy frameworks from a historical perspective. Section 3 discusses the economic impacts of digital government theoretically and empirically, followed by three mini case studies presented in Section 4. Section 5 presents preliminary evidence of the impact of digital government on international trade for Cambodia. Section 6 concludes and offers policy implications.

2. Digital Policy Developments

Cambodia has introduced important digital policy frameworks to accelerate the country's digital transformation.

The Cambodian ICT Masterplan 2020 was the country's first digital policy framework. It was adopted and implemented in 2014 to transform Cambodia into a society driven by ICT. The master plan is based on four main pillars empowering people, ensuring connectivities, enhancing capabilities, and enriching e-Services. These will serve as strategic drivers for achieving various public administration and policy goals, as well as for accelerating inclusive socio-economic development.

Using ICT in expanding e-Government and integrating public services falls into the fourth pillar.[1] To this end, five strategies have been implemented: (i) common task-related and technical factors, i.e. standardising e-government and sharing information amongst all public organisations; (ii) nationally critical ICT resources must be developed and managed under a centralised plan; (iii) all services must be provided in a transparent and seamless manner; (iv) newly introduced technologies must be open, flexible, and practical; and (v) management of all e-government projects must be supported through the establishment of efficient and well-defined policies and institutions.

By the end of 2021, the Cambodian government provides 3,508 public services digitally – 372 (10.60%) with the application form downloadable but submission not yet made online; 416 (11,86%) with the application form downloadable and online submission; and 2,720 (77.54%) whose application form can be submitted directly to One Window Service Offices. Cambodia has 196 digital information systems providing public services – 52 (30.8%) are government-to-citizens systems; 16 (9.5%) are government-to-business systems; and 101 (59.8%) are government-to-government systems. Most of these digital information systems were developed by their respective public institutions. Some of these systems have overlapping functions, such as human resources management systems and archive management systems.

The Cambodia Digital Economy and Society Policy Framework 2021-2035 was adopted in late 2021. Accelerating digital transformation in the public sector[2] is one of the five strategic focuses of this policy framework. Based on it, the Digital Government Policy, 2022–2035 was established to build the necessary digital infrastructure for developing sustainable digital government, aimed at improving public administration, public setor efficiency, and public service delivery to meet the rising demands of the public.

For the Digital Government Policy to achieve its vision, the government has set four main strategic goals – enhancing the digital government infrastructure, building digital governance and digital public services, fostering capacity building and digital innovations, and promoting public–private partnerships– with 10 strategies and 83 priority actions.[3]

- **Enhancing digital government infrastructure.** Digital government infrastructure needs to be improved to ensure its quality, efficiency, and secured network connectivity, as well as data storage and data exchanges, which are critical for supporting the development, management, and usage of the digital government system. The digital payment system infrastructure is also to be improved through the connection with and use of national payment gateway infrastructure to ensure high reliability of payments for public and other services. In addition, comprehensive cybersecurity infrastructure will be established and strengthened to ensure a high level of security in the digital technology system so that trust and confidence in using digital government systems is built. Infrastructure for postal services is also to be built to broaden and strengthen the management and expansion of postal services.

1 In the country's another ICT framework, the ICT Development Policy 2020, which was implemented in 2016, the government also committed to encourage promoting ICT applications in all public institutions.

2 Accelerating digital transformation in the public sector through the integration of government systems in all ministries and institutions to improve the quality of public service delivery to all citizens round the clock from anywhere.

3 This is based largely on the Cambodia Digital Government Policy, 2022–2035 (Government of Cambodia, 2022), approved on 28 January 2022.

- **Building digital governance and digital public services**. Digital governance starts with the necessary policies, the improvement of relevant legal frameworks, as well as the standardisation and architecture of digital government, which are in line with the international best practices. These are prerequisites for developing sustainable digital government with a high sense of security and efficiency, aimed at supporting the Cambodia Digital Economy and Society Framework, 2021–2035. Public services are to be improved through digital transformation of government services, i.e. the enhancement of government-to-government, government-to-citizens, and government-to-business interactions.
- **Fostering capacity building and digital innovations**. Capacity building is critically important for the success of digital government. Government leadership and employees are trained in the digital skills necessary for the adoption and use of digital technology systems so that public service delivery is enhanced to satisfy the needs of the public. Digital innovations and R&D are also to be encouraged to increase the effectiveness and efficiency of digital transformation and to ensure Cambodia's digital competitiveness in the region.
- **Promoting public–private partnership**. Active participation of the private sector in the digital government transformation process is encouraged. To this end, a coordination mechanism and cooperation has been established to facilitate a productive partnership between the government and technology firms. In addition, an incentive mechanism for digital start-ups has been initiated to promote digital entrepreneurship, research in digital technologies, and innovations for the sustainable development of digital government in Cambodia.

3. Economic Impacts of Digital Government

Governments worldwide have become increasingly digitalised by adopting ICT applications and other modern technologies to achieve their goals of being open and transparent, competent, and service-oriented through enhancing two-way communication and transactions. Several studies have assessed and documented the impacts of digital government (Asgarkhani, 2005; Lee, 2016; Codagnone et al., 2020). Through digital transformation and the use of ICTs and other digital technologies, governments create multiple societal effects, which can be broadly categorised into four dimensions: economic, administrative, social, and political (Lee, 2016). This study is largely devoted to the discussion of the economic effects of digital government.

3.1. Control of Corruption

Corruption has been identified as a major factor that is detrimental to economic growth and equitable economic development for many developing countries. Digital government may serve as an effective tool for the control of corruption and for facilitating international trade, economic growth, and development processes. This is because effective control of corruption contributes significantly to cost reduction. ICT and other technology applications introduced by the government cut corruption since digital government technologies significantly reduce direct contact between government officials and businesses and citizens (Mouna, Nedra, and Khaireddine, 2020). Similarly, digital government makes information available instantly, so citizens and businesses can question arbitrary procedures and decisions as well as opportunistic behaviour by government officials. This promotes transparency and accountability, and increases the fight against corruption which prevails to a larger extent in many developing countries.

Empirical evidence has established the relationship between digital government and reduced corruption. Using panel data from 149 countries over 1996–2006, Andersen (2009) found that e-government is positively associated with a reduction in corruption and the promotion of accountability and transparency in the public sector. Elbahnasawy (2014) empirically investigated the impact of e-government and internet adoption on combating corruption, by using a large panel data set from 160 countries over 1995–2009. The results revealed that e-government is a powerful tool in reducing corruption. The finding indicated that e-government is a necessary tool in the anti-corruption effort but feasible only through the development of telecommunications infrastructure and improved internet services. Majeed and Malik (2016) provided evidence that e-government and press freedom combined reduced corruption for a sample of 147 countries over 2003–2012. Using data from 214 countries for 2003–2016, Park and Kim (2019) found that e-government significantly reduces corruption. A similar finding reported by Ali et al. (2022) suggested that e-government plays an important role in reducing corruption.

3.2. Cost Reduction and Efficiency Gains

The use of ICT applications introduced by the government leads to cost reduction due largely to a decrease in administrative bureaucracy and the procedures required to perform public tasks by government employees, as well as to receive public services by citizens and businesses. Moreover, government digital technologies and platforms reduce the time and number of employees needed for many types of work, thus raising productivity. Yang and Rho (2007) indicated that digital government helps the public sector become more productive by allowing routine government activities to be handled electronically. Similarly, digital government can cut costs by reducing paperwork, political connections, staffing, printing, telephone calls, and visits to government offices, amongst other things, which increases economic efficiency and benefits. In addition, digital government applications allow citizens, businesses, and the public sector to access available government information round the clock from anywhere, which improves the quality of these services (Alshehri and Drew, 2010). Lee (2016) documented the relationship between e-government and cost reduction for Korea, where citizens and businesses gain cost-reduction benefits by using e-government. Lee (2016) reported that 61% of government officials at the national level benefited from cost savings through the use of computers in their organisations. Similar results were reported at the subnational level, where 62% of officials experienced time reductions to complete tasks, thanks to greater investment in information technology by local governments.

3.3. Improving Economic Performance

Digital government can positively impact economic performance through several channels. First, with digital transformation, governments worldwide can make extensive use of ICTs and digital technologies to facilitate growth-related activities, policies, and public services, as well as promoting strong and transparent institutions – thereby contributing to long-term economic growth and sustainable development. Castro and Lopes (2022) indicated that advances in ICTs and digital technologies provide unprecedented opportunities to transform the relationships amongst governments, citizens, and businesses, contributing to achieving various strategic government goals. Second, as indicated earlier, digital government can address the chronic issue of corruption, which prevails in many transitional and developing countries (Majeed, 2020). Improved corruption control reduces costs and improves the quality of growth-enhancing institutions, which can provide strong support for economic performance (North, 1990). Third, digital government helps build the necessary ICT and digital infrastructure, which improves the performance and productivity of public sector employees. Using data from 1976 to 2010 for Indonesia, Malaysia, the Philippines, Singapore, and Thailand, Mahyideen, Ismail, and Law (2012) found that ICT infrastructure is positively associated with the economic performance of these countries through enhancing total factor productivity. Similar results are reported by Choi and Yi (2009); Czernich et al. (2011); Majeed and Ayub (2018); and Majeed (2020).

3.4. Private Investment Environment

As digital government shifts public sector functions online, it can address the challenges faced by private investors, both domestic and foreign. These include bureaucracy, red tape, inconsistent procedures, and protracted approval processes by multiple government agencies with rent-seeking behaviour. In addition, multinational enterprises often experience difficulties for several reasons (Han et al., 2021). First, the dispersed locations of public agencies make contact physically difficult and time-consuming. Additional visits may be needed if firms fail to submit paperwork that meets these agencies' requirements. Second, since approvals of business permits are often made by multiple government agencies, the approval procedures may be complicated and protracted. Third, complicated approval procedures weaken accountability and transparency, and may encourage corruption. Han et al. (2021) indicated that, with a digital government portal, procedures that were previously carried out by multiple government agencies can move much faster, becoming flexible, fast, convenient, fair, and transparent; and reducing costs. With government functions moving online, businesses can access information at much lower costs round the clock from anywhere, enhancing government accountability and reducing opportunities for corrupt rent-seeking activities (Han et al., 2021).

Similarly, Al-Sadiq (2021) indicated that digital government tends to enhance the locational advantages of a host country for several reasons. First, digital government can facilitate FDI inflows through cost and time reductions, and it improves the effectiveness of the internal processes of government services through a government one-stop portal. Second, digital government enhances access to a greater range of information about public services. This makes the public sector more inclusive, effective, accountable, and transparent. Third, digital government increases access to information and knowledge about investment opportunities in a host economy. Han et al. (2021) empirically examined the effects of e-government on FDI inflows. Their results show that e-government is positively associated with FDI. This finding was confirmed by Al-Sadiq (2021), who investigated the impact of e-government on FDI for 178 host countries from 2003 to 2018.

3.5. Trade Facilitation

International trade has played a critical role in national economic development and welfare, especially for small open economies whose economic prosperity is highly dependent on the health of the world economy. It not only promotes inclusive economic growth, equitable development, income and employment generation, and technology transfers, but also reduces poverty and narrows inequality in many developing countries. Thanks to the economic gains from commercial activities, governments around the world have made great efforts to reduce international trade costs by enhancing government transparency and public services to citizens and businesses through digital government transformation. As digital government shifts functions online and serves as a one-stop portal, it could help achieve several government goals, including better delivery of public services, improved business interactions, greater access to government information, and efficiency gains of government agencies. The benefits from digital transformation of government can be substantial, especially for countries where the level of bureaucratic processes, government inefficiency, and corruption are high. These benefits include less corruption, increased transparency, a reduction in burdensome customs procedures and excessive paperwork requirements, and a decrease in business costs.

Therefore, digital government can improve international trade facilitation by mitigating trade frictions, transaction costs, and information costs; and improving market information for trade. Freund and Weinhold (2004) examined the role of internet adoption in bilateral trade flows in goods and found that internet adoption is positively associated with trade flows. Clarke and Wallsten (2006) found that greater internet penetration promoted trade flows from developing countries to developed countries. The findings are confirmed by Yushkova (2014), Lin (2015), and Xing (2018), amongst others.

4. Case Studies

4.1. National Bank of Cambodia's Bakong

Bakong, a blockchain-based payment system, was launched in July 2019 by Cambodia's central bank, the National Bank of Cambodia (NBC). It was developed by SORAMITSU Co Ltd, a technology company based in Japan, and won an award of excellence at the Nikkei Superior Products and Services Awards. Nikkei praised the platform for its achievements in promoting financial inclusion, as it served nearly half of Cambodia's population directly and indirectly (Iwamoto, 2022). The NBC (2020) indicated that the blockchain-based Bakong has the potential to increase economic efficiency; support financial inclusion; promote the use of the Cambodian riel; and address the lack of interconnectivity and interoperability of retail payments amongst banks, microfinance institutions, and mobile payment service providers.

According to the NBC, users who have an account with one of the partner banks, microfinance institutions, or mobile payment companies can create an account on the Bakong app. At its inception in July 2019, only three partner financial institutions joined Bakong. As of March 2022, the number had grown to 60, of which 28 are in the process of technical integration. Available services include interbank funds transfers and mobile payments. Data from the NBC show that, by March 2022, around 353,143 accounts were created, reaching 7.50 million people. About 7,500 merchants are on Bakong, making about 2.52 million transactions in Cambodian riels and 10.21 million in United States dollars. The NBC also acknowledges the potential of expanding Bakong's infrastructure for the KHQR code system, e-commerce transactions, cross-border payments, remittances, and large transfers. Bakong will be connected with the Cambodia Data Exchange (CamDX) platform so that Electronic Know Your Customer (e-KYC) can be easily accessed.

Despite the rise in innovations in the banking sector, paper-based instruments (e.g. cash and cheques) still make up the largest share of transactions in Cambodia. These practices are inefficient and inconvenient, especially for large transactions, and may provide room for criminal acts, including counterfeiting and fraudulence. Digital payment systems such as Bakong can overcome these challenges, as transactions can be made conveniently round the clock from anywhere via a mobile app in real time and free of charge. In 2019, remittances sent to Cambodia totalled about $1.6 billion or nearly 6% of the country's gross domestic product (GDP) that year (UNESCAP, 2021). According to the World Bank, the average cost of sending $200 home in 2021 was around $12.60 (World Bank, 2021a). By establishing partnerships with banks in migrant-receiving nations, Bakong has the potential to significantly reduce the cost and time needed for sending remittances home, even when the receivers are unbanked or underbanked. As of January 2022, migrant workers in Malaysia can use Bakong to send money to their families in Cambodia, and the NBC is planning to expand this service to other countries (Chandran, 2021).

Promoting financial inclusion is also a priority, as the expansion of financial services to a broader section of the population is essential for poverty alleviation and inclusive economic development. However, data from the World Bank's Global Findex Database in 2021 indicated that only 33% of adults in Cambodia had a bank account (World Bank, 2021b). This exceedingly limited reach can be explained by the lack of access to physical financial institutions in rural and remote areas, as well as the need for documentation that most people in those locations often do not possess (Barajas et al., 2020). The rise of e-payment services and e-wallets, such as Pi Pay and TrueMoney, has served some parts of the unbanked and underbanked population in Cambodia, and the NBC aims to take advantage of the country's high level of smartphone penetration through the user- and mobile-friendly Bakong. This platform could also support the NBC in its de-dollarisation efforts by making transactions in riels more convenient. Wider use of the national currency would enable the NBC to implement monetary policy effectively and ensure financial stability while opening new opportunities for developing new riel-denominated policy instruments, including direct cash transfers.

Bakong can address the issues of interconnectivity and interoperability of interbank payments, and that of a clearinghouse, since it brings financial institutions together on a common platform and provides a peer-to-peer feature that enables users to perform real-time fund transfers by simply scanning a QR code or keying in numbers. Despite its achievements and promises, Bakong will need to manoeuvre around two critical obstacles to achieve its objectives. The first challenge is the lack of basic and digital infrastructure, such as stable electricity and internet coverage, in rural and remote areas. Moreover, end-users of Bakong will need a considerable level of financial and digital literacy to make use of the available services, and the rise in cyber scams may also disincentivise many Cambodians from using the platform.

In the age of digitalisation, digital currencies and mobile payment systems are likely to account for a larger share of all future transactions. While developing countries generally fall behind in innovations and new technology system adoption, Cambodia's blockchain-based Bakong presents optimism for the successful development of digital payment systems in Cambodia and contributes to the government's digital policies, i.e. the Digital Economic and Society Policy Framework, 2021–2035 and the Digital Government Policy, 2022–2035.

4.2. Agricultural and Rural Development Bank's digital transformation

The Agricultural and Rural Development Bank (ARDB) has undertaken a transformation from a single-branch specialised bank with no digital banking platform to a digital-first multi-branch commercial bank. The vision and mission of the ARDB is to be a leading financial institution focused on the development of the agriculture and rural sectors in Cambodia and to uplift the agriculture and rural sectors through various methods. The goals of the ARDB are to become a fully digital bank, without the use of paper and bricks-and-mortar facilities; to maximise income from non-interest financial services; to transform subsistence farmers into agro-preneurs; and to promote the role of SME clusters for agro-processing businesses. To this end, the ARDB has adopted the following key values in its transformation: (i) a digital-first mindset to serve customers and improve operational efficiency, (ii) a collaboration-driven culture to maximise value delivery to customers, (iii) traditional distribution channels to complement digital distribution channels, (iv) 'agro-preneur' and SME clusters to drive economic growth, (v) diversified products and services to fulfil customers' needs, and (vi) a corporate culture and human resources to achieve success.

Since its receipt of a commercial banking licence from the NBC in February 2020, the ARDB has embarked on a digitalisation journey that has simplified and digitalised the customer experience through various methods. These include in-house development of technologies as well as partnerships with existing market players to offer digital technology-based services to its customers.

- **Digitalisation of loan processes to improve the customer experience**. Since February 2020, the ARDB has digitalised part of its loan application processes by harnessing the traffic from its corporate website (www.ardb.com.kh). It also provides loan applications via its mobile app. By creating an alternative method for customers to apply for loans, the ARDB can obtain more applications from customers who may be far from the bank's main office in Phnom Penh. The bank has also partnered with Wing Commercial Bank to offer loan disbursements through the Wing Cash Express agent network. With more than 8,000 agents nationwide, this partnership offers the ARDB the ability to disburse loans within 30 minutes to any customer in Cambodia, making it more convenient for farmers to borrow from the ARDB. The bank can also collect loan interest through the Wing Cash Express agent network. This increases the convenience for customers to repay the interest on their loans and may improve the ARDB's asset quality.
- **Digital banking as an alternative distribution channel of the bank**. The ARDB has launched a mobile banking App developed in-house. This has increased the convenience of reviewing account balances for customers and has provided a platform for future growth of the bank. The ARDB also offers mobile top-up services to its customers through the mobile banking app. In addition, it has established a partnership with Électricité du Cambodge (EDC) to offer bill payment services to its customers. Furthermore, it has enabled loan applications on the mobile banking App for loan extensions.

- **Digital marketing complementing traditional marketing**. As most of the Cambodian population uses Facebook, the social media platform has become an important marketing tool. The ARDB uses Facebook to promote its loans, deposit products, and other bank products to customers across the country. As the primary target customers of the ARDB mainly reside in remote rural areas of Cambodia where access to the internet is limited, traditional marketing strategies have been deployed concurrently with its digital marketing media.

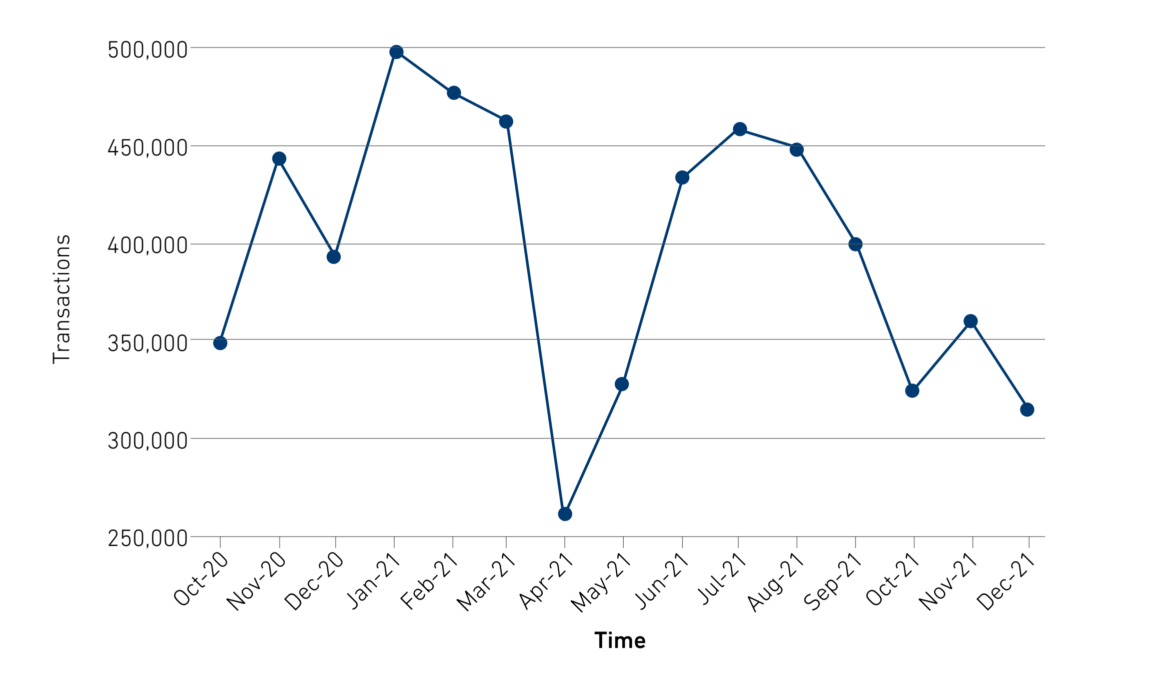
4.3. CamDX

CamDX is a platform for exchanging data between different government bodies in a standardised and secure manner, based on six main principles: distribution, security, reliability, no data ownership, ease of use, and heterogeneity (Kong, 2021). The initiative was largely inspired by Estonia's X-Road, where 99% of public services are available online 24 hours a day (e-Estonia, 2022). Currently, 11 government institutions participate on CamDX, with the Ministry of Economy and Finance being the central governing authority of the platform.

