

# Digitalization of Public Service Delivery in Asia



Asian Productivity Organization

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# **DIGITALIZATION OF PUBLIC SERVICE DELIVERY IN ASIA**

Digitalization of Public Service Delivery in Asia

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# FOREWORD

Public-sector organizations around the world are attempting to deliver services more efficiently through a combination of open, bottom-up, and digitally integrated hierarchies and operations. The aim is to create new levels of interaction between citizens and the state, closing the gap between demand and supply. Motivated by the necessity of increased efficiency in service delivery, public sectors are revamping their business models. Factors such as resource constraints also encourage innovation and the adoption of digital technologies and platforms in government operations and services.

Applications of digital technology for public service delivery can shift the model from being reactive to citizens' needs to becoming proactive to anticipate future needs. A key lesson learned from previous e-government initiatives is the importance of close communication among public-sector agencies, citizens, and businesses to offer services that represent a leap in value to recipients.

The Asian Productivity Organization (APO) conducted a research to determine the extent of digital transformation of public services in a cross-section of its members. The study involved in-depth analysis of digital applications in delivering services by selected public organizations in six APO member countries to contribute to similar efforts in others. Five key success factors in digital transformation efforts were identified: an aligned vision; prioritized goals; pragmatic implementation; a pool of enablers; and strong foundations.

While the research results reported in this publication are specific to Asia-Pacific economies, the APO believes that they will also be useful to public-sector organizations and policymakers in other regions, particularly those seeking to accelerate their digital transformations to provide better services to citizens.

Dr. AKP Mochtan  
Secretary-General



# EXECUTIVE SUMMARY

This research project aims to highlight the current state of digital-government transformation across public services of a cross section of APO members countries. In particular, the study undertakes an in-depth analysis of digital applications in the delivery of public services by selected public organizations in APO member countries. The project has drawn meaningful conclusions that can contribute to the pursuit of digitalization of public service in other APO member countries.

To ensure the integrity of the project, the research was systematically undertaken, from the selection of a methodology and sample cases to be studied to the determination of critical success factors for digital transformation in the public sector.

The first step was to determine a common method of analysis across the selected cases. This was to ensure that a standardized framework of evaluation was applied uniformly across the cases selected for study. The ‘Policy Modeling Canvas (PMC)’ and ‘key building blocks for driving digitalization’ were used as a methodology to analyze the digital-transformation effort in each of the selected country. The PMC helps to conceptualize a particular policy in terms of the issues or problems to be addressed and the policy objectives and strategies crafted for resolving those issues. Additionally, the model requires an examination of the governance structure for policy management, and the resources and activities necessary to implement the policy. The model also entails the specification of the results of implementation, i.e., outputs and outcomes, as well as the ultimate impact on targeted beneficiaries.

Complementing the PMC are the key building blocks required for driving successful digitalization. These are aligned vision, prioritized goals, pragmatic implementation, enablers (resources, capabilities, and governance), and strong foundations (legal underpinnings, quality data, and policy adoption). These building blocks are essential ingredients for the success of any policy or program. When combined, the PMC and the key building blocks offered a holistic and standardized framework for the analysis of the various cases of government digitalization.

Second, we studied the key global trends in digital-government transformation. The study of global trends was to extract insights on the critical success factors necessary for digital transformation. Among the trends that are making inroads in public services across the world are digital connectivity, internet of things (IoT) and smart cities, artificial intelligence (AI) and automation, big data and analytics, citizen-oriented

applications, digital government platforms, personalized digital services, digital identity, cloud computing, blockchain, and cybersecurity. The deep insights from the study of these global trends will be especially useful for other APO countries in their pursuit of digital transformation.

Third, we selected the latest cases of successful government digitalization initiatives from a sample of APO countries for review. The cases were drawn from India, Indonesia, Malaysia, the Republic of Korea (ROK), the Philippines, and Thailand. Each case was analyzed against the building blocks of the PMC. The research documents the challenges and prospects in digital-government transformation. The findings offer deep insights on how these countries have embarked upon their digital journeys, the lessons learnt, and the preconditions for an implementation's success. The research results will provide valuable pointers for implementing similar digital-transformation programs in other countries.

From the case analyses, the project identifies key success factors that have contributed to the success of each digital-transformation effort. In particular, the research confirms that all five building blocks, i.e., aligned vision, prioritized goals, pragmatic implementation, enablers, and strong foundations, are critical for the successful implementation of government digitalization. Given the unique circumstances of each case as a result of varying stages of digital transformation, there were understandable variations in the specific components of each building block.

However, plans alone will not do. Implementation will have to be followed through and challenges will have to be overcome. Each case had its own set of challenges. The case studies portray how these were overcome in the process of successful government digitalization.

The authors record their appreciation for the APO for having been selected to make this contribution to the development of digital government across APO member countries. One can always learn from another country's efforts. It was in recognition of this fact that the project sought to document individual countries' digital-transformation endeavors so that a better understanding of issues and solutions in policy implementation in general and digital policy in particular can be fostered. The authors also hope that this report will be a useful repository of knowledge and insights toward digital-government transformation.

# INTRODUCTION

**Prof. Jinho Choi**

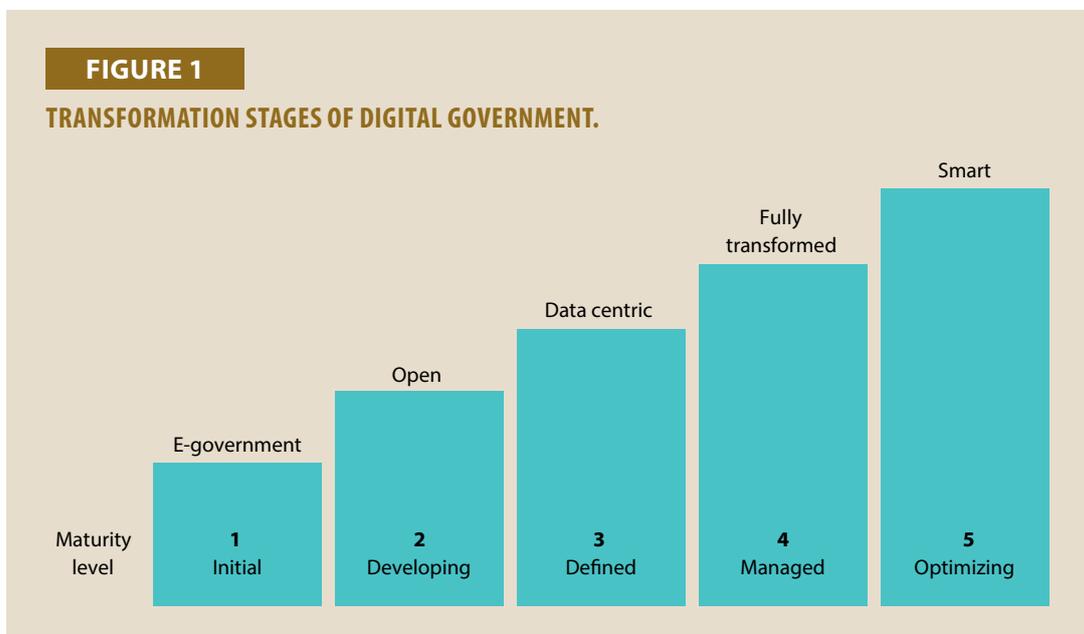
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## Research Background

Information technology (IT) is used to improve data management, analysis and sharing, planning and decision support, service delivery, and more. IT is also used to increase access to information, provide more convenient and timely transaction services, and increase citizen participation in the development of government regulations and other processes.

The diffusion and adoption of IT is changing citizen and business expectations on governments' ability to deliver public services. Public-sector organizations are adapting public service delivery, policymaking, citizen engagement, and interagency collaboration towards a new digital environment.

There have been many studies on the evolution of digital government [1–5]. Among these studies, Gartner [4, 5] proposed five transformation stages of digital government through the 'Digital Government Transformation Framework.' These five transformation stages are e-government, open government, data-centric government, fully transformed government, and smart government, as shown in Figure 1.