Via the CamDX platform, a business owner can conduct online business registration simply, and the completed data are sent to all relevant government institutions simultaneously. After those authorities approve the application, digital certificates, which have legal value, are issued for the applicant. The cost of business registration is estimated to have been significantly reduced, by 40% (Kong, 2021). In a similar vein, the banking sector is expected to benefit considerably from the CamDX platform. An up-and-coming service on CamDX – e-KYC – allows banks and other financial institutions to request KYC data directly from the Ministry of Interior, which is also a member of the platform. As a result, the data can be effectively cross-checked with the original data owner, thus reducing the processing time to deliver banking services. More importantly, CamDX enables data to be exchanged with a high level of security.

Since its inception, CamDX has become increasingly popular. From October 2020 to December 2021, more than 5.95 million data transactions were incurred via the platform, with more than 4.76 million transactions taking place in 2021 (Figure 9.1). Moreover, by 18 January 2021, around 2,500 companies had registered and 3,000 company names had been licensed via the platform (Kong, 2021). Following the land-and-expand approach, CamDX plans to start with public services, learn from them, and make improvements when necessary before expanding to other services.

Figure 9.1. Transactions via CamDX



Source: CamDX. (2022).

Although CamDX is an important step towards wider use of e-government services, challenges and concerns remain that may hinder its progress and success. The first set of issues is the lack of digital literacy amongst prospective users. Hence, a task force has been established to assist the public via hotline calls, live chats, email, and social media (Kong, 2021). A study by Saputro et al. (2020) found that one of the key prerequisites to successful implementation of X-Road was the organisation's awareness of the data exchange system. The study's authors also acknowledged the challenges to educating and motivating personnel, stemming from the lack of technical resources.

With robust support and encouragement from the government and the Cambodia Digital Economy and Society Policy Framework, 2021–2035 and the Digital Government Policy, 2022–2035, CamDX has high potential for future expansion and will become a popular one-stop platform. The high level of smartphone usage and penetration, and the pressing demand for better and more efficient public services, will help promote further development of CamDX.

5. Digital Government and International Trade: Preliminary Evidence for Cambodia

5.1. Econometric Specification, Data, and Estimation Methods

The digital government system allows exporters to file export documents and process customs information on the government's digital platform, and permits them to submit their prepared paperwork and pay tariffs online round the clock from anywhere (Biswas and Kennedy, 2018). Therefore, digital government enhances efficiency and effectiveness, improves the quality of government services, reduces trade costs, and saves time by reducing the number of visits to public offices (Biswas and Kennedy, 2018; Heeks, 2018). As indicated above, digital government reduces the probability of direct interaction between exporters and government officials in charge of international trade affairs, thereby reducing the incidence of bribery and corruption (Biswas and Kennedy, 2018). This suggests that digital government can be considered as trade facilitation, since it helps facilitate international trade flows by reducing trade costs, trade impediments, and other related costs. Therefore, it is hypothesised that digital government positively influences the export performance of Cambodia.

Based on the discussion above, the relationship between Cambodia's export performance and digital government in Cambodia is modelled as follows:

$$lnEXPORT_{cjt} = \beta_0 + \beta_1\ lnDG_{ct} + \beta_2\ lnDG_{jt} + \beta_3\ lnPOP_{jt} + \beta_4\ lnGDPCAP_{jt} + \beta_5\ lnEXCH_{cjt} + \beta_6\ lnDist_{cj} + \beta_7\ BORDER + \beta_8\ ASEAN + \beta_9\ EBA + Yeardummy + \alpha_i + \varepsilon_{ijt}$$

where $i = 1,2,3,\ldots,N$ *and* $t=1,2,3,\ldots,T$ *(2003 to 2020)*

Ln stands for a natural logarithm. The subscripts *c*, *j*, and *t* refer to Cambodia, trading partners, and time, respectively. α_i is individual country-specific, accounting for the unobserved heterogeneity amongst trading partners, and ε_{it} is the error term assumed to be well behaved. The specification above suggests that the exports of Cambodia are influenced by the population of the trading partners (*POP*); per capita income of the trading partners (*GDPCAP*); Cambodia's digital government, proxied by the United Nations (UN) e-Government Development Index (*DG_c*); the trading partner's digital government, proxied by the e-Government Development Index (*DG_j*); the exchange rate between the United States dollar and trading partners (*EXCH*); and a set of binary variables including Cambodia's membership of the Association of Southeast Asian Nations (ASEAN), the land border between

Cambodia and partners (*BORDER*), and Cambodia being the beneficiary of Everything but Arms (*EBA*).[4] A yearly dummy variable is included to account for the global business cycle, the extent of globalisation, oil shocks, COVID-19, and so on (Rose, 2004; Eichengreen, Rhee, and Tong, 2007). The population and per capita income of trading partners are included to capture the demand effects of trading partners for Cambodia's exports, while e-governments in Cambodia and its trading partners serve as trade facilitation in the gravity-styled specification above.

The specification is estimated by using an unbalanced panel data set covering 65 trading partners over 2003–2020 (Appendix). Data for the dependent variable (exports) and bilateral exchange rate are from the International Monetary Fund (IMF) Direction of Trade Statistics, while data on population and GDP per capita are from the World Bank's World Development Indicators. Data on distance are from the GeoDist database of the Centre d'Études Prospectives et d'Informations Internationales (CEPII). Digital government is proxied by the UN e-Government Development Index, which was first computed in 2003 and has been updated in the biennial E-Government Survey published by the UN Department of Economic and Social Affairs. The e-Government Development Index is a normalised composite index with three components: the Online Service Index, the Telecommunication Infrastructure Index, and the Human Capital Index. The index ranges from 0 to 1, with 0 being zero readiness to adopt and implement e-government activities and 1 being full readiness to adopt and implement e-government activities.

To choose the most appropriate model for estimating the above specification with the panel data set, we use the Hausman test for testing the appropriateness of the fixed effects model against the random effects model. A large value of the Hausman test statistic leads to the rejection of the null in favour of the fixed effects model (Verbeek, 2017). The alternative approach to either the fixed effects or random effects models is the Hausman-Taylor method (Hausman and Taylor, 1981), which combines the fixed effects and random effects estimation strategies and allows the estimations of both time-constant and time-varying explanatory variables that appear in our econometric specification. Soeng and Cuyvers (2018) provided a detailed discussion of the panel data estimation strategy.

[4] The Everything but Arms initiative is a European Union arrangement for countries classified as least developed countries by the UN. The initiative was introduced in February 2001, and contrary to the other arrangements mentioned above, it is laid down for an indefinite period and therefore not subject to the normal 3-year revisions. This is an additional measure taken by the European Union to enhance the stability and predictability of preferences for this group of countries that most needs them.

5.2. Estimation Results and Discussion

Table 9.1 presents basic statistics and variance inflation factor (VIF) values for all the included explanatory variables. The VIF values for all variables are well below 5, suggesting an absence of multicollinearity issues amongst the included variables.

Table 9.1. Basic Statistics and VIF Values for All Included Explanatory Variables

Variable	VIF	Mean	Minimum	Maximum
Ln DG_c	1.18	-1.169	-1.350	-0.671
LnDG_j	3.85	-0.454	-1.652	-0.024
LnPOP	1.34	16.803	12.775	21.068
LnGDPCAP	4.69	9.555	5.894	11.724
LnEXCH	1.73	-2.095	-10.052	1.314
LnDist	1.31	8.789	6.280	9.886

VIF = variance inflation factor.

Notes: lnPOP is the natural logarithm of the population of trading partners; lnGDPCAP is the natural logarithm of the per capita gross domestic product (GDP) of trading partners; lnEXCH is the natural logarithm of the ratio of the United States (US) dollar to the trading partner's national currency per US dollar exchange rate; lnDG_c is the natural logarithm of Cambodia's digital government index proxied by the United Nations E-Government Development Index (EGDI); and lnDG_j is the natural logarithm of the trading partner's digital government index proxied by the EGDI.

Source: Author's calculations.

Before discussing our estimation results, we summarise the results of the statistical tests to choose the most appropriate method for the estimations of our econometric specification. The test results are reported along with the estimates of all variables, presented in Table 9.2. The autocorrelation test was carried out and the test statistics are highly insignificant, indicating the absence of autocorrelation issues. Tests for heteroskedasticity show that the null hypothesis of homoscedasticity is strongly rejected at the 1% significance level. This suggests that heteroskedasticity is present in the panel data set used for the analysis. Therefore, our econometric specification above is estimated with heteroskedasticity-robust standard errors. By excluding the time-invariant variable lnDist, we carried out the Hausman test to choose between the fixed effects and random effects models. The Hausman statistic is marginally significant at the 10% level. For comparison, we report the estimates by fixed effects and random effects methods. We also report the results by the Hausman-Taylor method, which is the alternative method to fixed effects and random effects models and is the instrumental variable technique that reduces or removes the correlation between the composite error terms and the included variables.

[5] It is often accepted that a VIF of less than 5 indicates the severity of multicollinearity (Studenmund, 2014).

Table 9.2. Estimation Results

Variable	RE	FE	RE	H-T
Constant	9.152*** (3.187)	27.486 (20.445)	-19.341*** (5.972)	-4.795 (11.788)
LnDG_c	6.326** (2.557)	6.038** (2.542)	4.657* (2.512)	5.671** (2.398)
LnPOP		-1.329 (1.125)	1.020*** (0.098)	0.585** (0.277)
LnGDPCAP		0.388 (0.405)	0.933*** (0.242)	0.530** (0.208)
LnEXCH		0.154 (0.101)	0.091 (0.067)	0.171** (0.085)
LnDist			0.024 (0.321)	-0.245 (0.992)
BORDER			2.585*** (0.860)	2.585 (2.869)
ASEAN			2.033** (0.855)	1.057 (2.689)
EBA			0.949** (0.423)	1.149 (1.159)
Time dummy	Estimated	Estimated	Estimated	Estimated
No. of observations	629	629	629	629
Overall R^2	0.365	0.011	0.745	
Wooldridge test for autocorrelation	0.085	0.018	5.894	11.724
Wald test for heteroskedasticity	7623.29***	5385.33***	5.894	11.724
Hausman test	8.28	21.75*		11.724

Notes: *Ln* denotes values in logarithm. *, **, and *** denote that the slope parameter estimates are statistically significant at the levels of 10%, 5%, and 1%, respectively. Standard errors are heteroskedasticity robust standard errors in parentheses. RE denotes random effects method; FE is fixed effects method; H-T represents Hausman-Taylor method.

Source: Author's estimations.

The estimated coefficients on both the population and per capita GDP of trading partners have the expected positive signs while geographic distance, as expected, is negatively correlated with Cambodia's exports to its trading partners. The estimates on population and per capita GDP are both significant at the 5% level, which suggests that these two factors are positively associated with Cambodia's exports. Geographic distance is insignificant at the conventional significance level, which is not a surprise since the improvements in transportation technologies, increased digitalisation of information, and availability of digital platforms across the globe reduce transport costs significantly and make it easy to get the needed information immediately from a very long distance at almost zero cost. The estimated coefficients on the common border, ASEAN, and EBA have expected positive signs, but are insignificant.

Interestingly, the variable of interest – digital government – is statistically significant at the 5% level, after controlling for other determinants of international trade flows. This provides evidence that higher levels of readiness to adopt and implement digital government activities in both Cambodia and its trading partners leads to higher exports from Cambodia to the rest of the world. The role of digital government in facilitating Cambodia's exports is confirmed by the estimation results of all methods (Table 9.2). The coefficient on Cambodia's digital government of 4.66–6.33 implies that a 1% increase in the level of readiness to adopt and implement digital government in Cambodia, all else being equal, leads to an estimated 4.66%–6.33% increase in Cambodia's exports to the rest of the world. These results are in line with those reported by Biswas and Kennedy (2018).

6. Concluding Remarks

Over the past 20 years or so, the Government of Cambodia has introduced the use of technologies and a series of digital policy initiatives, including the ICT Masterplan 2020; the Telecom/ICT Development Policy 2020; and the Law on Electronic Commerce. In 2021, the government adopted the Cambodia Digital Economy and Society Policy Framework, 2021–2035 to accelerate digital transformation in Cambodia – to transform the country's current narrow-based economy into a knowledge-based or digital one, aiming at sustaining the high economic growth achieved in the pre-COVID-19 era and realising the aspirations for inclusive economic development. The Cambodia Digital Economy and Society Policy Framework, 2021–2035 serves as Cambodia's new economic growth model. In addition, the government adopted the Digital Government Policy, 2022–2035 to develop digital government to improve people's quality of life and build trust amongst citizens through the provision of better public services.

Using both theoretical and empirical literature as a research methodology, this study discusses the impacts of e-government, with a primary focus being placed on the discussions of economic-related impacts of e-government. Thanks to the availability of data on e-government, this chapter delves into the role of digital government in enhancing Cambodia's export performance. To this end, it employed the augmented gravity model with an unbalanced panel data set from 65 trading partners over 2003–2020. We controlled for population, income per capita, geographic distance, exchange rate, a set of binary variables, and a time dummy, all of which are believed to affect Cambodia's exports to its trading partners. To report the best possible results, several statistical tests were carried out. The estimation results support the role of digital government in Cambodia and trading partners in facilitating Cambodia's exports to its trading partners globally.

The estimation results, together with the empirical evidence from the literature review, should provide some policy implications. First, digital transformation for Cambodia, which serves as trade facilitation, needs to be accelerated to facilitate and provide public services to citizens and businesses, as well as to improve the effectiveness, efficiency, transparency, and accountability of the government, as digital government transformation could reduce trade costs and eliminate unnecessary trade impediments by using a one-stop government platform and other technologies. This will help facilitate and promote Cambodia's international trade with the rest of the world. Second, as Cambodia is a small open economy that is relatively dependent on international trade for employment opportunities, poverty reduction, narrowing inequality, and welfare, efforts need to be redoubled to develop and promote inclusive digital government that is known to be an effective trade facilitation and a strategic means of reducing trade-related costs, to facilitate and increase international trade flows. Third, investments in modern technologies and building digital human resources/digital citizens are encouraged to facilitate the use of digital government applications so that internal and external commercial activities are enhanced.

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Appendix 9A.1. Cambodia's Trading Partners in the Sample

Argentina	Egypt	Italy	Pakistan	Spain
Australia	El Salvador	Japan	Panama	Sri Lanka
Austria	Estonia	Korea	Peru	Sweden
Belgium	Finland	Kuwait	Philippines	Switzerland
Brazil	France	Lao PDR	Poland	Taiwan
Brunei	Germany	Lebanon	Portugal	Thailand
Canada	Greece	Lithuania	Romania	Turkey
Chile	Hong Kong	Luxembourg	Russia	Ukraine
China	Hungary	Malaysia	Saudi Arabia	United Arab Emirates
Colombia	India	Mexico	Singapore	United Kingdom
Croatia	Indonesia	Netherlands	Slovak Republic	United States
Czech Republic	Ireland	New Zealand	Slovenia	Uruguay
Denmark	Israel	Norway	South Africa	Viet Nam

Source: Authors.

Chapter 10

Digital Government in Facilitating GVC Participation

Nobuaki Yamashita

1. Introduction

Global value chains (GVCs), the cross-border splitting of the production process within vertically integrated manufacturing industries, have been a key facet of economic globalisation over the past several decades, especially in East Asia (Athukorala and Yamashita, 2006; Fernandes, Kee, and Winkler, 2021). With the cross-border fragmentation of products within GVCs, a country no longer needs to specialise in the production of an entire product. Instead, GVC participation can be based on niche segments within the entire production process where it has comparative advantages. Consequently, there has been a rapid increase in cross-border trade in parts and components within the East Asian region, linking a diverse set of countries specialising in different stages of production (Yamashita, 2010). This has also given unequalled opportunities for emerging economies, microenterprises, and small firms[1] to be part of GVCs. Being connected to the globalised market facilitates productivity growth, technological spillovers through learning effects, and improved resource allocation, all of which contribute to broader industrial development in a developing country (Verhoogen, forthcoming). It is thus argued that participating in GVCs expands the scope of economic prosperity for firms, industries, and countries (World Bank, 2020). Promoting GVCs is now seen as a pillar in economic development strategies and thinking in contemporary public policy.

However, the resilience of the GVC system was abruptly put to the test by the coronavirus disease (COVID-19) pandemic and economic lockdowns. Some argue that this speeds up the reshoring trend by returning some production blocs home. Others argue that this spurs the development of GVCs (but in a different form) and the geographical diversification of GVCs, especially shifting away from China (Kimura, 2020; Urata, 2020).

Ironically, despite all the economic and social devastation it has caused, the COVID-19 pandemic provides an opportunity for more emerging countries to tap into GVCs. In this process, the enhancement of digital capabilities has emerged as a key input.

With this ongoing development in mind, we examine how GVCs in East Asia can be further facilitated. Our focus is on the government digital support for export promotion and assessing how effectively governments can provide a digitally inclusive environment, making information and support usable by the large community of users in the open public space.

We first provide a framework for the study, followed by a survey of the efficacy of export promotion strategies. We then investigate the case of Vietnamese small and medium-sized enterprises (SMEs) to depict the firm-level characteristics of GVC participating firms. This is followed by a survey of the current state of e-government in selected countries of East Asia.

[1] According to the World Bank, microenterprises are firms with up to 10 employees, small enterprises have up to 50 employees, and medium-sized enterprises have up to 300 employees. The average number of employees that we use (described in Section 2) is about 30. We hence call our sample 'small firms' (Tewari et al., 2013).

2. Global Value Chains

Overview

GVCs broadly describe the process of breaking up the vertically integrated production process into finer stages and relocating each stage to the most suitable location across borders. In this study, GVCs cover both intra-firm transactions of parts and components and intermediate inputs between parent firms of multinational enterprises and their foreign affiliates as well as international arm's-length subcontracting transactions (inter-firm trade with unaffiliated suppliers) in these items. Additionally, the focus of this study is on the physical separation of production stages in the manufacturing production process across international borders in East Asia. GVC participation in the service industry is beyond the scope of this study.

Several factors have contributed to the development of GVCs. First, the communication and digitisation revolution has led to significant cost reductions, making it easier to coordinate a separate production process across international borders – called service link costs in Jones and Kierzkowski (1990). Second, the continuous decline in transportation costs, especially air freight costs and improved containerisation methods, has made it less costly and faster to move parts and components from one location to another (Hummels, 2007). The reduction in transportation costs has also facilitated the international separation of products that comprise higher values relative to their bulk (e.g. computer chips). Third, modular technology advancement has increased the separability of the production process into finer degrees and segments depending on the factor intensity used, allowing some components to be standardised for the use of multiple final products across different sectors (Jones, 2000).[2] Examples include computer chips and long-lasting batteries. Fourth, multilateral trade liberalisation has added to the rapid growth of fragmentation trade across national borders. Yi (2003) made the point that even a small tariff reduction has a 'magnification effect' on fragmentation trade. This is simply because, unlike finished products, components and unfinished products can cross international borders multiple times before reaching the final stage of the production process. Therefore, any marginal reduction in the protection scheme can significantly lower trade costs.

Digitisation and SMEs' GVC Participation

Embracing digital technologies in business can create new products, new services, and new markets. On the one hand, digitisation smears out a boundary between different links in GVCs and increases in information transparency for all participants. With this, firms can benefit from the low cost of

[2] This has facilitated a process once trapped within domestic trade to move across international borders (Krugman, 1995). For instance, engineering activities, such as the manufacture of automobiles and electronics, have increasingly been separated into discrete production stages – manufacture of components, assembly, testing, and packaging – with different skill requirements, scales, and factor inputs.

people-to-people connections and further fragment tasks internationally. Service linkages, such as for business and financial services, are becoming more important to coordinate and connect each stage of GVCs with seamless operation of the whole system. On the other hand, the application of digital technologies and related business models in the service sector makes services more productive. Digital-empowering service links, either digital-enabled or digital-born, can improve the capacity of GVC coordination and spur network extension. This tends to lower the threshold of GVC participation and benefit all businesses, particularly micro, small, and medium-sized enterprises.

However, digitalisation also poses a challenge to SMEs' development. While the integration of GVCs provides greater economic benefits, they can be heterogeneous in effects. With economies of scale, combined with the higher fixed costs of exporting, large firms are well positioned to reap a greater share of the benefits. This puts SMEs at a disadvantage, as they face a substantial barrier to participating in GVCs.