**Level 1 (e-government):** At this level, the focus is on shifting services online for user convenience and cost savings. The government organization delivers services through online channels to meet basic efficiency objectives. However, data and its uses are siloed and extremely limited.

**Level 2 (open government):** Level 2 is not necessarily subsequent to level 1. E-government and open government programs often coexist, with different leaderships and priorities. Open government often takes the form of public programs intended to promote transparency, citizen engagement, and a data-based economy. Organizational objectives evolve to focus increasingly on open-data sources for third parties to leverage. The organization delivers services through online channels to meet basic efficiency objectives.

**Level 3 (data-centric government):** At this level, the focus shifts from collecting data on citizen or user needs to proactively exploring new possibilities inherent in strategically collecting and leveraging data. The key performance indicators here are “how much of our data is open?” and “how many of our applications are built on open data?” The organization and third parties deliver data-based services to users.

**Level 4 (fully-transformed government):** At this level, the government organization, agency, or department is fully committed to a data-centric approach for improving governance. The preferred approach to innovation is based on open-data principles. Data flows regularly across organizational boundaries, leading to easier interactions and better services for constituents.

**Level 5 (smart government):** At this level, the process of data-centric digital innovation is embedded deeply across the entire government. The innovation process is predictable and repeatable even in the face of disruptions or sudden events that require rapid responses.

Governments around the world are attempting to deliver public services to people more efficiently by moving towards an open, bottom-up, agile, online, and integrated hierarchy of operations that provides a new level of interaction between citizens and their governments, irrespective of the stage of digital transformation. At the same time, the majority of government organizations are striving to innovate operations and services and improve service models, while increasing productivity and resolving resource constraints through the application of IT.

The adoption of digital technology for public service delivery can shift the model, from being reactive to citizens’ needs, to becoming proactive in knowing what their needs will be in future. It can provide a better platform for the participation of all stakeholders, and especially, allow for the reflection on citizen preferences in the policymaking process for public services. One key lesson that emerges from past online services and e-government initiatives, particularly those that have had limited success, is the central importance of close communication and active participation between government organizations and citizens and businesses in delivering public services that offer a leap in value to citizens.

To create such leap in value, governments first need to understand and integrate citizens’ preferences and requirements in the design and delivery of a digital public service architecture. The framework should ideally include all essential elements of public service systems such as stakeholders, organizations, platforms, interfaces, as well as infrastructure and technology. In creating such a framework for digital transformation of public services, it is also imperative to strike an optimal balance between solving current challenges, taking into account possible evolution of citizens’ needs in future, and managing constraints for a more efficient, sustainable, and streamlined service delivery.

As governments become the backbone of productivity improvement, the digital transformation of their services is an area of particular importance to the APO. The APO intends to support

policymakers and other relevant parties in member economies by developing evidence- and research-based frameworks for more digitized, platform-based public service-delivery systems.

This project is to grasp the current state of digital-government transformation through a systematic and in-depth analysis of digital-service cases in public organizations from selected countries in Asia. Such an understanding will help in drawing meaningful pointers for other countries. The proposed research will include lessons learned from the successes and failures of different models of digital government, current challenges in offering digital public services in the sample countries, and novel digital initiatives adopted to meet the increasing demand for higher-quality public services. This report will provide a practical framework for the digitalization of public service delivery, highlighting the necessary preconditions for adopting the framework, provide policy ideas for the digital transition, and make recommendations for the continued sustainability of digital initiatives.

For this research project, the APO, in collaboration with Development Academy of the Philippines (DAP), convened a research coordination meeting in Manila, Philippines during 25–27 September 2019, to discuss the overall research framework and the preliminary case studies from the selected countries. The chief expert, national experts, and the APO liaison officers in charge of the research attended the coordination meeting. The chief expert provided directions for the research and the research methodology. All national experts presented their preliminary case studies as part of the preliminary research activity. All experts discussed the research direction, scope, and methodology for the development of smart government through digitalization of public services. Overall, timelines to track the progress of the project till its completion were set. All national experts agreed that efforts would be made to ensure the coherence and integrity of their respective chapters. In addition, each national expert was given a degree of autonomy in applying the agreed mythology for the analysis and interpretation of the results.

## Research Issues and Objectives

This research project aims to understand the current state of digital-government innovations and derive meaningful insights for the benefit of other countries. To do so, case studies of successful government digitalization initiatives from around the Asian region were studied, based on a common methodology.

This paper presents the key trends in digital government (DG) around the world and the critical success factors in digital transformation of the public service. Also, this report covers the latest cases of digitalization of service delivery by public organizations in six APO member countries. The research focuses on how each public service organization undertook digital transformation as a way to meet the diverse needs of citizens and businesses. Furthermore, the research concentrates on analyzing the success factors behind a digital-government transformation. The case analyzes of six countries include India, Indonesia, Malaysia, the ROK, the Philippines, and Thailand. Through this study, the authors intend to provide a comprehensive set of lessons in various aspects of digital-government transformation.

It is necessary to use a standardized framework as a methodology to analyze the various digital-government transformation cases so that the results can be compared across the countries. Standardized frameworks enable consistent analysis and offer a more efficient and effective communication among stakeholders. Toward this end, this study established a standardized research framework separately to analyze each country's transformation effort. This analysis then used the methodology to cull out the key success factors of government digitalization.

The main objectives of this research project are to

- conduct a review of the key trends in digital-government transformation around the world;
- provide the latest cases of digital-service delivery in governments of major APO countries;
- analyze and present digitalization cases of public service delivery through a standardized framework of analysis, i.e., the Policy Modeling Canvas and its building blocks;
- identify key success factors from the selected cases through the standardized framework; and
- derive insights and lessons from the case studies and suggest recommendations for further research.

## Research Methodology

This study was conducted as a case study of government digitalization in the sample countries. For this study, the APO engaged a chief expert who led a team of national experts in carrying out the research. Each national expert undertook an analysis of his country's case using the standardized research framework.

One of the comprehensive and systematic ways to analyze specific digital-government transformation cases, including citizen or business needs and demands, in a variety of government environments, is to use tools such as the Business Model Canvas (BMC).

The BMC is a strategic-management and lean-startup template for developing new business models or documenting existing ones [6–8]. It is a visual chart with elements describing a firm's or product's value proposition, infrastructure, customers, and resources [8]. The building blocks of the BMC are determined and connected with each other to realize a business process. The BMC is a very useful tool used by many researchers and practitioners to analyze businesses across industries.

### Policy Modeling Canvas

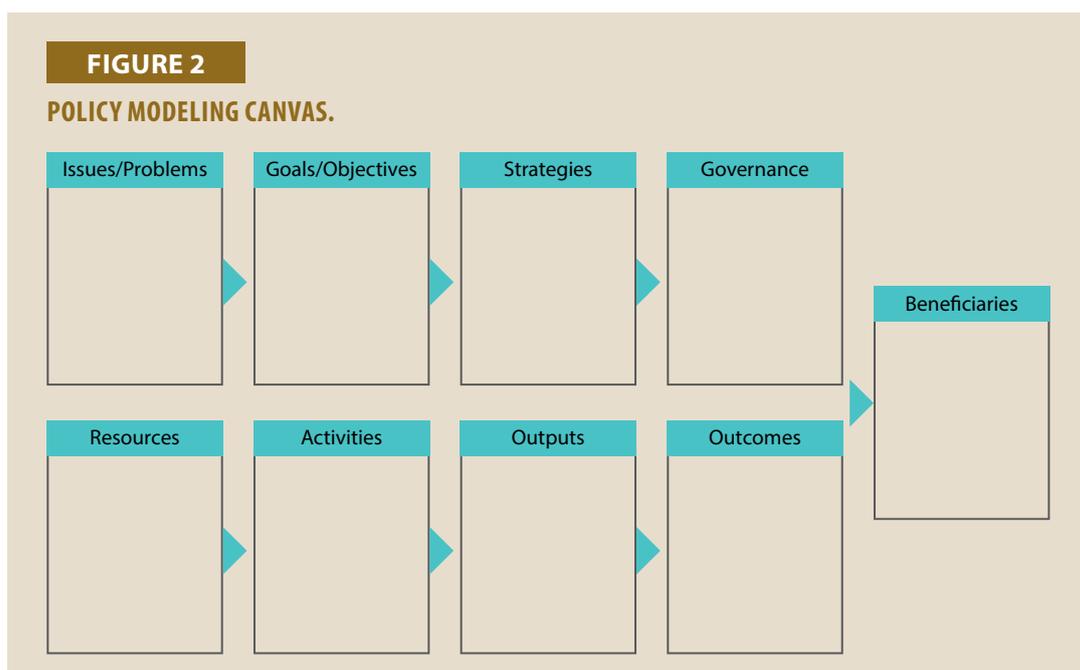
Inspired by the components of the BMC, we crafted a Policy Modeling Canvas (PMC). As a standardized framework, the PMC comprises nine building blocks for consistent representation and analysis of various government digitalization processes. Figure 2 presents the overall structure of the PMC. The elements are explained below.