An important parallel development is the spread of digital marketplaces (e.g. eBay and Amazon), becoming another trade facilitator matching global buyers and sellers. This can expand GVCs by reducing the fixed costs associated with exporting and connecting a diverse set of firms (Antràs, 2020).

In sum, in theory, digitalisation has the potential to empower SMEs to be part of GVCs and bring about further opportunities to be more competitive. However, the benefits are not automatic, requiring governments to provide a conducive business environment.

3. Experience of Vietnamese SMEs

This section uses data from the Viet Nam SME survey of manufacturing industries (UNU-WIDER, n.d.) and checks the characteristics of firms engaged with GVCs. This unique data source provides firm-level engagement for GVCs. The biennial SME surveys were jointly conducted and administered by the Central Institute for Economic Management, the University of Copenhagen, and the United Nations University World Institute for Development Economics Research (UNU-WIDER), starting in 2005 and ending in 2015 (i.e. 2005, 2007, 2009, 2011, 2013, and 2015).

We use the data for the 2011, 2013, and 2015 surveys. Each wave of the survey covered about 2,500 SMEs in 10 provinces, spread across three regions of Viet Nam – north (Ha Noi, Ha Tay, Phu Tho, and Hai Phong); south (Ho Chi Minh, Long An, and Khanh Hoa); and central (Nghe An, Quang Nam, and Lam Dong). The sampled enterprises include households, informal firms, private firms, cooperatives, and limited liability firms, which are represented in each province (Trifković, 2017).[3]

[3] A representative sample of registered household and non-household firms in manufacturing was drawn from the Establishment Census from 2002 and the Industrial Survey 2004–2006 of the General Statistics Office of Viet Nam under a stratified sampling procedure.

The salient feature of the Vietnamese SME data is information about both direct and indirect involvement with GVCs at the firm level. We identify direct involvement with GVCs if firms record any positive values of sales of exporting and importing raw materials (the translated survey questions are in Appendix A). Indirect involvement with GVCs is identified if firms report any positive value of sales to foreign-invested enterprises (FIEs) and outsourcing and subcontracting with FIEs operating in the local economy (Trinh and Doan, 2018).[4] All other firms that are not categorised in GVCs are labelled as non-GVC firms.

Within GVC firms, the data permit us to distinguish between exporting and/or importing firms as well as firms selling to and processing inputs for FIEs operating in the local economy.

Table 10.1 presents the number of firms by GVC engagement. As expected, GVC firms account for a small proportion of the total number of firms in this data set. This confirms that GVC participation requires a high fixed cost, and only productive firms can engage in GVCs. Table 10.2 shows the industry distribution, comparing GVC and non-GVC firms. There is no stark difference in terms of industry distribution between GVC and non-GVC firms; labour-intensive industries (e.g. apparel and fabricated metals) are concentrated in both types of firms.

Table 10.1. Number of SMEs in Survey Years 2011, 2013, and 2015

Item	(1)	(2)	(3)	(4)	(5)
	All	GVC	Direct	Indirect	Non-GVC
Unique firm	2,864	520	214	244	2,637
Firm-year	5,918	728	305	289	5,190

GVC = global value chain, SMEs = small and medium-sized enterprises.

Notes: Companies are considered to be part of GVCs (GVC firms) if they report any positive sales from exporting and importing raw materials, sales to foreign-invested enterprises, or outsourcing and subcontracting for foreign-invested enterprises. Any companies that do not meet these criteria are considered non-GVC firms.

Source: Data from UNU-WIDER (n.d.).

[4] This definition is broad, encompassing not only exporters and importers, described as GVC participating firms in Antràs (2020), but also firms supplying and processing intermediate inputs for FIEs and exporters. Without access to the detailed level of firm-to-firm transaction data such as the one presented in Bems and Kikkawa (2021), our approach using the specific survey questions about the involvement of GVCs is a second-best method. However, we argue that our firm-level measurement is still an improvement on studies measuring GVCs at industries and regions, using international input–output tables.

Table 10.2. Industry Distribution

GVC				Non-GVC			
Sector	Name	Count	Share (%)	Sector	Name	Count	Share (%)
14	Wearing apparel	84	11.54	10	Food	1,119	21.56
25	Fabricated metals	81	11.13	25	Fabricated metals	1,042	20.08
16	Wood and cork	80	10.99	16	Wood and cork	529	10.19
10	Food	79	10.85	31	Furniture	401	7.73
22	Rubber and plastic	74	10.16	22	Rubber and plastic	328	6.32
17	Paper	39	5.36	14	Wearing apparel	271	5.22
31	Furniture	33	4.53	23	Non-metallic minerals	265	5.11
23	Non-metallic minerals	31	4.26	13	Textiles	209	4.03
27	Electrical equipment	31	4.26	18	Printing	165	3.18
18	Printing	28	3.85	17	Paper	160	3.08
Total			**76.93**				**86.50**

GVC = global value chain, SMEs = small and medium-sized enterprises.

Sources: Vietnamese SMEs; data from UNU-WIDER (n.d.).

Table 10.3 compares the characteristics of GVC and non-GVC firms. As expected, GVC firms are larger and more productive than non-GVC firms. Table 10.4 focuses on digital access; survey questions ask if firms have internet access and a website. While not perfect, this information can be used to evaluate access to the digital economy. Again, unsurprisingly, GVC firms have better internet access (86% of GVC firms have internet access, against only 41% for non-GVC firms) as well as company websites (40% of GVC firms have their own websites, against 8% for non-GVC firms). This simple comparison does not allow us to draw any causal inferences on the relationship between digital access and GVC participation, but it indicates the importance of investment in digital capacity as firms seek to participate in GVCs. Continued progress in this area, coupled with greater emphasis on helping SMEs adopt new technologies, will help SMEs take advantage of the opportunities that digitalisation has to offer and enable countries to undertake a more inclusive recovery from the COVID-19 crisis.

Table 10.3. Firm-Level Characteristics

All	GVC	Direct	Indirect	Non-GVC
Revenue per employee	663.9	357.6	306.2	0.002
Total wages per employee	46.8	34.1	12.7	0.000
Value added per employee	144.4	89.8	54.6	0.000
Profit per employee	94.6	55.0	39.6	0.000
Capital per employee	539.9	453.3	86.6	0.005
No. of employees	50.4	12.7	37.6	0.000
Age	12.7	14.3	-1.6	0.000

GVC = global value chain, SMEs = small and medium-sized enterprises.

Note: Diff. refers to the difference between GVC and non-GVC firms.

Sources: Vietnamese SMEs; data from UNU-WIDER (n.d.).

Table 10.4. Comparison of Digital Access

Item	All	GVC	Non-GVC	Direct	Indirect
Export (y/n)	0.05	0.38	0	0.63	0
Import (y/n)	0.04	0.36	0	0.62	0
Sales to FIE (y/n)	0.06	0.52	0	0	0.89
Subcontract FIE (y/n)	0.01	0.10	0	0	0.19
Internet (y/n)	0.46	0.86	0.41	0.94	0.78
Website (y/n)	0.12	0.40	0.08	0.47	0.28

FIE = foreign-invested enterprise, GVC = global value chain.

Sources: Vietnamese SMEs; data from UNU-WIDER (n.d.).

Overall, with further development of digitisation and GVCs, SMEs in emerging economies are set to gain. As shown in the case of Vietnamese SMEs, firms that are directly involved with GVCs in exporting and importing are still in a minority. We also identified firms with indirect involvement, supplying and processing for local FIEs. This pattern is linked to productivity sorting; firms with higher productivity have a higher likelihood of engaging in GVCs. It is not straightforward to devise public policy tools to improve productivity for all firms in the economy. Government support can be directed towards reducing the digital divide by further reducing the costs of digital access for SMEs. Concurrently, governments can support SMEs to invest in adopting digital technologies and acquiring new skills to leverage data-driven innovation.

4. Digital Trade Facilitation Platform

This section presents a survey of the current practices of digital trade facilitation, undertaken in selected East Asian countries.

The underlying premise of government-led export promotion is to reduce information friction for exporters and buyers in uncertain export markets. Prospective exporters need to overcome various knowledge and information barriers to penetrate global markets, including potential markets for their products and their demand structure and characteristics, the degree of market competitiveness, as well as marketing and distribution channels. However, this information issue essentially boils down to identifying and matching with importing partners.

The information gap is likely to be more severe for SMEs with an existing digital divide and limited access to a broader information pool. Large exporting firms often have established networks with few information barriers. These large exporters tend to be experienced exporters and are less likely to benefit most from public export promotion.[5]

An online marketplace platform is a digital place where search and matching between buyers and sellers occur digitally, driven by algorithms via a browser, app, or text interface (e.g. Amazon, eBay, and Rakuten). Typically, this platform is designed to match buyers (exporters) and sellers (importers) with the search engine, whereby searchers form a consideration set through textual search. The platform usually provides a mechanism for delivering goods and services reliably, with minimal risks. Online

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[5] While export promotion, in theory, is usually framed as an effective vehicle for promoting exports, empirical studies are sceptical of the effectiveness of public export promotion. The results at best are mixed. Some studies have found evidence that public Export Promotion Agencies (EPA) can be effective in improving the required social capital, such as business contacts, to initiate and complete new trade transactions. This argument is based on the idea that information barriers and networks are important in international trade. Other studies have found that the new trade transactions would have occurred without the EPA programme. Volpe Martincus and Carballo (2008) estimated the impacts of export promotion on exporters that chose to participate in the EPA programme using detailed firm-level data for Peruvian exporters during 2001–2005. They found that export promotion participation leads to increased exports, but primarily along with the extensive margin (new export market entry or new product introduction to existing export markets). Görg, Henry, and Strobl (2008) found that government grants to Irish manufacturing firms during 1983–2002 were effective in increasing the export revenues of existing exporters (intensive margin) but ineffective in encouraging firms to become new exporters (extensive margins). Bernard and Jensen (2004) showed that export promotion did not appear to have any significant influence on the probability of exporting (extensive margin) of United States manufacturing plants during 1984–1992. In sum, export promotion programmes induce some positive impacts on exports. The effects, however, are quite heterogeneous along the extensive and intensive margins of exports. Information and promotion can be useful for firms that are new to the export markets and resource-constrained firms.

marketplaces are rapidly gaining in popularity as an alternative to the traditional market. Growth in online shopping is expected to continue, with more businesses turning to digital marketplaces because of the pandemic and economic lockdowns.

They are two main types of digital marketplaces: a business-to-business (B2B) model in which the exporter's customer is another business (a distributor, wholesaler, or retail store); and a business-to-consumer (B2C) model, directly exporting and selling to consumers. Since exporting also entails knowledge about local fields (e.g. logistics, social media, and foreign language customer service), public digital marketplaces usually provide information about exporting.

While digital marketplaces lower the entry barriers for potential exporters, they also come with risks (Fradkin, 2017). For instance, both sellers and buyers face risks through anonymous transactions. This entails the risk of sellers remaining unpaid, their assets being damaged, or having to deal with overly demanding or unpleasant buyers. Buyers face the risk of not getting the good or service they expected to get. A typical solution to the problem of trust can be developing reputations.

For example, Japan's public trade promotion agency, the Japan External Trade Organization (JETRO), provides an online trade fair database – a search engine tool for upcoming trade fairs/exhibitions around the globe. This caters for both exporters from Japan to the world market and for exporters from the world to Japan. Searches can be conducted based on keywords, and the search results include a date, place, and brief description of the marketing events. In most cases, there is a link to the official website of the events. Additional information includes stories of Japanese companies based in Japan and overseas in selected industries (e.g. machinery, food, and information technology). A section on exploring craftsmanship and culture in Japan showcases stories about culture and market insights for exporters targeting the Japanese market. The website also lists company directories for FIEs by prefecture, providing a list of companies engaged in exporting and importing.

To gain further insight, we conducted an online interview with a director of JETRO in Wakayama, Japan.[6] Wakayama is situated on the Western coast of the Kii Peninsula in the Kansai region of the mainland in Japan, Honshu and is adjacent to Osaka. Wakayama is well known for agricultural products such as oranges and plums, which are exported to other Asian countries (Tourism Exchange Division, n.d.). During the interview, we learnt about noteworthy developments for SMEs from Wakayama expanding their operations overseas.

The director presented key export successes and the crucial role that JETRO played in facilitating international business expansion for Wakayama-based firms. He also confirmed our assertion that online support has expanded substantially, especially since the COVID-19 pandemic, and believes that

[6] We would like to thank the Chief Economist of ERIA (Economic Research Institute for ASEAN and East Asia), Prof. Kimura, for creating this opportunity for us.

online support (e.g. trade fairs) will remain strong. He confirmed the importance of digital support in lowering information barriers through the provision of updated and comprehensive information for businesses overseas in the initial stage of expansion. JETRO's national and worldwide networks, with offices in several countries, provide continued support and services for businesses operating overseas. The director discussed an example of how JETRO Wakaura has been involved in the initiation of business development by an auto parts producer in China through information exchange at a trade fair, connecting the business to overseas JETRO networks, and via consulting and mentoring.

We also conducted a cursory survey of public trade promotion services available to selected East Asian countries (Appendix B). Overall, the survey reveals that two types of services have been implemented:
1. A marketing platform promoting companies, products, and brands, with some matching facility functions.
2. A transactional website promoting products and brands, allowing buyers (importers) to purchase products directly (and a payment facility).

Surprisingly, amongst the surveyed countries, only the public agency in the Republic of Korea (henceforth, Korea) provides a digital marketplace with a B2B model promoting Korean exporters. Cambodia provides a B2C platform that advertises locally produced products and provides a payment system. Most countries only provide a marketing platform with information on exporting and importing.

5. Conclusion

Promoting GVCs has become a pillar of economic development strategies and thinking in public policy. With further digital transformation, GVCs can become more inclusive – involving SMEs and microenterprises. However, only productive and capable firms can participate in and enjoy the benefits of GVCs. Digital transformation is one possible way of reducing entry barriers and achieving inclusion in GVC participation. This process can eventually deliver trickle-down effects to the wider economy.

With this ongoing development in mind, we discussed how effectively governments can provide a digitally inclusive environment for firms, especially SMEs. We paid particular attention to public marketplaces. The current practice of government support for export promotion in East Asian countries focuses on providing information – such as trade fairs and market intelligence. There is significant room for governments to facilitate trade in the digital space. Services targeting SMEs could be particularly beneficial, as we identified a group of firms still indirectly involved with GVCs.

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Appendix A: Survey Questions to Define GVC Firms

The survey questions used to define global value chain (GVC) connections were as follows in the 2013 Enterprise Survey:

I. Sales structure (in 2012) of the most important products (in terms of value). Calculate as percentages.
   A) Individual people/households (non-tourists)
   B) Tourists
   C) Non-commercial government authorities
   D) Domestic, non-state enterprises
   E) State enterprises
   F) Foreign-invested enterprises
   G) Direct exports

II. From whom did the enterprise procure its raw materials and other inputs in 2012. Give percentage distribution in terms of value.
   A) From households
   B) Other non-state enterprises
   C) State enterprises
   D) Other state agencies
   E) Imported (directly)
   F) Other

III. Outsourcing
   A) Did the firm outsource production in 2012? Yes or No
   B) If yes, how many outsourcing subcontracts in 2012?
   C) What was the total costs of outsourcing in 2012? (D million)
   D) What percentage of your outsourcing contract value was for exports?
   E) The main reason for outsourcing parts of the production

IV. Firm as a subcontractor:
   A) Did the enterprise itself produce as a subcontractor in 2012? Yes or No
   B) If yes, how many subcontracts in 2012?
   C) What was the total revenue from these subcontracts in 2012? (D million)
   D) What percentage came from subcontracts with foreign-invested enterprises?

Source: Data from UNU-WIDER (n.d.), Viet Nam Data. https://www.wider.unu.edu/database/viet-nam-data (accessed 26 April 2023).

Appendix B: Summary of Government-Led Export Promotion

Australia

The Australian Trade and Investment Commission, Austrade (https://www.austrade.gov.au/australian/export), provides information and advice to help Australian companies reduce the time, cost, and risk of exporting. The agency provides the following services: information and advice on doing business in international markets, help with overseas market selection, identification of relevant overseas contacts, assistance with market entry and expansion, and identification and follow-up on specific international business opportunities.

This agency also administers the grants scheme, a financial assistance programme for exporters. One example is a specialised programme for start-up businesses investigating overseas markets, Landing Pads, which offers business scale-up programmes with an operational base and customised support for their overseas expansion goals. This immersive programme is based on one of the following cities: Singapore, San Francisco, Tel Aviv, Berlin, and Shanghai. The support includes a mentoring programme; co-working space; connection to local founder communities; and Austrade customer networks, partners, and contracts.

Cambodia

The General Directorate of Trade Promotion (https://www.gdtp.gov.kh/) is a government organisation under the Ministry of Commerce, responsible for trade policy development and strategic planning, market development, domestic product promotion, export promotion, and exhibition coordination; and acts as the Cambodian Inter-Ministerial Committee for participation in the World Expo and International Trade Exhibitions and coordination with the One Village One Product Movement National Committee. It also administers the B2C Go4eCam.

Indonesia

Inaexport (https://inaexport.id), developed at the end of 2019, is the official B2B platform of the Directorate General for National Export Development under the Ministry of Trade. Its mandate is to connect Indonesian exporters with worldwide buyers, promote Indonesian companies worldwide, and provide updated trade news for registered entities.

The platform facilitates searches and matching through a chat function. It also has a screening tool that requests detailed information about companies during the registration process, including product images, a summary of company profiles, and product specifications. It provides access to buyers' inquiries and can communicate directly with buyers and representatives of the Ministry of Trade (Indonesian trade attachés and the Indonesian Trade Promotion Center). Inaexport also provides updates on trade statistics, workshops, training, and trade show participation.

Malaysia

Malaysia's External Trade Development Corporation (MATRADE, https://www.matrade.gov.my/en/) is a Malaysian government agency that promotes the export of Malaysian products and services to overseas markets. Established in 1993, MATRADE's mission is to enhance Malaysia's export competitiveness by developing and promoting Malaysian exporters and their products and services to overseas markets. MATRADE provides various services to Malaysian exporters, including market research and analysis, trade promotion, business matching, trade advisory and consultation services, as well as trade education and training programmes. The agency also organizes trade exhibitions, seminars, and missions to help Malaysian businesses explore new markets and expand their export opportunities.

Republic of Korea

The Korea Trade-Investment Promotion Agency (https://www.buykorea.org/) provides the B2B online platform, buyKOREA. Offering more than 250,000 high-quality Korean products, the platform focuses on buyers of Korean products. It also facilitates payment services (via credit card or PayPal). Buyers can post inquiries and requests for quotation on buyKOREA, and Korean suppliers reply to buyers' inquiries directly. The platform also includes information about trade shows in Korea.

Singapore

Enterprise Singapore (https://www.enterprisesg.gov.sg/) is an agency under the Ministry of Trade and Industry, with the mandate of developing the overseas growth of Singapore-based enterprises and international trade. It has offices in more than 30 locations worldwide, helping enterprises export, develop business capabilities, find overseas partners, and enter new markets. It also provides similar services for overseas business trying to enter the Singapore market. Singapore is marketed as an ideal launchpad because of its unique advantages of strategic location, stable government, competitive workforce, and pro-business environment. It also provides a range of financial assistance based on the type of firm (e.g. start-ups).

Viet Nam

The Vietnam Trade Promotion Agency (VIETRADE) has contact details in English on its webpage (http://www.vietrade.gov.vn/) and a LinkedIn page (https://vn.linkedin.com/company/vietnam-trade-promotion-agency). VIETRADE provides a wide spectrum of services to assist Vietnamese and foreign enterprises in their business development and expansion.

Chapter 11

Can Digital Government Improve Economic Resilience?

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1. Introduction

As the coronavirus disease (COVID-19) pandemic continues to tarnish the world economy, more than 3 years since its outbreak, it has become increasingly apparent that governments around the world have a crucial role to play – both to contain the spread of the virus and protect lives and to revitalise the economy. Indeed, as new variants continue to emerge, uncertainties remain as to when the pandemic will be brought under control. Meanwhile, internet-based contactless activities have flourished, on the one hand driven by sustained restrictions on people's movements and interactions to contain the spread of the virus, and on the other hand supported by the development of internet-related technologies. Many foresee significant changes taking place and gradually taking root in how societies will be organised and function in the future.

As societies change and adapt, an important question is how governments have and should respond to enhance and improve their performance, by taking advantage of the possibilities arising from the emergence and spread of many internet- and data-based contactless governance tools. In this chapter, we approach this question by examining whether and how digital government plays a role in two important aspects – protecting lives and enhancing growth.

On the other hand, as significant development gaps remain amongst countries, the degree of digitalisation and the adoption of internet-based technologies varies considerably, including by governments. In addition to addressing various challenges with the available technology and infrastructure, governments have tried to adjust the development of digital government to adapt to the impacts of the pandemic. This may further diverge the development of digital government and its contribution to economic growth amongst different countries in the future.

The objective of this study is to examine the role of digital government in the world's efforts to fight the global pandemic. Our main research questions are:

(i) What are the impacts of digital government on countries' overall economic performance before and during the pandemic?

(ii) What are the impacts of digital government development on governments' pandemic policies?

(iii) What are the impacts of the pandemic on the development of digital government?