#### Issues/Problems

This building block in the canvas highlights issues/problems that a particular government organization is trying to solve. In the context of this research it relates to the service-delivery problems that the digitalization seeks to solve. These issues and problems can be current or long-term challenges faced by a government organization. Yet, in essence they relate to the features of service delivery in terms of time, effort, and convenience.

#### Goals/Objectives

Goals/objectives describe what the government has to achieve to solve a problem. In our research's context, objectives relate to what an organization or a country must achieve through digital transformation to solve the identified service-delivery problems. Some management writers term these as 'outcome' statements. This means that the objectives detail what results will be expected as a result of attaining a goal.



### Strategies

Strategy is about how an organization will go about achieving the objectives it has set for a particular program. Strategy, therefore, is a set of actions or a plan of action chosen to achieve one or more goals.

### Governance

Governance describes the formal government institutions, private companies, and other stakeholders involved in digital-government transformation and the relationships among them. Governance also refers to the ways, decisions, and rules concerning the process of management and implementation of government digitalization.

### Resources

Resources are the key inputs, e.g., time, money (financial resource), personnel (human resource), equipment, and supplies used to produce outputs and outcomes.

### Activities

Activities describe actions associated with delivering project goals, objectives, and strategies. Essentially, they are what an organization and its personnel do to achieve the aims of a digital-government-transformation policy.

### Outputs

Outputs are the direct and immediate results associated with the government's digitalization effort. They are usually what the project has achieved in the short term through the digitalization. Some examples of outputs from the implementation of digital transformation are IT systems, web-based information portal sites, mobile applications, specific public services delivered, data standards, manuals, and publications.

### Outcomes

In contrast, outcomes refer to the benefits that beneficiaries have obtained through the delivery of outputs. For example, as a result of a digital transformation, the time taken to receive a service

reduces and the convenience improves for citizens. Also, as a result of faster public services through digitalization, the business environment improves and attracts more foreign direct investments than before.

Outcomes usually relate to policy goals or objectives. These are specific and meaningful results measured by key metrics, including financial perspectives or user perspectives.

Impact refers to the ultimate outcome from the implementation of a particular program. It is usually a long-term result generated by the outputs of the digital-transformation policy. For example, as a result of faster public services through digitalization, the business environment improves so much that the resulting competitiveness enhances the nation's wealth and prosperity.

### Beneficiaries

Beneficiaries refer to those citizens or businesses that benefit directly from the government's digitalization policy. Furthermore, these may include other citizens, businesses, and organizations, who, while not directly benefiting from the policy, still indirectly enjoy the positive benefits of the policy. Direct beneficiaries are the target groups that the policy is meant to aid.

A more effective analysis of specific cases of digital-government transformation requires an analysis of success or failure factors. For this purpose, the analysis framework is also necessary to systematically analyze and compare success factors across the various cases. We adopted the "key building blocks for driving digitalization" suggested by Little [10], to analyze critical success factors of each government-digitalization case.

Governments can collectively improve their service delivery through a holistic, leadership-driven approach covering an aligned vision, prioritized goals, and sustained implementation [9]. This should be supported by key enablers and buttressed by strong foundational elements.

### Building Blocks of Digitalization

As shown in Figure 3, the key building blocks for driving successful digitalization are aligned vision, prioritized goals, pragmatic implementation, enablers, and strong foundations [9]. These building blocks are explained below.

#### Aligned Vision

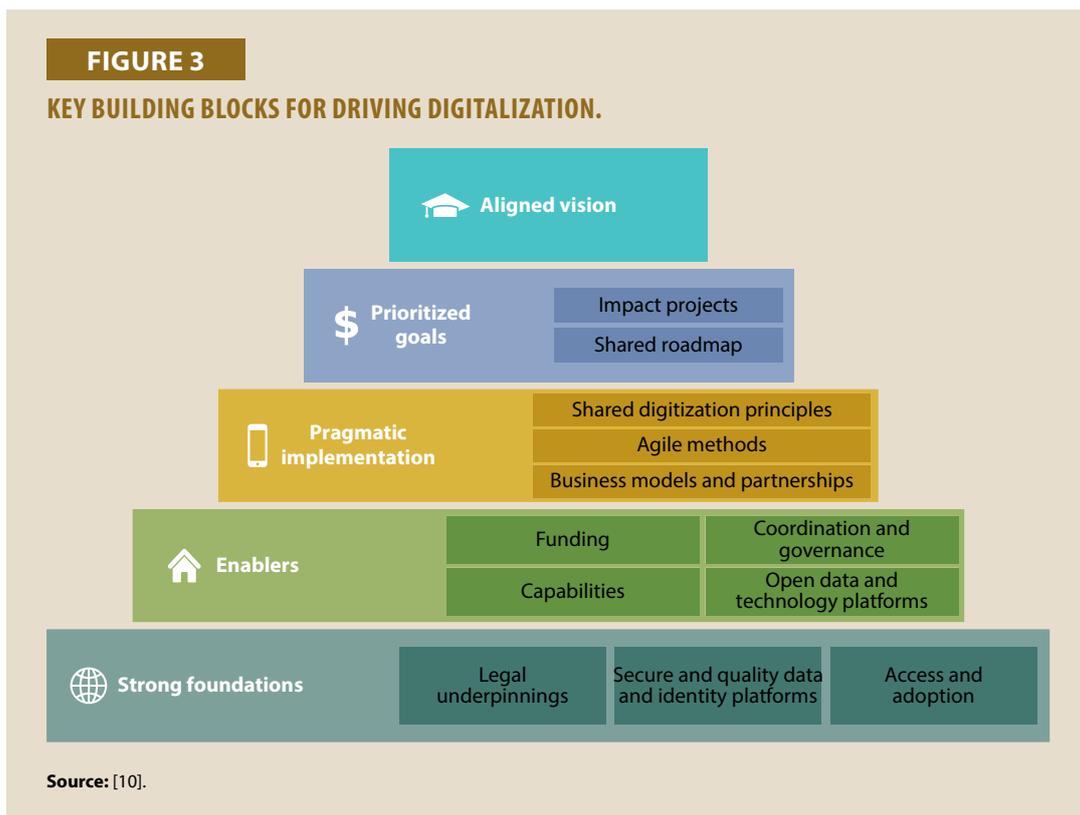
Political leadership sets a stretched agenda for what it intends the future at a particular point in time to look like for the public service or any of its organizations. Having an aligned vision and strong leadership commitment is an often-overlooked but essential starting point for any large-scale initiative, program, or project.

#### Prioritized Goals

Prioritization of goals helps to focus scarce resources on high-impact projects and puts a shared roadmap in place. This ensures the successful completion of constituent projects in a timely manner and within budget.