2. Literature Review

2.1. The impacts of digital government on economic performance

Since the 1960s, governments in many countries have undertaken the computerisation and basic automation of government services (Dunleavy et. al., 2006), although the development of digital government varies significantly amongst nations (UN, 2012; Nograšek and Vintar, 2014). International organisations also call for more efforts on the implementation of digital-government. The United Nations (UN, 2012) defined digital government as the use of information and communication technologies (ICTs) to deliver government services more effectively and efficiently to citizens and businesses. The World Bank (2008) also considered digital government as the use of information technology (IT) to improve business processes and service delivery by government departments and other government entities. For the Organisation for Economic Co-operation and Development (OECD, 2003: 17), digital government is 'the use of ICTs, and particularly the internet, to achieve better government'.

However, earlier academic research about digital government focused on the technology side and its impacts on public services (Dunleavy et al., 2006). More attention has been paid to the economic impacts of digital government since the early 2010s. Some studies have shown a positive relationship between digital government and economic growth (Khan and Majeed, 2019; Castro and Lopes, 2022). Research has also investigated the impacts of digital government on different aspects of the economy, such as trade (Majeed and Malik, 2016), the digital economy (Ali, Hoque, and Alam, 2018), and foreign direct investment (Al-Sadiq, 2021). Zhao, Wallis, and Singh (2015) found that the relationships between digital government and the digital economy are reciprocal.

Based on annual data for 24 OECD member countries from 1998 to 2006, Corsi and D'Ippoliti (2013) showed that investment in digital government can significantly improve the productivity of public administrations, which can further contribute to economic growth.

Bélanger and Carter (2012) argued that by using ICT, digital government allows governments to provide better-quality and more effective and efficient public services for businesses, employees, residents, and other government entities, which can lubricant the growth of the economy. The adoption of digital government can also boost public services and communication (Krishnan, Teo, and Lim, 2013) as well as the information economy and other business opportunities, which are also growth drivers of the economy.

Ali (2021) showed that better digital government can help economies enhance foreign direct investment inflows through three channels: efficiency gains through cost and time reductions; reduced corruption, with more inclusive, effective, accountable, and transparent public services; and access to information and knowledge about investment opportunities.

Based on annual data for 15 countries in the Middle East and North Africa region between 2003 and 2018, Dhaoui (2022) showed that better digital government development significantly improves governance in terms of the control of corruption, government effectiveness, and regulatory quality. The study also found that good governance has a positive contribution to sustainable development, including gross domestic product (GDP) per capita. However, there is no significant evidence of digital government's positive impacts on any aspects of sustainable development they investigated.

On the other hand, evidence has shown that economic performance can also affect the development of digital government. For example, based on the annual data of the 534 largest cities in the world for 2003, 2009, and 2016, Ingrams et al. (2020) showed that population size, GDP, and regional competition have a positive impact on the development of digital government.

2.2. The role of digital government in the pandemic

As infectious cases began rising sharply in various countries in early 2020, governments took unprecedented steps to lock down social activities to contain the spread of the virus, which inadvertently disrupted the global economy. The negative impacts of the pandemic on the global economy have achieved widespread agreement amongst economists (Statista Research Department, 2023). A forecast by the World Bank indicated that the economic recession in 2020 would affect 90% of the world's economies and could become the deepest since World War II (World Bank, 2020). According to the International Monetary Fund (IMF, 2021), global economic growth fell to an annualised rate of around –3.2% in 2020. In addition, the impacts can be long-lasting. According to OECD (2020) calculations, output may remain around 5% below pre-crisis expectations in many countries in 2022. OECD (2020) also warned that the pandemic is fragmenting the global economy through a growing number of trade and investment restrictions and diverging policy approaches that are being implemented on a country-by-country basis, which can have very long impacts on the global economy.

Meanwhile, governments' economic policy responses to the pandemic were extraordinary in terms of the speed with which they took place, the broad scope of the fiscal and monetary policies they adopted, and the number of countries involved. Therefore, the implementation of these policies is crucial to their effectiveness.

Several studies have shown that digital government can play an important role in policy implementation during the pandemic. According to Knutt (2020), the Romanian Ministry of Labour used robotic process automation to distribute direct payments to self-employed workers impacted by COVID-19. Of the 285,000 claims processed, 96% were automated, with each claim taking 36 seconds as opposed to 20 minutes when processed manually. A Gartner report (Gartner, 2020) also showed that government organisations increased their IT spending on digital public services, public health, social services, education, and workforce reskilling in support of individuals, families, and businesses that were heavily impacted by the COVID-19 pandemic in 2020.

Sullivan et al. (2021) argued that digital government was no longer 'nice to have' for governments, but imperative. They found that, to meet the needs of the pandemic, governments all over the world accelerated their digital transformation through investment and human capital training, and 79% of government officials in their survey indicated that automation is making a significant positive impact on their business, so the adoption of automation is likely to continue. Based on a web survey amongst 404 residents during the Recovery Movement Control Order period in Malaysia in 2020, Dawi et al. (2021) showed that digital government significantly improved public engagement on protective behaviour. However, further quantitative analysis and studies on this topic are still needed.

Some governments have also adjusted the development of digital government to adapt to the impacts of the pandemic. Based on a survey of individuals, officials, and government agents in Latin America and the Caribbean, Roseth, Reyes, and Yee Amézaga (2021) found that the pandemic has led many countries to digitise a significant range of services. At the same time, the proportion of citizens using the internet to access government transactions rose from 21% before the pandemic to 39% during it. However, around 50% of citizens completed their last such transaction in person. Regarding teleworking in the public sector, almost half of all employees stated that they had been unable to perform critical tasks since the onset of the pandemic, many of which could have been resolved using digital governance tools. These findings point to the need to improve the availability and quality of digital services, as well as the feasibility of government telework.

A UN Department of Economic and Social Affairs policy brief showed that the percentage of government portals with COVID-19 information increased from 57 on 25 March 2020 to 86 on 8 April 2020. It argued that digitalisation can help governments and society respond to crises in the short term, resolve socio-economic repercussions in the midterm, and reinvent policies and tools in the long term (UN DESA, 2020).

Freeguard, Shepheard, and Davies (2020) argued that the pandemic has accelerated the digital transformation of public service delivery and government use of data in the United Kingdom. They showed that digitalisation has made public services more efficient in certain sectors, such as the Coronavirus Job Retention Scheme, the Self-Employment Income Support Scheme, the Vulnerable People Service, and Verify and Notify Citizens. However, they also noticed some high-profile failures, such as the roll-out of the contact tracing app, which caused more problems than it solved.

In summary, digital government has been considered an important contributor to many countries' economic growth and their efforts to combat the pandemic. Some countries have also accelerated the development of digital government during the pandemic. In the following sections, we will investigate how digital government has contributed to countries' efforts to combat the pandemic as well as its possible contribution to economic growth in the future.

3. Methodology

We follow the policy-oriented study of Bassanini and Scarpetta (2003) and use their policy-augmented growth equation derived from a neoclassical growth model based on constant-returns-to-scale technology (Barro, Mankiw, and Sala-I-Martin, 1995) as our benchmark equation:

$$g_{i,t} = \beta_0 + \beta_1 \, lny_{i,t-1} + \beta_2 \, lnI_{i,t} + \beta_3 \, h_{i,t} + \beta_4 \, \Delta lnpop_{i,t} + \sum_{i=5}^{m} \beta_j \, lnV_{i,t}^{j} + \varepsilon \qquad (1)$$

where g is the annualized growth rate of GDP per capita; y is GDP per capita; I is the investment; h is human capital; $\Delta lnpop$ is population growth; V_j is a vector of policy-related variables affecting economic efficiency; and ε is the usual error term. The policy-related variables include inflation, government size, financial development, and openness.

To investigate the impact of digital government on economic performance, we add digital government related variables into Equation (1). As suggested by the UN E-Government Survey, e-government can affect the economy from two aspects: the development status of e-government and public participation in e-governance. Since digital government shares many features with e-government, the economic impacts of digital government can be quite similar to those of e-government. Therefore, our analysis of the economic impacts of digital government also includes variables measuring the development status of e-government and public participation in e-governance.

According to the literature mentioned above, the COVID-19 pandemic impacted the economies mainly from three channels. First, the severe epidemic made people unable to carry out normal economic activities due to the fear of being infected. Second, the preventative measures implemented by governments to slow the spread of the virus also slowed down most economic activities. Third, governments' economic supporting policies may help reduce the economic damage caused by the epidemic and promote economic recovery. The first impact has negative impacts on almost all aspects of economic performance. Therefore, we add the pandemic-related variables to our estimated equations to investigate the impacts of pandemic severity, preventative measures, and economic support policies on economic performance.

The pandemic effects may also change the effectiveness of digital government. As many studies mentioned above have shown, during the pandemic, the development of digital government has been speeded up in many countries, including both infrastructure development and utilisation. At the same time, due to its contactless feature, digital government may also improve the effectiveness of governments' preventative measures and economic support policies. Therefore, the impacts of digital government on economic performance may be strengthened during the pandemic. We add the interactive variables of digital government and pandemic-related variables into our estimated equations to test these possible impacts.

The data we used to measure the variables mentioned above are from three sources: the economic-related data are from CEIC Data's World Trend Plus Database (CEIC, 2022); the digital government related data are from the UN's E-Government Survey for 2014, 2016, 2018, and 2020 (UN, 2014, 2016, 2018, 2020); and the pandemic-related data are from the Oxford COVID-19 Government Response Tracker (OxCGRT) (Mathieu et al., 2020).

CEIC Data's World Trend Plus Database provides annual and seasonally adjusted quarterly time series data on key economic indicators such as nominal and real GDP and GDP growth, the Consumer Price Index (CPI), government consumption, exports, imports, capital formation, and population. CEIC calculates the seasonally adjusted series by X-12 ARIMA.[1]

The UN E-Government Survey is a biennial survey published by the Department of Economic and Social Affairs since 2001 (UN, 2001). It assesses the digital government development status (E-Government Development Index (EGDI)) and the effectiveness of the digital government (E-Participation Index (EPI)) of all 193 UN Member States. Neither the EGDI nor the EPI capture digital government development or inclusion in an absolute sense; rather, they give a performance rating of national governments relative to one another. The EGDI tries to incorporate countries' website development patterns and access characteristics, such as infrastructure and educational levels, to reflect how a country uses IT to promote access and inclusion. Therefore, the EGDI is a weighted average of three normalised scores on the three most important dimensions of e-government: (i) the scope and quality of online services (Online Service Index), (ii) the development status of telecommunication infrastructure (Telecommunication Infrastructure Index), and (iii) inherent human capital (Human Capital Index). These aspects are also the three most important factors for the development of digital government. Therefore, the EGDI can also reflect the development status of digital government.

The survey questions and the national scores of the EPI focus on how well a government relays information to its constituents (e-information sharing), how engaged citizens are in the design of policies (e-consultation), and how empowered citizens feel in the decision-making process (e-decision making). The EPI is normalised by taking the total score value for a given country, subtracting the lowest total score for any country in the same year survey, and dividing by the range of total score values for all countries.

The OxCGRT tracks the development of the COVID-19 pandemic and the policy measures that governments have taken to deal with COVID-19 since 1 January 2020. It provides systematic information covering more than 180 countries and codes the information into 23 indicators. In our study, we use the number of confirmed cases, the overall government response index, the stringency index, the economic support index, and the containment and health index.

A detailed description of the variables and data used in our empirical analysis is summarised in Table 11.1.

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[1] X-12-ARIMA is a seasonal adjustment software package developed by the United States Census Bureau in 1998. It is based on the autoregressive integrated moving average (ARIMA) regression model.

Table 11.1. Variable List

Variable	Description	Availability
	Economic variables	
growthi,t	Seasonally adjusted year-on-year growth of quarterly real GDP	Q1 2015–Q3 2021
Export	Seasonally adjusted year-on-year growth of quarterly exports in million US dollars	Q1 2014–Q3 2021
Import	Seasonally adjusted year-on-year growth of quarterly imports in million US dollars	Q1 2014–Q3 2021
lnCF	Logarithm of seasonally adjusted quarterly gross fixed capital formation in million US dollars	Q1 2014–Q3 2021
CPIYOY	Seasonally adjusted year-on-year change in quarterly Consumer Price Index	Q1 2014–Q3 2021
GDPPC	Real GDP per capita, annual data	2014–2020
lnH	Logarithm of the stock of human capital measured with the Human Capital Index from CEIC, which is calculated by the Groningen Growth and Development Centre and based on years of schooling and returns to education, annual data	2014–2020
lnPop	Logarithm of population in million persons, annual data	2014–2020
lnDeposit	Financial development measured by the logarithm of total deposits as a percentage of GDP, annual data	2014–2020
Open	Exposure of countries to foreign trade measured by the sum of exports and imports as a share of GDP, annual data	2014–2020
	Digital government variablesw	
EGOV	UN E-Government Index, biennial data	2016, 2018, 2020
EPart	UN E-Participation Index, biennial data	2016, 2018, 2020
EServ	Online Service Index, biennial data	2016, 2018, 2020
Tel	Telecommunication Infrastructure Index, biennial data	2016, 2018, 2020
	Pandemic-related variables	
Pandemic	A dummy variable valued at 1 for Q1 2020–Q3 2021, and 0 for Q1 2015–Q4 2019	Q1 2015–Q3 2021
lnConfirmed	Logarithm of the total number of confirmed cases. Equals 0 for periods before Q1 2020.	Q1 2015–Q3 2021
RConfirmed	Share of confirmed cases in population. Equals 0 for periods before Q1 2020.	Q1 2015–Q3 2021
GovResp	The OxCGRT overall government response index measures the overall strength of government responses based on all indicators in the database. A higher value indicates stronger government responses. Equals 0 for periods before Q1 2020.	Q1 2015–Q3 2021

Variable	Description	Availability
Stringency	The OxCGRT stringency index measures the strictness of 'lockdown style' policies that restrict people's behaviour and public information campaigns. A higher value indicates stricter policies. Equals 0 for periods before Q1 2020.	Q1 2015–Q3 2021
EconSupport	The OxCGRT economic support index measures the strength of economic policies such as income support and debt relief. A higher value indicates stronger economic support. Equals 0 for periods before Q1 2020.	Q1 2015–Q3 2021
Health	The OxCGRT containment and health index combines 'lockdown' restrictions and closures with health-related measures such as testing policy and contact tracing, short-term investment in healthcare, as well investments in vaccines.	Q1 2015–Q3 2021

GDP = gross domestic product, Q = quarter, UN = United Nations, US = United States.

Source: Authors' summary.

All policy-related variables have been introduced with a 1-year lag to reflect the lag of policy effectiveness. After combining data from all three data sources, we have 62 countries left in our estimations.

As our data mix up quarterly, annual, and biennial data, the number of observations for each regression is determined by the frequency of its dependent variable. If the data of the dependent variable are quarterly (e.g. the growth), the values of an independent variable with annual data will be the same for all quarters of the same year. If the dependent variable is a biennial digital government related variable, the values for the fourth quarter (Q4) of the previous year will be used for the independent economic variables. The values for different quarters of the same year will be used in separate regressions for the pandemic-related variables, so that the impacts of the pandemic at different periods can be investigated. A more detailed explanation is provided in the following section.

4. Statistic and Econometric Analysis Results

4.1. The impact of the pandemic and Chinese investment

To analyse the impacts of the pandemic on economies, we first compare the changes in economic performance in 2020 by region based on our data. The regional mean values[2] of year-on-year percentage changes in 2020 are calculated for the economic variables listed in Table 11.1 and reported in Table 11.2. Regions are listed in the order of their regional mean changes of real GDP, from lowest to highest. From Table 11.2, we have a preliminary finding: the pandemic did affect the economic performance of most economies in 2020. All regions recorded negative mean changes in real GDP and openness in 2020. All regions except South America increased government consumption expenditure in 2020.

To compare the development of digital government and the impact of the pandemic on digital government development for different regions, we calculated the regional mean values of digital government related variables as well as changes in these regional mean values for different regions in 2020. In Tables 11.3 and 11.4, regions are listed in the order of their regional mean e-government, index from highest to lowest. Table 11.3 reports the regional mean values of each index in 2020. Table 11.4 reports the differences between the regional mean of biennial index changes in 2020 and the regional mean of biennial index changes over 2016–2020. From Tables 11.3 and 11.4, we can see that the development of digital government in Oceania, East Asia, and Europe is better than in other regions. However, for all these top regions, the provision of online services is less developed than e-participation, human capital, and telecommunication infrastructure. The Arab Middle East is temporarily behind but developed rapidly during 2018–2020 (Table 11.4). All regions except South America have accelerated the development of telecommunication infrastructure in recent years, especially those left behind such as Sub-Aaharan Africa, the Arab Middle East, and West Asia (Table 11.4). On the other hand, the growth of online services provision and e-participation have been slowing significantly for most regions. This may be because the development of digital government has reached a more challenging stage compared with earlier stages for the whole world.

2 We performed similar analysis based on median values, which produced similar findings.

Table 11.2. Year-on-Year Change in Economic Performance by Region, 2020

(%)

Region	Real GDP	Real GDP per capita	Openness	Government Consumption Expenditure	Total Deposit
North America	-10.36	1.19	-5.74	4.11	9.67
South America	-7.73	-8.30	-0.33	-6.79	14.40
Arab Middle East	-5.78	-6.17	-12.45	21.76	14.72
Sub-Saharan Africa	-4.37	-6.62	-6.14	4.31	22.91
Europe	-4.35	-4.10	-4.86	7.42	18.19
West Asia	-2.99	-3.83	-9.26	6.33	10.63
Southeast Asia	-2.75	-3.72	-1.39	4.23	9.68
Oceania	-1.79	-2.69	-5.72	7.25	18.36
East Asia	-1.72	-2.04	-5.19	8.23	17.12
Total	**-4.42**	**-4.91**	**-5.66**	**6.31**	**15.60**

GDP = gross domestic product.

Source: Authors' calculation based on data from CEIC (2022).

Table 11.3. Digital Government Development by Region, 2020

Region	E-Government Index	E-Participation Index	Online Service Index	Human Capital Index	Telecom-munication Infrastructure Index
Oceania	0.845	0.806	0.794	0.925	0.817
East Asia	0.835	0.865	0.812	0.858	0.835
Europe	0.826	0.813	0.786	0.878	0.816
South America	0.726	0.749	0.738	0.808	0.633
Southeast Asia	0.649	0.625	0.622	0.694	0.630
North America	0.642	0.610	0.607	0.730	0.591
West Asia	0.638	0.652	0.658	0.720	0.536
Arab Middle East	0.570	0.502	0.519	0.619	0.571
Sub-Saharan Africa	0.429	0.447	0.456	0.513	0.318
Total	**0.650**	**0.641**	**0.636**	**0.716**	**0.598**

Source: Authors' calculation based on data from UN (2014, 2016, 2018, 2020).

Table 11.4. Impacts of the Pandemic on Digital Government Development by Region

Region	E-Government Index	E-Participation Index	Online Service Index	Human Capital Index	Telecom-munication Infrastructure Index
Oceania	5.659	4.536	-3.959	-0.318	28.470
East Asia	-0.934	-17.621	-14.621	-0.872	15.768
Europe	-1.170	-17.481	-14.486	-3.571	12.828
South America	-5.692	-16.831	-18.683	-3.866	-8.407
Southeast Asia	1.695	-1.229	-19.867	-3.724	1.485
North America	-2.758	-30.663	-26.326	-0.542	11.256
West Asia	1.913	-33.191	-44.171	3.433	38.872
Arab Middle East	15.369	-0.804	13.636	5.227	40.409
Sub-Saharan Africa	9.277	0.901	-9.907	7.543	41.247
Total	**3.414**	**-12.488**	**-15.098**	**1.108**	**23.376**

Source: Authors' calculation based on data from the UN (2014, 2016, 2018, 2020).

4.2. Estimation results

To further analyse the impacts of the pandemic and digital government on economies quantitatively, we performed some regressions and reported the estimations in Tables 11.5–11.13. Table 11.5 shows our estimations of the benchmark equation (the first column) and the overall impacts of the pandemic (columns 2–3) and digital government (columns 4–6) on economic growth, respectively. The dependent variables for all equations in this table are the year-on-year growth of seasonally adjusted quarterly GDP in real terms, and the results are based on random effect panel data regressions. Our benchmark equation is the estimation of Equation (1) based on pre-pandemic data (Q1 2015–Q4 2019). For the benchmark equation, the estimated convergent coefficients (the coefficient of GDPPC1, the GDP per capita lagged one period), the population, and inflation (*CPIYOY*) are significantly negative, while the estimated coefficients for capital formation, the growth of exports and imports, and financial development (*lnDeposit*) are significantly positive. These results are consistent with most literature. The estimated coefficients for human capital (*lnH1*) and Open are not significant but with expected signs. Column (2) also estimates the Equation (1) but is based on data during the pandemic (Q1 2020–Q3 2021). We can see that the estimated coefficients for *GDPPC1*, *lnPop*, and *CPIYOY* are no longer significant. The sign of the estimated coefficient for lnDeposit even changes from significantly positive to significantly negative. This indicates that the pandemic has significant economic impacts. In column (3), we add a dummy variable *pandemic* to Equation (1) and include data both before and during the pandemic. The significance and signs of estimated coefficients in column (3) are similar to those in column (1), except that *lnDeposit* becomes insignificant. The estimated coefficient for *Pandemic* is significantly negative, which is consistent with our expectation of the pandemic's negative shock on economies.

We further investigate how the development of digital government has affected economic growth by adding digital government related variables to Equation (1) and estimate the equation with pre-pandemic data. As the digital government data are only available for two of the five pre-pandemic years (2016, 2018) covered by our study, our number of observations decreases from 1,298 in column (1) to 520 in columns (4)–(6) of Table 11.5. We can see that the estimated coefficients for EGOV are significantly positive in column (4). This indicates that the development of digital government promotes economic growth. We then decompose digital government into online service provision and telecommunication infrastructure. In column (5), the estimated coefficient is significantly positive for online service provision while insignificant for telecommunication infrastructure. This indicates that the expansion of available online services can significantly support economic growth, but the huge investment in telecommunication infrastructure has no clear impacts in the short run. When we add the E-Participation Index to the equation in column (6), its estimated coefficient is positive but not significant. But the estimated coefficient for the E-Government Index becomes insignificant with a much smaller value. This means that better public participation in digital government may play an important role in digital government's economic impacts. In unreported results, we also estimated Equation (4) with data during the pandemic. The estimated coefficient for digital government is still insignificant, but its sign becomes negative. This indicates that the impacts of digital government might be very different during the pandemic compared with pre-pandemic impacts.

To investigate the impacts of the pandemic on the development of digital government, we use the four digital government related variables mentioned above as dependent variables and regress them on the dummy variable *pandemic*, respectively, based on annual data for 2016, 2018, and 2020. To control for the various trending factors of the digital government development, we add the variable year into the estimations. Since the independent variable that we are interested in is *pandemic*, a dummy variable, the fixed effect panel data regression will drop it. Therefore, we use the random effect panel data regression. As shown in Table 11.6, based on our random effect panel data regressions, the estimated coefficients for *pandemic* are all statistically significant, which indicates that the development of digital government before and during the pandemic is significantly different. The signs of the estimated coefficients suggest that during the pandemic, the overall development of digital government and telecommunication connectivity is faster than before, while the improvement in public participation and the provision of online services is slower. This indicates that, although the overall online and digital transformation of public governance is accelerated during the pandemic, the involvement expansions of both citizens and public servants are slower than the development of facilities. This may because of the reduction in public governance activities during the pandemic.

Table 11.5. Overall Impacts of Digital Government and the Pandemic

Variable	(1) Benchmark	(2) In Pandemic	(3) Eq1	(4) Eq2	(5) Eq3	(6) Eq4
GDPPC1	-2.636 ***	0.644	-2.094 ***	-3.411 ***	-3.179 ***	-3.171 ***
lnCF	1.005 ***	2.656 ***	2.408 ***	1.429 ***	1.448 ***	1.415 ***
lnH1	-1.497	-1.182	-2.729	-1.264	-0.161	-0.900
lnPop	-1.972 ***	-0.931	-2.382 ***	-2.323 ***	-2.361 ***	-2.310 ***
Open	0.078	-1.565	0.234	0.274	0.272	0.279
Export	0.024 ***	0.169 ***	0.041 ***	0.019 ***	0.020 ***	0.019 ***
Import	0.027 ***	0.184 ***	0.063 ***	0.022 ***	0.022 ***	0.021 ***
CPIYOY	-0.153 ***	0.009	-0.095 ***	-0.128 ***	-0.124 ***	-0.123 ***
lnDeposit	0.793 ***	-1.615 *	-0.174	0.694 **	0.705 **	0.669 **
Pandemic			-6.136 ***			
EGOV				4.170 **		0.643
Eserv					1.782 *	
Tel					-0.488	
Epart						1.836
_cons	16.891 ***	-8.124	12.051 ***	19.210 ***	17.358 ***	17.940 ***
N	1298	228	1526	520	520	520
r2_o	0.206	0.551	0.508	0.293	0.287	0.295
r2_w	0.169	0.652	0.558	0.166	0.166	0.169
r2_b	0.304	0.388	0.371	0.422	0.413	0.425

Notes: *** = significant at the 1% level; ** = significant at the 5% level; * = significant at the 10% level.

Source: Authors.

Table 11.6. Impacts of the Pandemic on the Development of Digital Government (based on 2016, 2018, and 2020 annual data)

Variable	EGOV	Epart	Eserv	Tel
year	0.020 ***	0.046 ***	0.045 ***	0.013 ***
pandemic	0.019 ***	-0.093 ***	-0.096 ***	0.125 ***
_cons	-40.078 ***	-92.223 ***	-90.692 ***	-25.658 ***
N	596	596	596	596
r2_o	0.059	0.085	0.084	0.098

Notes: *** = significant at the 1% level; ** = significant at the 5% level; * = significant at the 10% level.

Source: Authors.

Table 11.7. Impacts of the Pandemic on the Development of Digital Government in Different Periods

Variable	EGOV	Epart	Eserv	Tel	EGOV	Epart	Eserv	Tel
				Q2 2020				
RConfirm	7.87E-06 *	7.58E-06	7.98E-06	1.18E-05 **				
lnConfirm					0.036 ***	0.05 ***	0.048 ***	0.035 ***
_cons	0.711 ***	0.711 ***	0.7 ***	0.657 ***	0.325 ***	0.195 ***	0.206 ***	0.285 ***
N	105	105	105	105	145	145	145	145
r2	0.054	0.029	0.04	0.075	0.18	0.252	0.266	0.115
				Q3 2020				
RConfirm	3.97E-06 ***	4.42E-06 **	4.53E-06 **	5.03E-06 ***				
lnConfirm					0.032 ***	0.045 ***	0.043 ***	0.029 ***
_cons	0.706 ***	0.702 ***	0.691 ***	0.655 ***	0.321 ***	0.188 ***	0.201 ***	0.296 ***
N	105	105	105	105	145	145	145	145
r2	0.051	0.037	0.048	0.051	0.128	0.179	0.187	0.074

Q = quarter.

Notes: *** = significant at the 1% level; ** = significant at the 5% level; * = significant at the 10% level.

Source: Authors.

Table 11.8. Impacts of Pandemic Policies on the Development of Digital Government in Different Periods

Variable	Q2 2020				Q3 2020			
	EGOV	Epart	Eserv	Tel	EGOV	Epart	Eserv	Tel
Stringency	-0.014 ***	-0.015 ***	-0.013 ***	-0.017 ***	-0.009 ***	-0.010 ***	-0.008 ***	-0.013 ***
Health	0.016 ***	0.019 ***	0.016 ***	0.020 ***	0.012 ***	0.013 ***	0.011 ***	0.016 ***
EconSupport	0.003 ***	0.003 ***	0.003 ***	0.003 ***	0.003 ***	0.003 ***	0.003 ***	0.003 ***
_cons	0.410 ***	0.365 ***	0.368 ***	0.341 ***	0.347 ***	0.345 ***	0.347 ***	0.242 ***
N	145	145	145	145	145	145	145	145
r2	0.430	0.342	0.341	0.431	0.340	0.271	0.271	0.355

Q = quarter.

Notes: *** = significant at the 1% level; ** = significant at the 5% level; * = significant at the 10% level.

Source: Authors.

To study whether the impacts of the pandemic vary during different periods of the pandemic, or by the severity of the pandemic, we regress the digital government variables on the number of confirmed cases and the share of confirmed cases over the total population, respectively. As we have only 1 year (the 2020 UN E-Government Survey) of pandemic data for digital government, which reflect the digital government development status at the end of 2020, we use robust ordinary least squares (OLS) regressions based on the data for Q2 and Q3 2020. Our estimation results in Table 11.7 show that, for Q2 2020, the greater share of confirmed cases significantly accelerated the overall development of digital government and telecommunication connectivity, while the increase in the number of confirmed cases significantly increased the development of all aspects of digital government. For Q3 2020, a more severe pandemic, in terms of both the number and share of confirmed cases, accelerated all aspects of the digital government development.

We further investigate the impact of pandemic-related policies on the development of digital government with robust OLS regressions, based on data for Q2 and Q3 2020. As shown in Table 11.8, the stringency of virus containment measures significantly slowed the development of digital government in all aspects, while economic support and health policies (e.g. tracing and vaccination) significantly promoted the development of digital government.

As mentioned earlier, the development and availability of digital government may also help the global battle with the virus and economic performance. We investigate the impact of digital government on the government's response to the pandemic with random effect panel data regressions. To control for the impacts of the pandemic severity on governments' responses, we add the number or share of confirmed cases in the regressions, respectively. To solve the endogeneity problem, we use the 2018 digital government data, the latest before the pandemic. Our estimation results in Table 11.9 show that when we use the share of confirmed cases to reflect the severity of the pandemic, digital government significantly promotes governments' overall responses to the pandemic and the economic support policies. When we use the number of confirmed cases to reflect the impacts of pandemic severity, digital government significantly promotes all aspects of the government responses.

Table 11.9. Impacts of the Development of Digital Government on Government Responses to the Pandemic

Variable	Stringency	Health	EconSupport	GovResp	Stringency	Health	EconSupport	GovResp
RConfirm	0.000 ***	4.49E-06	-6.3E-05 **	-5.53E-06				
EGOV1	-1.849	8.37848	73.918 ***	16.693 **	23.737 ***	20.944 ***	67.758 ***	27.105 ***
lnConfirm					-2.059 ***	-0.029	0.572 **	0.016
_cons	65.332 ***	51.682 ***	0.471	45.178 ***	65.023 ***	44.401 ***	-3.094	38.509 ***
N	681	702	702	702	1010	1011	1011	1011
r2_o	0.033	0.007	0.123	0.021	0.019	0.078	0.249	0.151
r2_w	0.085	0.000	0.005	0.002	0.171	0.002	0.000	0.000
r2_b	0.001	0.012	0.211	0.034	0.045	0.149	0.417	0.264

Q = quarter.

Notes: *** = significant at the 1% level; ** = significant at the 5% level; * = significant at the 10% level.

Source: Authors.

Table 11.10. Impacts of Public Participation on Government Responses to the Pandemic, Q1 2020–Q3 2021

Variable	Stringency	Health	EconSupport	GovResp	Stringency	Health	EconSupport	GovResp
RConfirm	0 ***	7.32E-06	-6.00E-05 **	-2.45E-06				
EGOV1	-22.214 *	1.762	64.603 ***	9.221	6.588	22.1 ***	48.91 ***	25.799 ***
EPart1	17.69 *	5.78	8.139	6.56	16.031 *	-1.121	17.509	1.21
lnConfirm					-2.018 ***	-0.027	0.616 **	0.022
_cons	66.687 ***	52.11 ***	1.08	45.639 ***	65.125 ***	44.369 ***	-2.896	38.488 ***
N	681	702	702	702	1010	1011	1011	1011
r2_o	0.041	0.012	0.12	0.025	0.02	0.078	0.242	0.151
r2_w	0.088	0	0.007	0.001	0.174	0.002	0.002	0
r2_b	0.003	0.02	0.206	0.039	0.051	0.149	0.402	0.263

Q = quarter.

Notes: *** = significant at the 1% level; ** = significant at the 5% level; * = significant at the 10% level.

Source: Authors.

Table 11.11. Impacts of Digital Government Investment on Government Responses During the Pandemic, Q1 2020–Q3 2021

Variable	Stringency	Health	EconSupport	GovResp	Stringency	Health	EconSupport	GovResp
RConfirm	0.000 ***	1E-05	-5E-05	1.22E-06				
EGOV1	19.272 ***	10.668	42.604 ***	15.025 **	28.261 ***	10.138 **	45.510 ***	14.731 ***
EPart1	-20.132 ***	-1.444	19.016	0.851	-6.643	8.778 *	13.823	9.516 **
lnConfirm					-1.956 ***	-0.033	0.689 **	0.027
_cons	62.378 ***	50.738 ***	9.937	45.520 ***	64.581 ***	46.347 ***	1.811	40.856 ***
N	681	702	702	702	1010	1011	1011	1011
r2_o	0.055	0.024	0.105	0.037	0.026	0.074	0.221	0.143
r2_w	0.089	0.001	0.009	0.000	0.172	0.002	0.004	0.000
r2_b	0.029	0.043	0.178	0.059	0.035	0.142	0.365	0.250

Q = quarter.

Notes: *** = significant at the 1% level; ** = significant at the 5% level; * = significant at the 10% level.

Source:

Table 11.12. Impacts of the Pandemic on Economic Growth

Variable	(1)	(2)	(3)
GDPPC1	1.871 ***	1.274 *	-2.387 ***
lnCF	2.235 ***	2.333 ***	2.601 ***
lnH1	-10.562 ***	-9.245 ***	-2.608
lnP	-0.044	-0.424	-2.682 ***
Open	1.455 **	1.187 **	0.225
CPIYOY	-0.077 ***	-0.078 ***	-0.095 ***
Export	0.052 ***	0.052 ***	0.041 ***
Import	0.114 ***	0.111 ***	0.060 ***
lnDeposit	-2.398 ***	-2.118 ***	-0.081
Confirmed	-0.000 **		
RConfirmed		-0.000 ***	
Pandemic			-3.962 ***
Stringency			0.104 ***
Health			-0.116 ***
EconSupport			-0.030 ***
_cons	2.540	3.884	12.660 ***

Variable	(1)	(2)	(3)
N	1526	1526	1526
r2_o	0.233	0.263	0.518
r2_w	0.365	0.376	0.574
r2_b	0.109	0.140	0.362

Notes: *** = significant at the 1% level; ** = significant at the 5% level; * = significant at the 10% level.
Source: Authors.

Table 11.13. Interactive Impacts of Digital Government and the Pandemic

Variable	(1)	(2)	(3)	(4)
GDPPC1	-1.814 **	2.332 ***	-1.887 **	-2.009 ***
lnCF	2.259 ***	1.977 ***	2.554 ***	2.521 ***
lnH1	0.923	5.757 **	1.409	1.454
lnP	-2.275 ***	-1.272 *	-2.681 ***	-2.738 ***
Open	-0.219	-0.138	-0.206	-0.224
CPIYOY	-0.045	0.001	-0.039	-0.038
Export	0.066 ***	0.082 ***	0.069 ***	0.069 ***
Import	0.097 ***	0.133 ***	0.088 ***	0.090 ***
lnDeposit	-0.143	-0.862 **	-0.059	0.061
Pandemic	-12.476 ***			
RConfirmed		0.001		
Stringency			-0.142	-0.053
Health			-0.098	-0.169
EconSupport			0.009	0.028
EGOV	-5.445	-42.763 ***	-10.038 **	
Epart	0.844	12.211 ***	2.508	
*EGOV*Pandemic*	7.297 **			
*EPart*Pandemic*	1.831			
*EGOV*RConfirmed*		-0.001		
*EPart*RConfirmed*		0.000		
*EGOV*Stringency*			0.858 **	
*EGOV*Health*			-0.768	
*EGOV*EconSupport*			0.040	
*Epart*Stringency*			-0.486 *	

Variable	(1)	(2)	(3)	(4)
*Epart*Health*			0.637 *	
*Epart*EconSupport*			-0.100	
EServ				-0.923
Tel				-5.140 **
*EServ*Stringency*				-0.227
*EServ*Health*				0.444
*EServ*EconSupport*				-0.142 **
*Tel*Stringency*				0.502 **
*Tel*Health*				-0.491 *
*Tel*EconSupport*				0.058
_cons	9.006 **	-11.357 ***	8.425 **	6.996 *
N	744	744	744	744
r2_o	0.614	0.490	0.634	0.636
r2_w	0.656	0.624	0.684	0.683
r2_b	0.428	0.216	0.412	0.427

Notes: *** = significant at the 1% level; ** = significant at the 5% level; * = significant at the 10% level.

Source: Authors.

The estimation results in Table 11.10 show that the improvement in e-participation significantly increases the stringency of virus containment measures. This indicates that, with better prepared digital government, governments tend to be stricter in terms of controlling the virus spread. The reason can be that it is easier for governments to implement the stringency policies with the help of digital government. In the estimations shown in Table 11.11, we decompose digital government into telecommunication connectivity and online service provision. We can see that better online service provision significantly promotes governments' responses to the pandemic in all aspects. However, the development of telecommunication connectivity has a significantly negative impact on stringency policies. This may because governments can trace people's activity better with well-developed telecommunication connectivity, so there is no need to implement very stringent policies.

Finally, to study the interactive impacts of digital government development and the pandemic on economic growth, we add both the digital government and pandemic-related variables as well as their interactive variables to Equation (1). Tables 11.12 and 11.13 show our random effect panel data estimation results. As shown in Table 11.12, we found that the impact of the share of confirmed cases (column (2)) on the growth is more significant than that of the number of confirmed cases (column (1)).

This is different from the impact of the pandemic severity on governments' responses, as shown in Tables 11.9–11.11, where the number of confirmed cases tends to have more significant impacts. This may because governments target the number of confirmed cases when they respond to the pandemic.

Secondly, still shown in Table 11.12, when we decompose governments' responses, we find that the stringency policies have significantly positive impacts on economic growth (column (3)). This indicates that the stringency policy may effectively control the spread of the virus and alleviate the negative shock of the pandemic. On the other hand, the estimated coefficients for the containment and health index are significantly negative (*Contain* in column (3)). This index includes information on both activity restrictions and health-related measures, such as the testing policy, contact tracing, short-term investment in healthcare, and investments in vaccines. As the impacts of activity restrictions have been controlled by the stringency index, the estimated coefficients of *contain* should mainly reflect the impacts of health-related measures. Therefore, our estimation indicates that the health-related policies have negative impacts on economic growth. This may be because governments spent significant resources and money to implement the health policies, which decreases the resources for economic growth. The estimated coefficient for the economic policy index in column (3) of Table 11.12 is also significantly negative. The reason may be similar to that of the health policies. As governments spent substantial resources and money to help and subsidise business and people during the pandemic, less resources and money than usual are available to support economic growth. Therefore, the economic support policies during the pandemic have negative impacts on economic growth.

Columns (1)–(4) of Table 11.13 add both digital government and pandemic-related variables to Equation (1). For column (1), we can see that the estimated coefficient is still significantly negative for *pandemic* while insignificant for *EGOV* and *Epart*. However, the sign of the estimated coefficient for *EGOV* becomes negative. The estimated coefficients are even significantly negative for *EGOV* in column (2) and (3) while significantly positive for *Epart* in column (2). This may be because the development of digital government consumes significant resources which could otherwise be used for economic growth. This negative impact can be more critical for economic growth during a pandemic. We can also see that the estimated coefficients for telecommunication infrastructure in column (4) are also significantly negative. This may also be because the investment in telecommunication infrastructure has become a crucial burden in the pandemic. At the same time, the increase in public participation can help enhance the growth impacts of digital government. However, when we add the interactive variables to the equation, we can see that the estimated coefficients for *pandemic* doubled (comparing column (1) of Table 11.13 with column 3 of Table 11.5). The goodness of fit (measured by *r2_o* and *r2_w*) for the estimations also doubled. Therefore, digital government has impacts on the economic effects of the pandemic. The estimated coefficient of *EGOV*Pandemic* in column (1) of Table 11.13 shows that digital government significantly decreases the pandemic's negative impacts on economic growth. The estimated coefficients for interactive variables in column (3) of Table 11.13 show that digital government can help enhance the positive impact of stringency policies on economic growth (*EGOV*Stringency*) while public participation weakens it (*Epart*Stringency*). Public participation can also weaken the impacts of health policies (*Epart*Health*). As we discussed in Tables 11.9–11.11, countries with better digital government development tend to have stricter policies. Therefore, digital government may help the implementation of stringency policies to be more efficient in terms of controlling the spread of the virus. This can further help economic growth. On the other hand, with better public participation, the split in public opinion may make it more difficult to implement the stringency policies.

In column (4) of Table 11.13, we investigate the impacts of the two components of the E-Government Index: telecommunication infrastructure and online service provision. The estimation results show that the provision of online services increases the negative impact of economic support policies on economic growth. On the other hand, better telecommunication infrastructure strengthens both the stringency and the health policies' impacts.

5. Conclusions and Discussion

5.1. Impacts of digital government on economic growth and policies during the pandemic

In this study, based on countries' economic, digital government, and pandemic-related data, we study the relationship between digital government and the pandemic as well as their impacts on economic growth. We have some interesting findings. First, the pandemic has significant impacts on economic growth. But the impacts are comprehensive, not straightforward. For governments' decision-making in response to the pandemic, the share of confirmed cases should be a more important factor to be considered than the number of cases because the former has more significant impacts on economic growth. In terms of government responses, the stringency policies have significant positive impacts on economic growth. On the other hand, pandemic-related health policies – such as testing policy and contact tracing, investment in vaccines, and economic support policies (e.g. income support and debt relief) – have significant negative impacts.

Second, before the pandemic, the development of digital government had significantly positive impacts on economic growth. However, the huge infrastructure investment in digital government development has become a crucial burden during the pandemic and has negatively affected economic growth. As public participation increases, the negative impacts of digital government on economic growth can be partially alleviated. Therefore, in the long run, digital government should be beneficial for economic growth and welfare improvement. In the short run, for countries with well-developed digital government infrastructure, to make the development of digital government more beneficial for economic growth, more attention should be paid to the expansion of public participation in digital government activities.

Third, the pandemic accelerated the development of digital government overall. However, the expansion of public participation and online service provision has been slower since the beginning of the pandemic. This may be because of the reduction in normal public governance activities in the pandemic. At the same time, stringency policy has negative impacts on all aspects of digital government development, such as the telecommunication infrastructure, online services provision, and public participation. On the other hand, health policies and economic support policies promote the development of all aspects of digital government. Therefore, the acceleration of digital government development during the pandemic is primarily due to the demand induced by health policy implementation and economic support policies. The stringency policies hindered the development of digital government. The severity of the pandemic also slowed the expansion of digital government utilisation. After the pandemic, governments should try to promote the development and utilisation of digital government in areas not related to the pandemic.