#### Pragmatic Implementation

Pragmatic implementation refers to the adoption of methods, tools, and approaches that ensure progress over time rather than one-off or *ad hoc* efforts. This can be effectively promoted by the following three elements:



1. Shared digitalization principles that ensure citizen-centricity and digital-first principles lead to redesigning of processes across departments with the citizen in mind.
2. Agile methods across the implementation cycle ensure that the overall vision and prioritized goals have been met, without necessarily being wedded to ‘master plans’ developed years or months earlier.
3. Innovative business models and partnerships can aid service delivery and digital implementation.

### Enablers

Ensuring a supporting environment for sustained implementation requires attention to (1) committed funding of prioritized projects; (2) coordination and governance of initiatives, across agencies; (3) continued capability building or sourcing within institutions to deliver and manage the transformation; and (4) provisioning of open data and technology platforms for standardization and reuse.

### Strong Foundational Elements

Digitalization efforts also need to be underpinned by foundational elements that allow for the digitalization infrastructure to be scaled up and sustained over time. This requires (1) legal underpinnings to be in place for drivers and enablers of digitalization, including removal of legacy requirements; (2) availability of quality data across platforms for all government entities; (3) deployment of secure data and identity platforms that all stakeholders can trust; and (4) ensuring that citizens can access and adopt services by means of awareness and provisioning of citizen and business incentives.

The same analytical framework (comprising the key building blocks for digitalization) is applied for systematic and consistent analysis of success factors in various government-digitization cases.

Each national expert (NE) selects the appropriate success factors from various building blocks and components proposed in the analysis framework. Some success factors may be removed or added, depending on the nature and maturity of the government's digitalization initiatives. In addition, the NE provides a detailed analysis of each success factor. These are covered in the subsequent chapters.

## Report Structure

This report consists of four parts.

Chapter 1 presents the research background, research issues and objectives, and research methodology as a general introduction to this study. It also suggests the 'Policy Modeling Canvas (PMC)' and 'key building blocks for driving digitalization' as a methodology for application in case analyses.

Chapter 2 describes the major trends in digital-government transformation around the world and the critical success factors for digital transformation.

Chapters 3 through Chapter 8, present case studies of successful government digitalization initiatives in Asia. These country chapters are presented in alphabetical order: India, Indonesia, Malaysia, ROK, Philippines, and Thailand. Each chapter is self-contained. It consists of a case study based on the common theme of 'digitalization of public service delivery for smart government.' So, readers may study this report either as a whole or deep dive straight into a selected chapter. The authors tried to keep each chapter consistent by using a common methodology. The PMC framework was a useful tool in this regard. However, each NE was given some degree of autonomy when applying the analytical framework and in interpreting the results. The conclusions in the case studies are the personal views of the authors based on the available data examined.

Chapter 9 concludes with a summary of the content of the cases, overall lessons learned, limitations of the research, and directions for further research.

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# LEADING GLOBAL TRENDS IN PUBLIC SERVICE DIGITALIZATION

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## Abstract

Digital transformation is inexorably hitting the shores world over, and the public-sector organizations are not left out of this reform wave. This chapter sketches the latest trends in public-sector digital transformation for selected rich as well as emerging countries. It is a curtain-raiser for the case studies of selected countries that follow in the subsequent chapters. The trends include the adoption of digital technologies such as artificial intelligence (AI) and automation, big-data analytics, cloud computing, internet of things (IoT), blockchain, and the development of smart cities. These technologies help countries in modernizing their public services to serve their businesses and citizens better.

From a deeper understanding of the noble efforts of modernization through the adoption of digital technologies, this chapter identifies the critical success factors that contribute to the progress of digital transformation in the public sector. These critical factors can be useful to public sectors in APO member economies as they embark on their digital-transformation journeys. Among the key factors are digital leadership, strategy, culture of innovation and collaboration, digital infrastructure development, a central management secretariat, skilled workforce, and citizen participation.

## Introduction

While deglobalization is taking place in global trade as a result of trade wars, protectionism, nationalism, and geopolitical tensions, globalization is proceeding apace in the area of international data and information exchange. The world is more connected than ever, and cross-border capital and data flows are ever-surging. In 2020, the volume of cross-border data traffic was 45 times the data traffic in 2005. It will likely increase by an additional nine times by 2025 as streams of information, searches, communication, video, transactions, and intracompany traffic continue to multiply and enlarge [6, 7].