Fourth, the development of digital government has significant impacts on governments' responses to the pandemic. For countries with better digital government development, governments tend to be more responsive, with stronger stringency, health, and economic support policies. The online service provision shows more significant impacts than other components of digital government. It promotes the implementation of governments' responses to all aspects of the pandemic. At the same time, better public participation increases the strength of stringency policies while better telecommunication infrastructure decreases the strength of stringency policies.

Finally, we also find significant evidence for the impacts of the development of digital government on the economic effects of the pandemic. The development of digital government helped enhance the positive impacts of stringency policies, but public participation weakened the impacts of some policies. This indicates the dilemma of digital government utilisation during the pandemic. Better development of digital government, including the provision of online service and better telecommunication infrastructure, can increase the efficiency of policy implementation, while better public participation may slow the decision-making process. Due to data limitations, we cannot find more evidence for the decomposed impacts of digital government development. This could be done in the future when more data are available.

5.2. Policy suggestions for the development of digital government

Our findings in this study support the view of Sullivan et al. (2021) that digitalisation is no longer 'nice to have' for governments, but an imperative. In addition, we find that better development of digital government is beneficial not only for economic growth, but also public health in the long run. We believe that many other aspects of society – such as education, care of older persons, and social security – can also benefit from the improvement in digital government development. Based on our findings in this study, we have the following policy suggestions for the development of digital government in the post-pandemic era.

First, the governments of all countries should pay more attention to the development of digital government, irrespective of the economic and digital government development status of the country. As we showed earlier, some countries have slowed the development of digital government for various reasons. However, as our findings have indicated, the development of digital government is good for economic growth in the long run. Therefore, all countries should try to improve their digital government development.

In addition, it can also stimulate economies and support the recovery of economic activities if governments increase their investment in digital government development. As government behaviour can reach all aspects of national economic activities, the development of digital government can also be related to all aspects of economic activities. Therefore, the increase in economic activities related to digital government development can have impacts on a relatively long and comprehensive supply chain. This indicates that the investment multiplier can be large for governments' investment in digital government development.

Second, after the pandemic, governments should try to promote the development and utilisation of digital government in areas not related to the pandemic. As we have mentioned, due to the virus containment policies and the weak economic performance, many activities have slowed or even stalled, including digital government activities unrelated to the pandemic. However, like all other ICT-based activities, economies of scale and scope can help accelerate the development of digital-government. Utilisation in a single area, such as public health, can only include limited users and applications. Therefore, it is important to expand and strengthen the utilisation of digital government in areas other than public health.

Third, for countries with better digital government development, more attention should be paid to the expansion of public participation and online service provision in digital government activities. Our findings indicate that public participation and online service provision are important for the implementation and effectiveness of policy. However, as we can see from Table 11.4, the expansion of online service provision and e-participation have slowed significantly for most regions. As leading countries in this area tend to have good human capital and infrastructure already, increasing the provision of online services and e-participation could be more efficient and easier to improve the utilisation of digital government in these leading countries.

Fourth, for countries with less developed digital government, accelerating the construction of telecommunication infrastructure is the most important factor for digital government development. As shown in Table 11.3, regions with a low E-Government Index all have an even lower score for their telecommunication infrastructure. Without the necessary infrastructure, it is even harder to expand e-participation and online services provision. The accumulation of human capital in related areas can also be very slow.

Fifth, it is important for all countries to strengthen cooperation in this field. As mentioned earlier, the development of digital government has reached a more challenging stage compared with earlier stages throughout the whole world. Therefore, even for the leading countries, the growth of online services provision and e-participation have slowed significantly in recent years. It now takes longer for leading countries to make progress in promoting digital government, even though they already have good infrastructure and human capital in this area. Therefore, for countries left behind with disadvantages in infrastructure and human capital, establishing more international cooperation and obtaining more international aid should be a more efficient means of digital government development.

On the other hand, as mentioned earlier, economies of scale and scope are crucial for rapid development of digital government. The involvement of more countries means more government users and developers, which imply more application scenarios and more powerful development capability. This will further accelerate global digital government development. In this context, increased international cooperation is crucial and beneficial for any country involved.

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Chapter 12

Investigating the Growth Effects of Sharing Health Data in ASEAN Member States

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1. Introduction

1.1. Background

The medical and healthcare industry has achieved considerable growth in the Association of Southeast Asian Nations (ASEAN) Member States (AMS), partly driven by demographic changes. Moreover, medical tourism has become a significant industry in countries such as Thailand (Thailand Convention and Exhibition Bureau, 2020). AMS might face challenges balancing investment in infrastructure and increasing healthcare expenditure while confronting a decline in tax revenues (ASEAN, 2020: 9). Yet, healthcare is also a source of innovation and growth. This chapter argues that improving health-related information data sharing can achieve further growth and productivity gains.[1]

This chapter focuses on identifying the impact of enhanced data sharing in healthcare on economic growth. In a recent report, the Asian Development Bank (ADB, 2022) highlighted the three core benefits of data sharing in healthcare: monitoring infectious diseases, preventing non-communicable diseases, and remote monitoring. Quantifying the benefits of data sharing is essential for formulating policy recommendations, as costs need to be considered (e.g. investment in cybersecurity, regulatory changes). The coronavirus disease (COVID-19) pandemic illustrated that data hold crucial health value in addition to economic and societal value. Health data, including COVID-19 pandemic data, can potentially inform policies that would, directly and indirectly, contribute to productivity and growth on the micro and macro level. Health data benefit individuals, health systems, as well as policies. Individual-level data can help individuals to monitor their health. For instance, the data are valuable in marketing health-based gadgets, including smartwatches and COVID-19 symptom trackers. Moreover, the ASEAN Digital Masterplan 2025 (ASEAN, 2020) highlighted that e-health will be central in enhancing access to healthcare and mitigating the impact of COVID-19 (deliverable DO5). In summary, this study focuses on the impact of data sharing on the productivity of the healthcare industry, which contributes to economic output. Arguably, there is a second channel through which data sharing increases output – by improving population health – which in turn drives labour productivity. However, this relationship is beyond the scope of this study. To analyse this effect properly, one needs to address dual causality as it is well documented that labour market outcomes affect health, leading to an endogeneity issue. Furthermore, many confounding effects affect population health apart from data sharing in healthcare settings.

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[1] Note that we use the terms 'data sharing' and 'data sharing in healthcare' interchangeably.

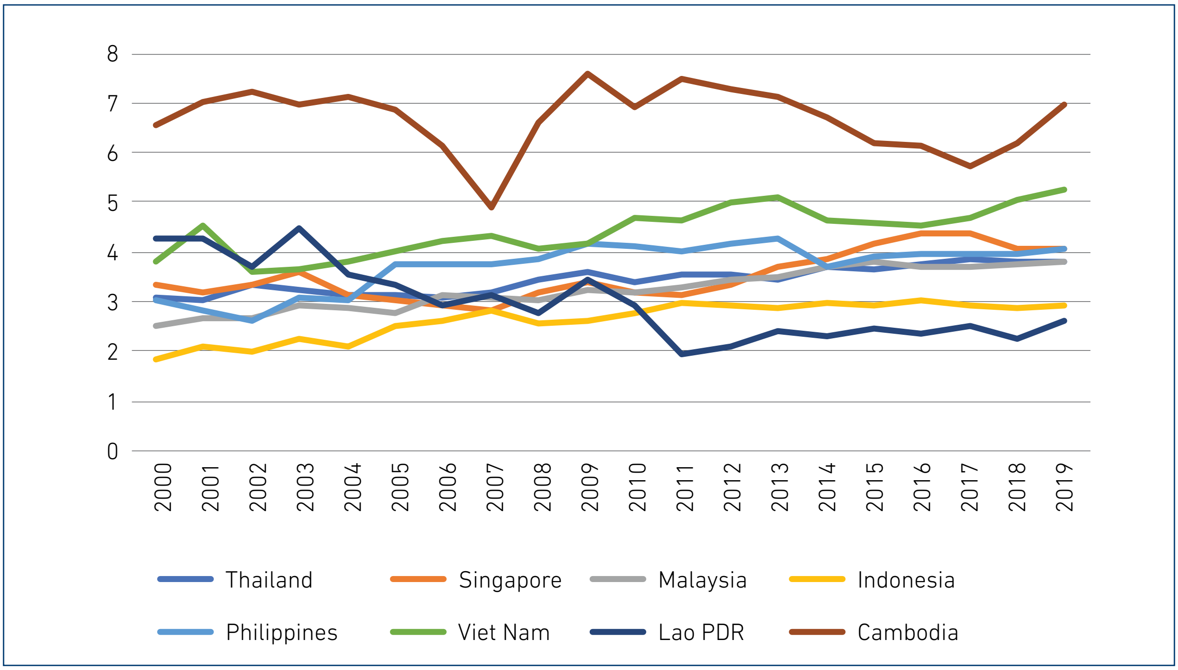
Beyond the urgency created by the pandemic, health data sharing has always benefited health systems and policymakers. For instance, AMS have the tradition of collating national-level representative data on maternal and child health, HIV/AIDS, family planning, and nutrition. This monitoring resulted in policies and programmes that could improve the health system and the health and well-being of populations at the national and subnational levels. Recently, most AMS joined the District Health Information Software (DIHS-2) partnership, which collates regular and timely data from health facilities to improve the health outcomes of patients. These sources of information strengthen health systems. Data-sharing activities and the information and communication technology (ICT) infrastructure support individuals and equip health providers and policymakers to make better decisions. However, very little is known about the impact of the health data infrastructure on economic growth. Our study fills this gap by assessing the economic argument for enhanced data sharing. We hypothesise that improved data sharing will contribute to the growth of the region, which in turn will support further growth of the e-health sector in AMS.

Data sharing is essential in digital healthcare and, to a lesser extent, in more traditional healthcare settings. However, ensuring cybersecurity is paramount due to the sensitive nature of health-related private information. As stated in deliverable DO3 of the ASEAN Digital Masterplan 2025 (ASEAN, 2020), digital services must be trustworthy, and consumer protection cannot be compromised. Our report details security concerns and possible technology-based solutions while looking at the benefits of data sharing. Next, we discuss the country-specific context, followed by our research questions, data sources, methodology, and empirical findings. Finally, we outline policy recommendations and conclude our study. Our code, written in Python and Stata, is available on GitHub (Kling, 2023). The repository provides access to the repository with links to educational videos produced by Yunikarn Ltd.

1.2. Country-specific context

Figures 12.1, 12.2, and 12.3 show stylised facts for selected AMS, including health expenditure as a percentage of gross domestic product (GDP), internet servers per 1 million people, and mobile phone subscriptions per 100 people. All data are extracted from the World Development Indicators (WDI) database (World Bank, 2022). The general trend amongst AMS, based on the mean and median, indicates that health expenditures relative to GDP have increased from 2000 to 2019 – the median increased from 3.22% to 3.95%, whereas the mean rose from 3.56% to 4.19%. Moreover, the data do not suggest any decline from the 2010 levels, with a median of 3.30% and a mean of 3.90%.

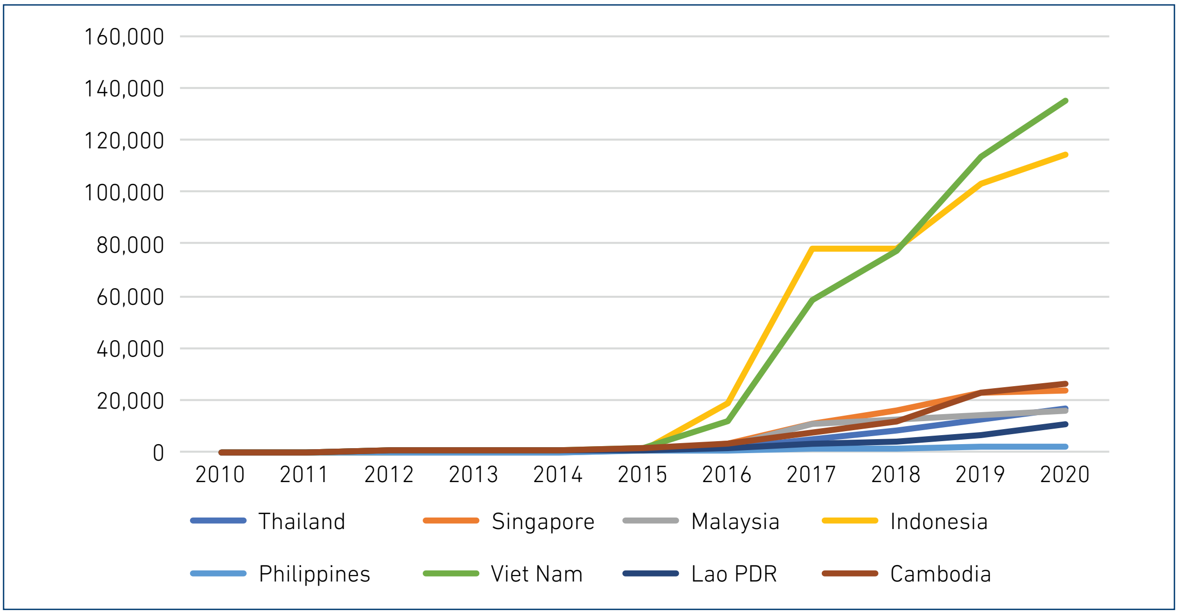
Figure 12.1. Current Health Expenditure in Selected ASEAN Member States
(% of GDP)



ASEAN = Association of Southeast Asian Nations, GDP = gross domestic product.
Source: World Bank (2022).

It is evident that ICT infrastructure has developed rapidly in AMS, while healthcare has witnessed a sustained increase relative to GDP, driven by population ageing and higher living standards. Figure 12.2 illustrates the relative expansion of the internet from 2010 to 2020. Singapore exhibits the highest number of secure internet servers per 1 million inhabitants due to the high concentration of international businesses. However, Viet Nam and Indonesia have improved the most compared with their 2010 starting positions.

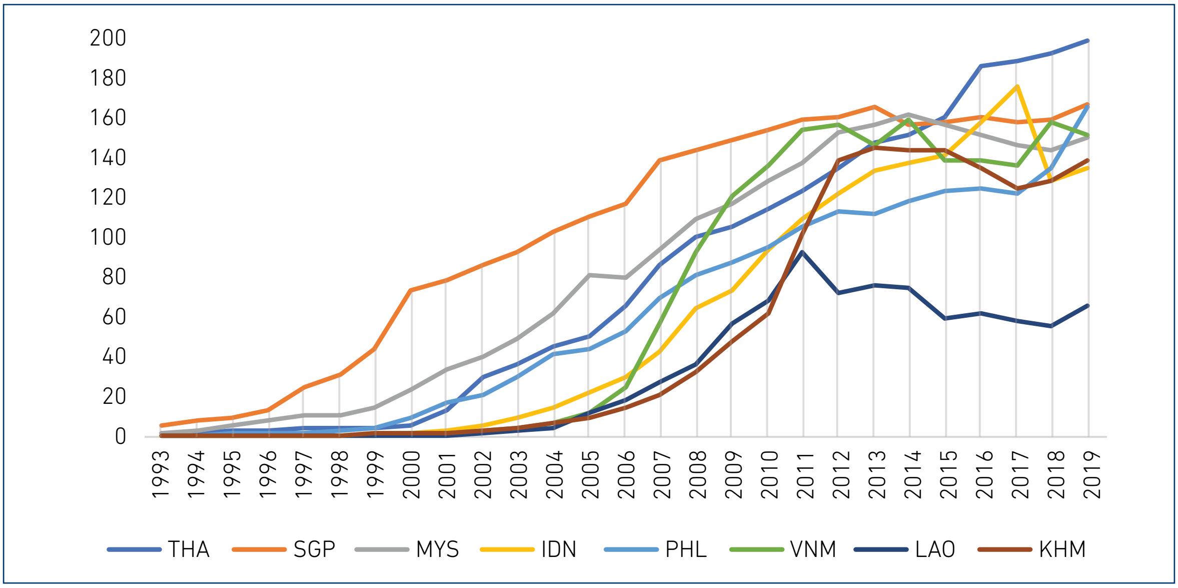
Figure 12.2. Secure Internet Servers in Selected ASEAN Member States
(per 1 million people, indexed)



ASEAN = Association of Southeast Asian Nations.

Source: World Bank (2022).

Figure 12.3. Mobile Phone Subscriptions in Selected ASEAN Member States
(per 100 people)



ASEAN = Association of Southeast Asian Nations, IDN = Indonesia, KHM = Cambodia, LAO = Lao PDR, MYS = Malaysia, PHL = Philippines, SGP = Singapore, THA = Thailand, VNM = Viet Nam.

Source: World Bank (2022).

This chapter explores current practices in AMS and tries to quantify the economic impact of sharing health-related data using a growth accounting framework. Policy implications will focus on achieving the alleged benefits by mitigating and managing inherent barriers and risks. The ASEAN Digital Masterplan 2025 is highly ambitious and names e-health as one of the four key industries amongst finance, education, and e-government (ASEAN, 2020).

In a report on the digital health industry in ASEAN, the Hong Kong Trade Development Council outlined recent collaborations with the private sector to tackle the pandemic (HKTDC, 2021). These initiatives include an expansion of telemedicine, which is the dominant business segment in e-health, according to a recent study by McKinsey (Baur, Yew, and Xin, 2021). Providing remote healthcare to treat milder cases of COVID-19 has reduced the pressure on the healthcare system. Providing access to COVID-19 data through the open-data COVID-19 tracker in the Philippines and similar apps developed in other AMS helps plan capacity and inform decision-makers. HKTDC (2021) outlined that regulation related to data protection has focused on telemedicine in AMS.

1.3. Research questions and analytical steps

The section reviews the literature, modifies existing methods, combines secondary data sources, and estimates the economic impact of improved sharing of health-related data. Based on our quantitative analysis, we derive policy recommendations aimed at achieving the expected benefits by mitigating risks and barriers. Our overarching research question is: how can enhanced data sharing of health-related information generate economic growth?

To address this question, we have to break down the underlying relationships into several smaller steps. First, we can relate different types of capital accumulation and labour supply to economic growth using growth accounting. Economic growth occurs by efficiently combining capital and labour through a production function affected by technological progress. We split investment into ICT and non-ICT investment. Infrastructure like broadband or mobile networks is central to reducing the digital divide and is a prerequisite for data sharing (ASEAN, 2020).

Second, after demonstrating the importance of ICT capital and its partial impact on growth in AMS, we estimate the size and growth potential of e-health based on industry and company reports. Using secondary data (i.e. the WDI provided by the World Bank), we can relate the size of the nascent e-health market to overall health spending. Using additional data on health expenditure, we estimate a panel vector autoregression (VAR) to explain economic growth. The panel VAR model focuses on the short-term dynamics of changes in health spending, ICT and non-ICT capital accumulation, and economic growth.

Third, based on the panel VAR model, we obtain the system's dynamics, captured in impulse-response functions. These are used to simulate the likely impact of data sharing and e-health on future economic growth. We calculate impulse responses over 10 steps to obtain midterm forecasts, simulating a 10-year period.

Finally, we provide practical policy implications based on our estimates, including privacy-preserving technologies, which can enable data sharing by mitigating associated risks. These technologies could increase trust in the system, which is essential for participation. Moreover, our analysis suggests that a data gap exists as current practices of data sharing in healthcare settings are not reported at the country level. It would be prudent to monitor data sharing more closely to mitigate risks and understand the current state of technology.

2. Research Approach

2.1. Prior research

Prior research fundamentally stresses two important perspectives. First, we discuss the contribution of information technology to economic development via productivity, research, innovation, and technological development. Previous literature documented the positive impact of the internet of things (IoT) on economic value (productivity) by using interconnected devices and transmitting data and information (Espinoza et al., 2020). In a similar line of research, Vasileiadou and Vliegenthart (2009) highlighted the impact of internet use on sharing research information, coordination, meetings, and team management. These factors contribute to enhancing research productivity. However, they stressed the challenges of data security and privacy. These challenges are relevant in healthcare settings. Bozeman and Rogers (2002) investigated the historical perspective of knowledge transformation through the internet and technological innovation, where social configurations contributed to the knowledge value. Using longitudinal surveys of 94 internet ventures in Beijing, Batjargal (2007) examined internet entrepreneurship relations in China and found that the interaction of social capital and entrepreneurs positively affects the survival of internet firms and creates value by combining their social and human capital. Using 356 internet-related firms listed on the NASDAQ, Wagner and Cockburn (2010) found that information and the effect of patents are essential determinants of the signal of the firm's quality and survival.

Second, we highlight the importance of new technology in healthcare settings, such as applications of blockchain technology. Theodouli et al. (2018) explained the importance of blockchain technology and its contribution to private and auditable healthcare data sharing and healthcare data access permission. In addition, applications of machine learning and artificial intelligence (AI) have been studied in the literature extensively. This issue is fundamentally important for both developed and developing countries. During the COVID-19 pandemic, data sharing and learning from data have received great attention and prominence in academic research and policy debates. However, the challenges to the privacy of health-related data are crucial and costly, and high-level technological innovation is required, as discussed in our policy recommendations. Using health expenditure data for 20 Organisation for Economic Co-operation and Development (OECD) countries, Devlin and Hansen (2001) explained the bi-directionality between healthcare expenditure and GDP. They found that increasing healthcare spending causes output using the Granger causality testing approach. Our panel VAR confirms this dual causality, as GDP growth affects health spending – but health spending also drives economic growth.

Mobile applications, blockchain, and information technology amplify the potential value of healthcare, benefiting care providers and medical research, as documented by Liang et al. (2017). These advances supported the integrity and validity of the health data and shared them with healthcare providers and health insurance companies. Information sharing in the healthcare sector is vital for healthcare providers and patients. Shen, Guo, and Yang (2019) highlighted the importance of blockchain, digest chain, and structured peer-to-peer (P2P) network techniques, which MedChain can use to achieve higher efficiency and satisfy the security requirements in data sharing in the health sector. However, innovative design technology and transparency can transform healthcare information sharing by incorporating the protection of sensitive health information and deploying and installing software across health systems amongst providers and electronic health record systems (Cyran, 2018).

Banerjee, Hemphill, and Longstreet (2018) studied the importance of wearable devices and their competency in relation to healthcare data sharing and privacy risks. Recent literature in the healthcare sector has showed the importance and implementation of AI. For instance, Aggarwal et al. (2021) conducted a study in the United Kingdom with a cross-sectional survey of 408 patients, which was based on the views of patients and the public about sharing health data for AI-based research. Despite these developed strands of literature, a systematic approach that attempts to quantify the economic impact of enhanced data-sharing in healthcare is missing.

2.2. Growth accounting

In line with recent research on IoT and its impact on growth, we use a growth accounting framework to evaluate the impact of data sharing in healthcare on productivity (Espinoza et al., 2020). This methodology was developed by Jorgenson and Griliches (1967); Jorgenson et al. (2003); and Jorgenson, Gollop, and Fraumeni (1987). Following this methodology, each industry, including healthcare, achieves its gross output as a function of capital, labour, and technology. We define aggregate input, say capital, as a Törnqvist quantity index of individual capital types (Espinoza et al., 2020).[2] To capture the impact of data sharing, which requires broadband and mobile access, we distinguish between ICT and non-ICT capital.

The growth accounting methodology requires a set of assumptions, including competitive factor markets, full input utilisation, and constant returns to scale. Constant returns to scale imply that doubling all inputs increases the output twofold. Accordingly, output growth can be expressed as the cost-share weighted growth of inputs and technological change, using the translog functional form. In line with Espinoza et al. (2020), we use two types of capital: ICT capital (*C*), which refers to investment in ICT; and non-ICT capital (*K*). Data sharing requires adequate infrastructure to collect, store, transmit, and analyse data. Hence, we argue that the availability of ICT infrastructure determines the growth impact of data sharing. Understanding the contribution of ICT capital to growth is central to assessing the likely effect of enhanced data sharing.

In line with the growth accounting literature,[3] economic output in a country at time t (Yt) is achieved through a combination of the two types of capital (ICT and non-ICT), labour input (Lt), and technology (At). Equation 1 captures these model assumptions:

$$Y_t = A_t\, C_t^{a} K_t^{\beta} L_t^{1-\alpha-\beta}, \alpha > 0,\ \beta > 0 \qquad (1)$$

Equation (1) is often expressed in per capita form by dividing by the level of population at time t (P_t). Let $y_t = Y_t / P_t$ denote GDP per capita, and let δ be the employment rate as a share of the total population, i.e. Lt = lt Pt with 0 ≤ lt ≤ 1. Capital is expressed in per capita terms and denoted ct and kt, respectively. Hence, we obtain Equation (2) in per capita terms:

$$y_t = A_t\, C_t^{a} K_t^{\beta} L_t^{1-\alpha-\beta}, \alpha > 0,\ \beta > 0 \qquad (2)$$

[2] See Kohli (2004) for a detailed discussion of the Törnqvist index.

[3] See Jorgenson and Griliches (1967); Jorgenson et al. (2003); and Jorgenson, Gollop, and Fraumeni (1987).

Accordingly, growth occurs if technology (total factor productivity) increases, capital deepens (i.e. more capital per person), and the employment rate increases. Several assumptions must be imposed to obtain this simplified functional form, including competitive factor markets, full input utilisation, and constant returns to scale. Hence, if all inputs are multiplied by a factor, say m, outputs increase by the same factor m due to assuming constant returns to scale. This implies that any further increase in output would be attributed to technological progress.

Taking the natural logarithm on both sides of Equation (2) and first-differencing yields Equation (3), where variables refer to log returns. The statistical model adds an error term, where $\varepsilon_t \sim N(0, \sigma^2)$ is identically and independently distributed.

$$\hat{y}_t = \hat{A}_t + \alpha\hat{c}_t + \beta\hat{k}_t + \gamma\hat{l}_t + \varepsilon_t, \gamma = 1 - \alpha - \beta \qquad (3)$$

Equation (3) is estimated with our panel data set using various specifications. We modify Equation (3) using an intercept dummy for AMS and interaction terms. The intercept dummy and interaction terms can determine whether ICT-related investment benefits AMS more than other countries.

2.3. Linking data sharing to e-health and growth

Historically, global pandemics have been shown to impact productivity due to labour shortages arising from the death of adults. The double impact of pandemics, i.e. mortality and the economic fallout, has remained the main concern globally. For instance, responses to combat the spread of COVID-19 have had a considerable economic impact. While most countries devised some local interventions in addition to the World Health Organization (WHO) global recommendations, different models emerged. Sweden tried keeping the economy open, which impacted mortality and the economy. The United Kingdom followed stricter regulations and largely relied on data to make lockdown decisions. Interventions such as the furlough scheme were launched to mitigate the impact of the lockdowns on the economy. But the public finances of several countries have been directly and indirectly affected by the pandemic. Most governments made record budget deficits due to increased pandemic spending and decreased tax revenues.

As the pandemic and the economy are closely connected, the big question every country seeks an answer to is what are the best mitigating strategies. While test and trace, improved vaccination, and cure will continue to play an important role, the pandemic clearly shows that our data systems require strengthening.

Methodologically, data sharing in healthcare is difficult to measure directly. However, data sharing is a core component of business models in digital healthcare (e-health). Our research strategy uses three main types of data sources to explore the relationship between data sharing and growth. First, country-level data are provided by The Conference Board and the World Bank. Second, industry reports focused on healthcare in Asia and AMS. These reports also focused on e-health and its dominant business segments. Third, firm-level reports are challenging to obtain due to the nascent nature of the e-health industry. However, firm-level reports provide insights into business models to identify the importance of data sharing.

2.4. Panel VAR and simulation

As Van Beveren (2012) outlined, there are many statistical concerns regarding the estimation of total factor productivity (TFP) using the growth accounting approach. By default, TFP is a residual, which makes it prone to biases due to model specification problems. Furthermore, the growth accounting approach does not explicitly consider any feedback processes, e.g. current growth could affect subsequent infrastructure spending. These feedback effects matter when considering healthcare spending and economic growth (Devlin and Hansen, 2001). Hence, we follow Devlin and Hansen (2001) and estimate a panel VAR in reduced form, which permits that health-related and economic variables can both be dependent. The system of equations can be written as follows, where all dependent variables and their lagged independent variables are in log returns.

$$\hat{y}_{it} = r_0 + \sum_{j=1}^{j} r_j \, \hat{y}_{it-j} + \varepsilon_{it} \qquad (4)$$

We estimate this system of equations using Generalized Method of Moments (GMM). The coefficient matrices can be used to construct impulse-response functions (Holtz-Eakin, Newey, and Rosen, 1988). These illustrate the short-term dynamics of the system triggered by small changes in variables. Hence, we simulate the expected expansion of e-health on growth using these transmission matrices.

3. Data Sources

We follow a threefold data strategy. First, country-level data are obtained from The Conference Board's Total Economy Databases (CBTED1 and CBTED2) and the World Bank's WDI database. The databases cover most AMS, except Brunei and the Lao People's Democratic Republic (Lao PDR). Second, industry reports provide estimates of the e-health market in Asia and AMS. These reports identify business segments and dominant players in the e-health market of each country. Third, we obtain company reports from various sources. Most companies operating in the e-health market are at a nascent stage of development; hence, larger data providers such as Bloomberg or Datastream do not provide any financial information. Therefore, we had to rely on smaller data providers and mandatory disclosure requirements, which are minimal for private limited companies (Table 12.4). Table 12.1 introduces the variable names, their definitions, and data sources.

Table 12.1. Variables, Definitions, and Data Sources

Variable	Definition	Data sources
r_gdp	Real GDP, in billions of 2020 international dollars, converted using purchasing power parity	CBTED1
n_gdp	Nominal GDP, in billions of current international dollars, converted using purchasing power parity	CBTED1
Emp	Persons employed (millions)	CBTED1
Hours	Average annual hours worked per worker	CBTED1
t_hours	Total annual hours worked (millions)	CBTED1
Pop	Midyear population (millions)	CBTED1
out_p	Labour productivity per person employed in 2020 international dollars, converted using purchasing power parity	CBTED1
out_h	Labour productivity per hour worked in 2020 international dollars, converted using purchasing power parity	CBTED1
inc_pc	GDP per capita in 2020 international dollars, converted using purchasing power parity	CBTED1
gdp_g	Growth of GDP, percentage change	CBTED1
emp_g	Growth of employment, percentage change	CBTED1
t_hours_g	Growth of total hours worked, percentage change	CBTED1
pop_g	Growth of population, percentage change	CBTED1
out_p_g	Growth of labour productivity per person employed, percentage change	CBTED1
out_h_g	Growth of labour productivity per hour worked, percentage change	CBTED1

Variable	Definition	Data sources
inc_pc_g	Growth of GDP per capita, percentage change	CBTED1
Gdp	GDP	CBTED2
l_quant	Labour input – quantity	CBTED2
l_qual	Labour input – quality	CBTED2
c_total	Capital input – total	CBTED2
c_ict	Capital input – ICT	CBTED2
c_non_ict	Capital input – non-ICT	CBTED2
l_quant_c	Labour quantity contribution	CBTED2
l_qual_c	Labour quality contribution	CBTED2
c_total_c	Total capital contribution	CBTED2
c_ict_c	ICT capital contribution	CBTED2
c_non_ict_c	Non-ICT capital contribution	CBTED2
Tfp	Total factor productivity	CBTED2
l_share	Labour share	CBTED2
c_share	Capital share	CBTED2
ict_share	ICT capital share	CBTED2
non_ict_share	Non-ICT capital share	CBTED2
Health	Current health expenditure (% of GDP), 2000–2018	WDI
h_growth	Log return of health expenditure ($ current)	WDI

CBTED = The Conference Board Total Economy Database, GDP = gross domestic product, ICT = information and communication technology, WDI = World Development Indicators.

Sources: The Conference Board Total Economy Database (2022), Output, Labour and Labour Productivity, 1950–2021: CBTED1 and CBTED2 (accessed 29 September 2022); and World Bank (2022).

4. Empirical Findings

4.1. Growth accounting

Table 12.2 presents descriptive statistics for all countries. AMS differ considerably in terms of long-term growth, which tends to be higher (average annual growth rate of 5.37% compared with 3.71%), and ICT capital accumulation (average share of ICT capital of 3.96% compared with 2.75%).

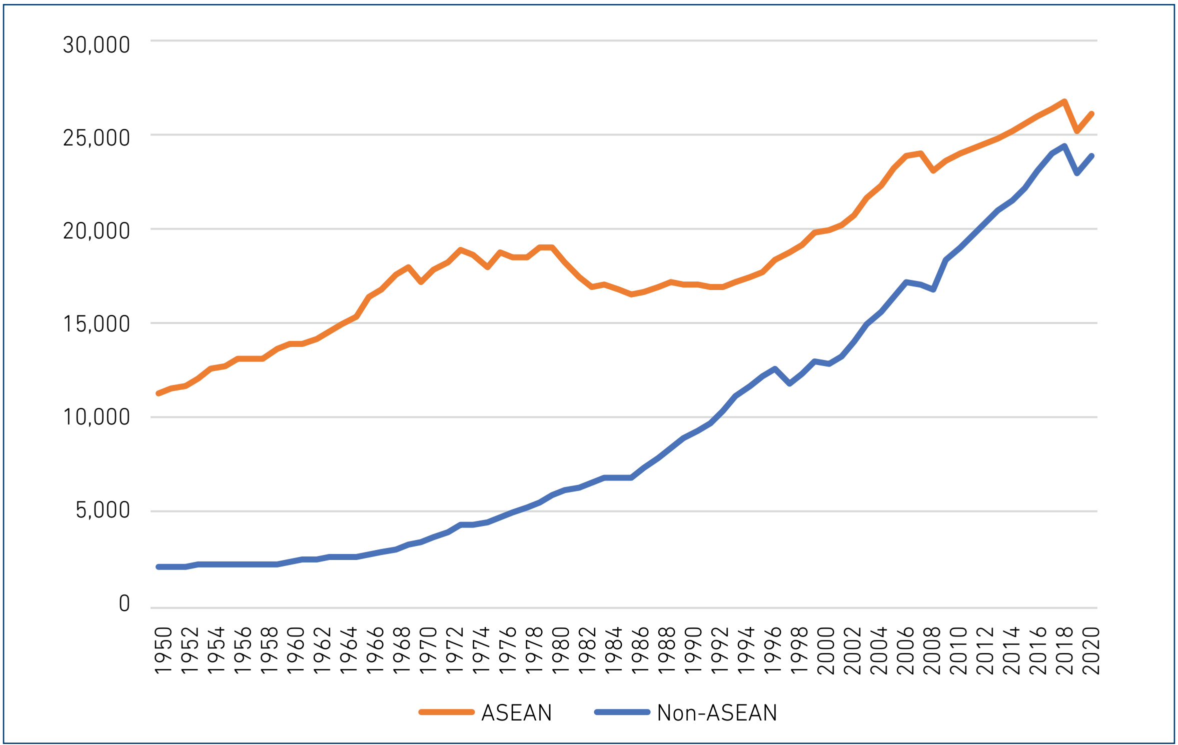
Table 12.2. Descriptive Statistics

Variable	Count	mean	std	25%	50%	75%
r_gdp	9,154	561.633	1928.417	24.542	78.989	311.669
n_gdp	9,154	388.3	1645.766	8.427	34.691	168.575
Emp	9,576	20.239	76.012	1.423	3.589	10.477
Hours	4,949	2,025.826	316.856	1,792.904	2,013.929	2,239.586
t_hours	4,949	7,4188.34	23,7623.4	5,092.157	12,009.7	40,967.44
Pop	9,576	45.585	150.344	3.624	8.97	27.837
out_p	9,154	44,284.56	65,639.52	10,898.84	26,636.42	55,797.31
out_h	4,947	25.775	21.315	8.13	20.356	38.223
inc_pc	9,154	18,152.9	27,789.22	3,665.533	9,683.518	22,195.47
gdp_g	9,021	3.814	6.185	1.629	3.923	6.438
emp_g	9,443	1.94	3.29	0.76	1.861	3.007
t_hours_g	4,816	1.398	3.44	-0.046	1.45	2.972
pop_g	9,443	1.779	1.846	0.754	1.671	2.678
out_p_g	9,021	1.869	5.956	-0.319	2.022	4.437
out_h_g	4,814	2.43	4.926	0.486	2.491	4.653
inc-pc_g	9,021	2.008	5.936	-0.066	2.263	4.606
Gdp	4,256	2.934	6.795	1.407	3.588	5.806
l_quant	4,256	1.394	4.738	0.058	1.664	3.177
l_qual	4,256	0.584	0.972	0.205	0.489	0.925
c_total	4,256	4.25	6.26	2.068	3.753	6.104
c_ict	4,170	16.067	14.317	9.503	15.136	22.539
c_non_ict	4,170	3.65	6.38	1.447	2.933	5.357
l_quant_c	4,256	0.598	2.319	0.033	0.81	1.489
l_qual_c	4,256	0.286	0.463	0.099	0.234	0.434
c_total_c	4,256	2.184	3.173	0.948	1.802	3.177
c_ict_c	4,170	0.408	0.587	0.162	0.354	0.608
c_non_ict_c	4,170	1.807	2.965	0.58	1.319	2.641
Tfp	4,256	-0.134	6.294	-1.78	0.049	2.023
l_share	4,256	49.665	11.562	44.803	50	55.969
c_share	4,256	50.335	11.562	44.031	50	55.197
ict_share	4,170	2.823	2.129	1.461	2.438	3.634
non_ict_share	4,170	47.375	11.717	40.588	46.949	52.515

Source: Data analysis conducted by the authors.

Figure 12.4 plots income per capita for the average AMS compared with the global average, indicating convergence due to catch-up growth after 1950.

Figure 12.4. Convergence of ASEAN Member States After 1950

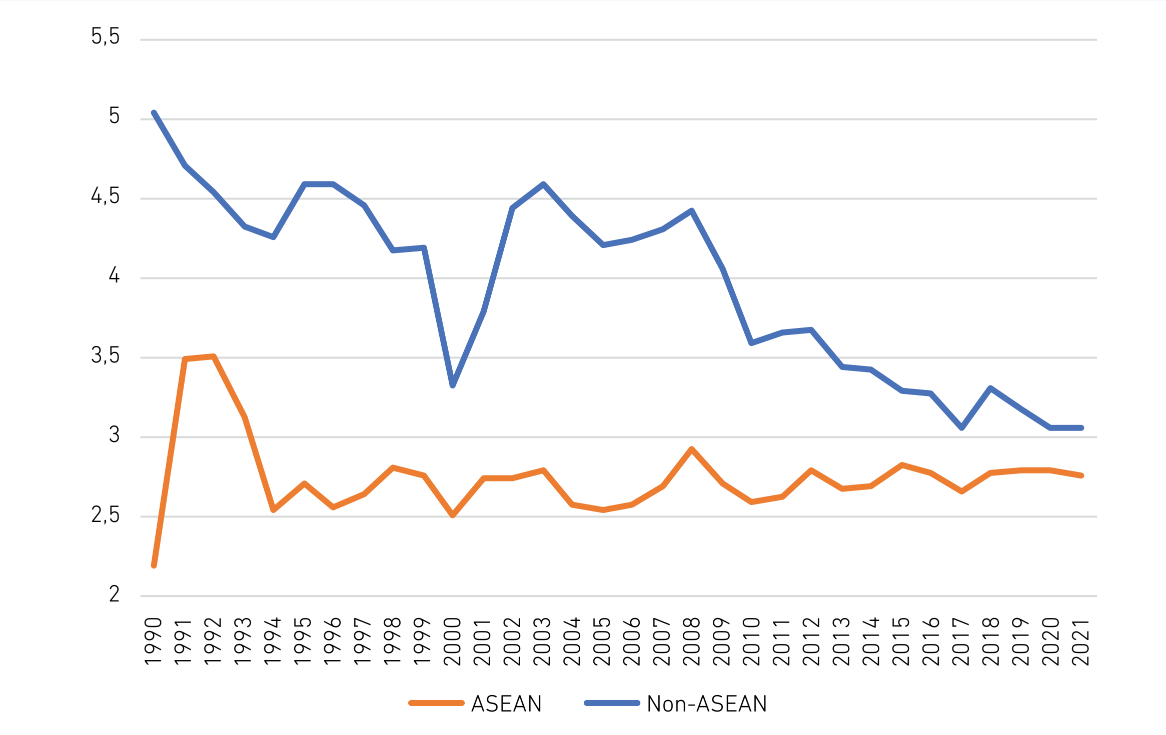


ASEAN = Association of Southeast Asian Nations.

Source: Data analysis conducted by the authors.

Compared with other countries, AMS exhibited high shares of ICT investment throughout the investigation period, as shown in Figure 12.5. Significant improvements can be observed in all AMS in terms of fixed broadband subscriptions (per 100 people). Access to the internet and mobile phone coverage are prerequisites for e-health, benefiting from data sharing.

Figure 12.5. Share of ICT Capital in ASEAN Member States



ASEAN = Association of Southeast Asian Nations, ICT = information and communication technology.

Note: ASEAN refers to a dummy variable, which uses the label 1 for ASEAN Member States and 0 otherwise.

Source: Data analysis conducted by the authors.

Next, we assess whether AMS benefit more from ICT investment than other countries. Hence, we estimate Equation (3) using pooled ordinary least squares (POLS) [A], fixed effects [B], a constrained regression [C], and POLS with interaction effects related to AMS. The constrained regression imposes constant returns to scale. These models try to explain GDP per capita growth rates using growth in ICT investment (c), in non-ICT capital (k), and labour market participation (l). We add an intercept dummy (*ASEAN*) and three interaction terms with capital and labour growth to test whether AMS differ from their peers.

Table 12.3. Growth Regressions

Variable	A	B	C	D
ICT investment (c)	0.007*** 0.000	0.006*** 0.000	0.007*** 0.000	0.004** 0.002
Non-ICT capital (k)	0.020*** 0.000	0.020*** 0.000	0.016*** 0.000	0.016*** 0.000
Labour market participation (l)	0.402*** 0.000	0.436*** 0.000	0.978*** 0.000	0.260*** 0.000
*ASEAN * c*				0.019*** 0.000
*ASEAN * k*				0.01 0.131
*ASEAN *l*				-0.188 0.117
ASEAN				0.018*** 0.000
N	3298	3298	3298	3298
Ll	6,405.986	6,793.862	6,181.443	6,678.837
Aic	-12,804	-13,579.7	-12,356.9	-13,281.7
Bic	-12,779.6	-13,555.3	-12,338.6	-13,049.8

ASEAN = Association of Southeast Asian Nations, ICT = information and communication technology.

Source: Data analysis conducted by the authors.

Table 12.3 shows that AMS, on average, outperform their peers as the coefficient for the *ASEAN* dummy is positive and significant. Moreover, the interaction term with ICT capital growth denoted *ASEAN * c* exhibits a positive and significant shift. Hence, a marginal increase in ICT investment is likely to generate about four times more growth than in other countries.

In summary, our findings stress that AMS exhibit a high level of ICT investment. This investment, in turn, contributes more to economic growth than in other countries. Accordingly, AMS are in a unique position to benefit from their lead in ICT investment, which will underpin the digital transformation of healthcare.

4.2. Linking data sharing to e-health and ICT investment

The main challenge is the lack of time series data on e-health. Consulting firms and commercial data providers such as Statista use a bottom–up approach. They identify companies that operate in e-health and use their company reports to assess the market size. We followed this approach – but noticed significant limitations due to the nascent nature of the industry. The main issue is the reliability of the data, as most companies in e-health are private limited companies. Hence, they are only required to report simplified income statements (if at all) and balance sheets. Furthermore, the data displayed by Statista are projections. They are not actually observed at each point in time. We use similar projections in our report based on several consulting firms.

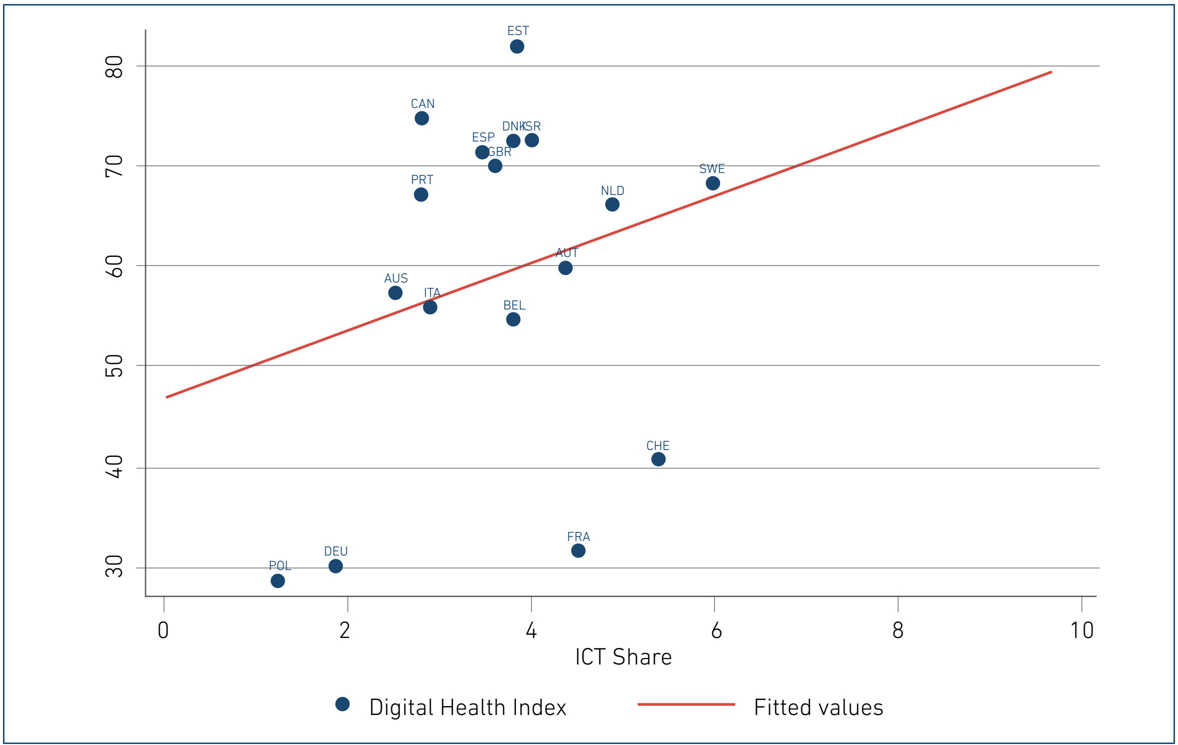
Table 12.4 summarises our data collection effort to uncover the size and growth of e-health in AMS. In 2021, McKinsey published 'The Future of Healthcare in Asia: Digital Health Ecosystems', which estimated the current size of the e-health market in Asia at $37.4 billion (Baur, Yew, and Xin, 2021). Global Market Insights (2023) estimated the size of the global e-health market at $114.8 billion, which seems to be consistent with the McKinsey report. By 2025, both reports project a trebling of the e-health market, implying annual growth rates from 21.7% to 22.5%.

Using World Bank data on health spending, which are only available for 2018 for most countries, we estimate that e-health constitutes 1.4% of the global healthcare market and 2.2% of the market in the Asia-Pacific region. Due to the high growth expectations in e-health, the market share is likely to more than double by 2025 compared to 2018. As outlined in various reports, including Baur, Yew, and Xin (2021) and HKTDC (2021), telemedicine and online pharmacies account for two-thirds of the e-health market. These segments will experience the highest growth rates. Based on current industry trends, medical devices powered by IoT are in a nascent stage and less likely to contribute significantly to short-term growth.

Firm-level data are scarce, as most companies can be classified as microbusinesses or small and medium-sized enterprises with limited financial history. Based on our data collection effort, we can obtain estimates for the current and future size of the e-health market and its growth from 2020 to 2025. These estimates are used in our growth simulation to understand the likely impact on short- and medium-term economic growth in AMS, driven by the expansion of the e-health market. As the e-health market relies extensively on sharing health-related data, this simulation will provide a lower bound to assess the economic impact of enhanced data sharing.

We argue that ICT investments are a prerequisite for a thriving e-health market, as infrastructure such as mobile networks and high-speed internet facilitates the development of digital products. Apart from this qualitative argument, can we provide any quantitative evidence? As outlined above, there is a lack of reliable time series data on digital health. However, Bertelsmann Stiftung (2019) published a Digital Health Index for selected European countries, Canada, Australia, and Israel. We used this cross-sectional study to explore the relationship between e-health and ICT investment. Figure 12.6 shows a scatter plot and a fitted line based on a linear regression model. The share of ICT investment has a positive and significant (p-value: 0.000) impact on the Digital Health Index.

Figure 12.6. Relationship Between ICT and e-Health



AUS = Australia, AUT = Austria, BEL = Belgium, CAN = Canada, CHE = Switzerland, DEU = Germany, DNK = Denmark, ESP = Spain, EST = Estonia, FRA = France, GBR = United Kingdom, ICT = information and communication technology, ISR = Israel, ITA = Italy, NLD = Netherlands, POL = Poland, PRT = Portugal, SWE = Sweden.

Note: This figure plots the Digital Health Index for selected European countries, Canada, Australia, and Israel, published by Bertelsmann Stiftung (2019) against the share of ICT investment. The fitted line refers to an ordinary least squares regression that explains the Digital Health Index using the share of ICT investment as an independent variable.

Source: Data analysis conducted by the authors.

Table 12.4. Combining Macro-Level, Industry, and Firm-Level Data Sources

Panel A: Market reports			2020	2025
Organisation	**Report**	**Variables**	**Values in USD billion**	**Values in USD billion**
McKinsey & Company (2021)	The future of healthcare in Asia: Digital health ecosystems	Size of digital health market in Asia	37,4	100
		Telemedicine, remote monitoring	16,8	37,1
		Digital pharmacies	7,1	33,8
		Digital therapies (CDM and CDS)(*)	6,1	7,6
Global Market Insights (MGI) (2023)	GMI833	Size of digital health market in Asia (global)	114,8	316,2
Panel B: Health spending				
Organisation	**Database**	**Variables**	**Asia-Pacific**	**World**
World Bank (2022)	World Development Indicators	Current health expenditure USD billion	1685,6	8440,8
		Current health expenditure per capita (current USD)	720,91	1110,27
		Population	2.338.223.462	7.602.454.161
		Estimated share of e-health	2,22%	1,36%
Panel C: Companies in e-health operating in telemedicine				
Name	**Country**	**Website**	**Revenue ($ million)**	**Employees**
Doctor Anywhere	30A Kallang Place, #11-06, Singapore	https://doctoranywhere.com/	14	80
MyDoc	43A HongKong St, Singapore	https://my-doc.com/		<25
Speedoc	60, Jalan Sri Hartamas 1, Kuala Lumpur, 50480, Malaysia	https://speedoc.com/sg	18	97
Alodokter	No.7, RT.7/RW.2, Kuningan, Jakarta, Indonesia	https://www.alodokter.com/	19	461
Halodoc	Jl. HR Rasuna Said Kav. B32-33, Jakarta, Indonesia	https://www.halodoc.com/	5	<25

Sources: Arizton Advisory and Intelligence, BCC Research, MarketsandMarkets, Mind Commerce, TechNavio 1MG, AliHealth, Alodokter, Halodoc, JD Health, Ping An Good Doctor, Practo, WeDoctor, Zoominfo, RocketReach, PitchBook. Data analysis conducted by the authors.

4.3. Panel VAR and growth simulation

We determine the optimal lag structure of a reduced form panel VAR, which suggests one lag. The reduced form panel VAR is estimated using either GMM (dynamic panel data estimation) or OLS. Fixed effects are not relevant in these specifications as first-differencing all dependent variables eliminates country-specific effects to a sufficient degree. As shown in Table 12.3, growth accounting establishes instantaneous relationships between economic growth (y), ICT capital growth (c), non-ICT capital growth (k), and changes to the labour force (l). The panel VAR explores an alleged feedback effect, i.e. past realisations might drive current values of growth rates. Moreover, we added growth rates in health expenses (h_growth) to explore the relationship with economic growth. This is in line with Devlin and Hansen (2001).

Table 12.5 presents Granger causality tests, demonstrating that all dependent variables exhibit a degree of autocorrelation, i.e. their past realisations explain current values significantly. Furthermore, past economic growth (second column) affects all other variables – except ICT capital growth. It is important to note that expanding healthcare (i.e. increasing health expenditure) in the previous year has a significant and positive impact on current economic growth. Hence, we confirm the empirical findings shown in Devlin and Hansen (2001).

Table 12.5. Granger Causality Tests

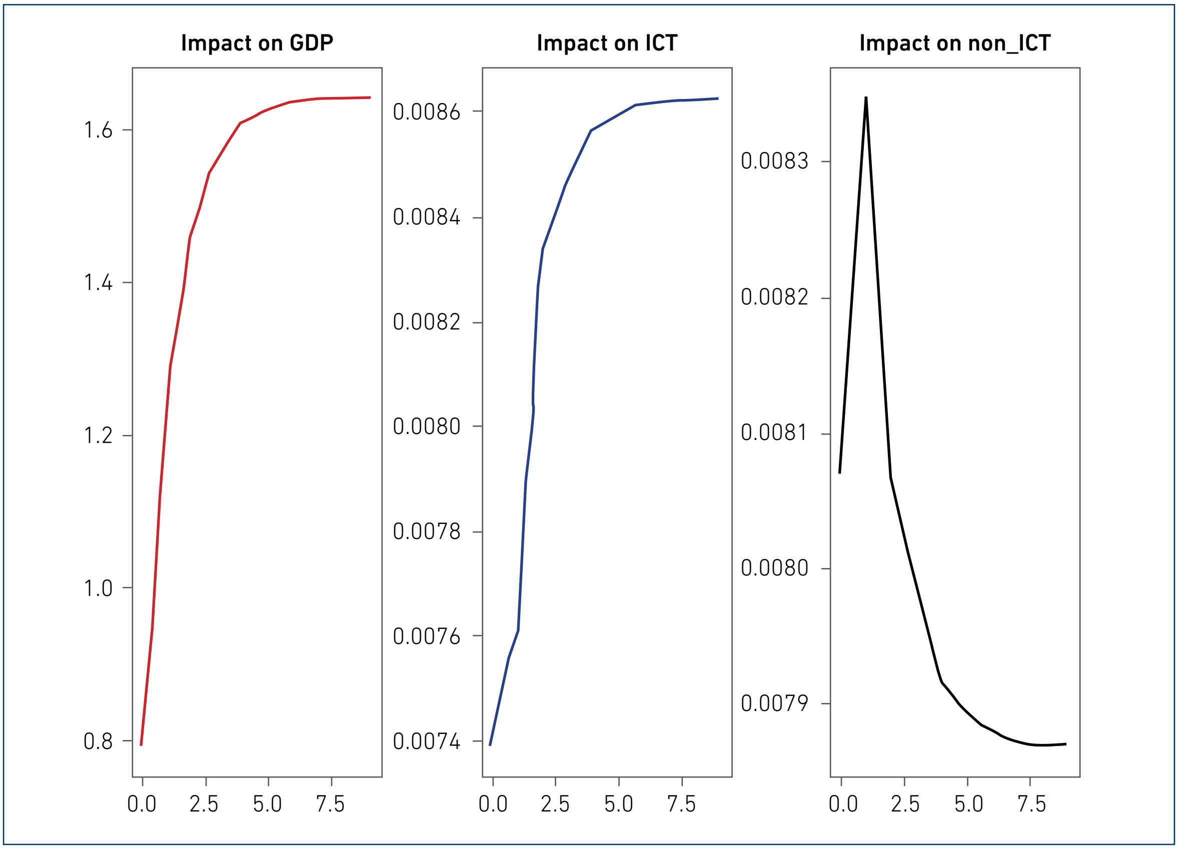
Variable	*y*	*c*	*k*	*l*	h_growth	All
y	0.000***	0.507	0.773	0.327	0.049*	0.000***
c	0.205	0.000***	0.001***	0.070	0.570	0.000***
k	0.000***	0.132	0.000***	0.916	0.130	0.000***
l	0.000***	0.712	0.021*	0.000***	0.156	0.000***
h_growth	0.000***	0.166	0.223	0.334	0.000***	0.000***

Note: * indicates significance at the 5% level, ** refers to the 1% level, and *** shows the 0.1% level.

Source: Data analysis conducted by the authors.

To explore the dynamics of the system of equations captured by the panel VAR, we estimate the coefficient matrix and derive impulse-response functions. Hence, we can simulate a marginal increase in the healthcare sector on economic growth, capital accumulation, and labour market participation. To derive growth scenarios, we use the sources summarised in Table 12.4. The reports by Baur, Yew, and Xin (2021) and HKTDC (2021) suggested annual growth rates in digital health in the region of 21%–22% per year until 2025. Telemedicine and online pharmacies account for two-thirds of the market. Telemedicine's business model relies on data sharing by default. Service delivery is remote, requiring access to medical data, including medical imaging. However, online pharmacies require only limited access to data (prescriptions, allergies, and underlying medical conditions). Traditional healthcare providers have enhanced their data-sharing capabilities.

Figure 12.7. Cumulative Impulse-Response Function



GDP = gross domestic product, ICT = information and communication technology.

Note: We simulate a 1% increase in healthcare provision and its subsequent impact on GDP, ICT, and non-ICT capital accumulation.

Source: Data analysis conducted by the authors.

Figure 12.7 plots cumulative impulse-response functions for GDP growth rates and ICT and non-ICT capital growth rates. The impulse refers to a 1% increase in healthcare provision. Based on our simulation, the 10-year cumulated effect suggested a GDP increase of 1.64%, whereas the impact on capital accumulation is negligible.

5. Policy Recommendations

5.1. The need for data: Addressing data gaps

Our efforts to obtain data on the extent of data sharing in healthcare demonstrate that a data gap exists. To monitor the progress in data sharing and to mitigate risks, countries should collect more information on current practices of data sharing in healthcare settings. Now, this information is only available in a disaggregated form using industry and firm-level reports.

Apart from information on data sharing, it is crucial to have information on the prevalence of non-communicable diseases by age. While the pandemic on its own does not discriminate between people, our societal and economic structures allow the pandemic to impact certain groups disproportionately. Moreover, the risk of mortality is concentrated amongst older people with and without other risk factors and younger people with non-communicable diseases. As males have a higher mortality risk, it is crucial to have sex-specific data.

Finally, pandemic-related data sources need to be strengthened. These investments will be beneficial for long-term prevention and resiliency building. While the track-and-trace mechanism helps identify areas with higher cases, localised lockdowns can be planned to mitigate the impact. But this might be difficult in smaller counties like Singapore, where the risk of infection continues to be higher due to population density. Another crucial data set is vaccination coverage. While it is important to have vaccination coverage data, the most value from it comes from the age-specific vaccination rates, which require a detailed age¬–sex profile of the population. Where the census data are old, robust projection techniques must be used for pre-COVID-19 data. Furthermore, we need data on vaccines, available hospital beds, and medication. Such data will give the public confidence to carry out their economic activities. In addition, more countries are using apps to report symptoms and ping citizens when they are close to a COVID-19-positive person. All these measures play a significant role. During various stages of the pandemic, these data will also help decide the capacity of various buildings depending on the economic activity and risk involved. Better planning will enable countries to allow tourism, which plays an important role in the Thai economy, to continue. Due to the pandemic, dwindling tourism impacted the Thai baht, one of the best-performing currencies, to join the worst-performing currencies globally such as the Turkish lira and Peruvian sol.

5.2. Mitigating risks

Estimating the economic and health benefits of data sharing is essential to inform policymakers. Our analysis suggests that ICT capital plays a more prominent role in AMS than in other countries (Figure 12.5). Our growth accounting approach uncovers that ICT capital contributes more to economic growth in AMS than in its peers (Table 12.3). We extend the growth accounting model by exploring the dual causality between growth, various forms of capital accumulation, and healthcare expenditures. Granger causality tests (Table 12.5) suggest that expanding healthcare will increase future economic growth.

The inherent dual causalities are modelled using panel VAR, and the dynamics of the system are captured in a coefficient matrix. Our simulation reveals that increasing healthcare provision enhances economic growth 1.64-fold over a 10-year period. In summary, there is a clear economic justification to foster growth in healthcare provision (apart from ageing populations, morbidities, etc.). Our firm-level and industry-level analyses identify that digital healthcare will make a considerable contribution to this expansion. Baur, Yew, and Xin (2021) and HKTDC (2021) predicted annual growth rates in digital health in excess of 20% per year until 2025. Not all areas of digital and traditional healthcare rely in a similar way on data sharing – but the most promising areas, such as telemedicine, depend on enhanced data sharing.

Furthermore, we outline mitigation strategies that are likely to affect the willingness to share data (e.g. building trust). The main challenge in healthcare settings is to ensure that data remain private. There has been a considerable expansion of privacy-enhancing technologies (PETs). PETs promise to separate learning from private data and data transmission. Ideally, medical data do not need to be transmitted – only learned parameters are transferred to the service provider. However, now, there are very few providers of PETs, such as a team at Microsoft (CrypTFlow), and practical challenges remain.

Encryption algorithms have witnessed several advances in the context of health data. First, user-centric designs have become more common in healthcare settings, enabling end-users to remain in control of their data (Qiu et al., 2020). Second, wearable medical devices require additional advances in encryption (Chen et al., 2020).

Imaging data have inherent data storage and management challenges. Moreover, wearable medical devices and IoT technology generate increasing data (Zheng et al., 2019). Hence, cloud-assisted wireless body area networks have entered hospital settings to manage these data requirements (Hassan et al., 2017). Finally, distributed ledger technologies (e.g. blockchain) provide solutions for a decentralised system of data sharing (Zheng et al., 2019).

As outlined in our analysis, ICT capital is a prerequisite for data sharing and developing business models in digital health care. Significant progress has been achieved in AMS, as illustrated in Figures 12.2 and 12.3; however, continued investment in ICT infrastructure is needed to sustain and support the expected expansion of digital health care.

6. Conclusion

The ASEAN Digital Master Plan 2025 (ASEAN, 2020) outlined ambitious goals, transforming AMS into digital societies and economies. This policy agenda stresses the importance of digital health care, which accounts for only around 2% of healthcare provision based on our analysis (Table 12.4). Yet, various industry and firm-level reports suggest annual growth rates above 20% in the coming years. Our analysis shows that data sharing is at the heart of some business models, such as providers of telemedicine. However, not all business segments rely on data sharing to the same extent.

This report develops a methodology to quantify the economic impact of data sharing through its role in digital health care. Growth accounting reveals that AMS benefit more from ICT capital, which is a prerequisite of data sharing in healthcare settings. Our panel VAR model permits feedback effects, i.e. changes in health expenditure can cause changes in capital accumulation and economic activity. Causality tests demonstrate that health expenditure in the past drives current economic growth. After estimating the dynamics of the system, we simulate the impact of a 1% increase in health spending over a 10-year period. We find that economic growth increased by 1.64%, suggesting a sustained positive contribution to growth.

The likely upside of enhanced data sharing in health care, however, needs to address security concerns that can undermine trust. This, in turn, can limit the willingness to engage in data sharing. The deliverable (DO3) in the ASEAN Digital Masterplan 2025 (ASEAN, 2020) highlights the importance of consumer protection. Hence, we suggest exploring the use of PETs. These technologies are not yet mature – but developments such as fully homomorphic encryption are suitable in healthcare settings. In this case, data do not have to be transmitted (split deep learning) without compromising the benefits of learning from data (Onoufriou, Mayfield, and Leontidis, 2021; Onoufriou et al., 2021).

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