In addition to transmitting valuable currents of information and ideas, data flows enable the movement of goods, services, finance, and people. Indeed, every type of cross-border transaction now has a digital component. Going digital in government has the potential of releasing over USD1 trillion annually in economic value globally through better services and fraud management. That makes digital transformation one of the most important phenomena of the 21st century.

Digital transformation is unstoppable. It is a key platform for any country to progress economically [10, 12, 23].

The demographic compositions of countries, both developed and developing, are also changing. Increasingly, consumers are becoming tech-savvy. Being connected online, they are knowledgeable about the state-of-the-art service delivery in their respective countries and any relative deficit in its quality. Accordingly, these tech-savvy consumers are creating new demands for public services.

It cannot be gainsaid that the public service is the ultimate determinant of the wealth and prosperity of society. This is because the speed and efficiency with which the public service operates determines the speed and cost-effectiveness of the private sector. Notably, it is the private sector's efficiency that shapes the nation's competitiveness and its subsequent wealth and prosperity.

Digital transformation and demographic changes also impinge on the capacity and quality of the public service to render top-notch services. Digital transformation is a prerequisite to improving public services in the era of fourth industrial revolution (4IR). It is imperative therefore for the public service to jump onto the digital bandwagon if it wants to remain relevant and continue to drive economic growth [6, 11].

Relevance also means being able to offer quality public services with speed and at a reasonable cost. Digitalization helps governments in that endeavor. Digital government (DG) not only reduces the cost of operations; it also enhances the performance through greater transparency and accountability. Additionally, it allows for greater sharing of data and resources in a world of siloed operations where agencies are possessive of their turfs and resources. With data sharing, digitalization promotes collaboration across related agencies to offer enhanced public services [29].

However, for it to be meaningful, digital transformation must go beyond website development and conversion of manual operations into electronic modes. This is because digital transformation goes beyond digitization of records and transactions. It means the application of digital technology to all aspects of the public service, thus radically altering the way the public service operates and delivers value to its citizens.

Governments are at different stages in their digital-transformation journeys. Admittedly, the benefits of DG have been more keenly felt by advanced economies than those in developing nations. This is understandable. Developed nations have had a long head-start in embracing digital technologies over developing ones. For example, starting as early as the 1990s, the USA and the UK were pioneers in digital transformation. These nations identified the potential of digital technologies soon after the emergence of the internet. Given their head-start and having perfected their digital service-delivery systems, it is only natural that public service delivery in the digital mode is more advanced in developed countries than in the developing ones [22, 24].

The differential progress can also be explained by the differences in the quality of leadership, strategy, and cost. DG requires specialized resources ranging from skilled ICT employees to an elaborate ICT infrastructure. It also requires a leadership and a culture that fosters and institutionalizes digital transformation. That culture was rubbed onto the public services in the advanced world from their private-sector counterparts.

Notwithstanding, starting from a low base, developing countries are playing catch-up. They have accelerated the adoption of digital technologies and are making good use of them in improving citizen welfare. The implementation of electronic toll-collection in India, Bangladesh, and other

developing countries, which vastly improves the lives of road users, is one such example of adoption of digital technologies by public services in the developing world.

Like the advanced countries ahead of them, public services in developing countries can reap bountiful benefits in adopting digital technology in areas such as financial and human resource management, including procurement and revenue collection. Starting late in the game, public services in developing countries stand to benefit from the experience of those in the developed world. They also profit from adopting current technologies that the developed countries did not have when they started their digital journeys [10, 13].

In 2015, Deloitte, one of the big four accounting and consulting companies globally, surveyed more than 1,200 government officials from over 70 countries on digital transformation. It found that digital technologies had a major impact on governments, and that this transformation was disrupting the way the public service delivered its services [19].

The trend therefore is for public services across the world to ride the wave of DG in their continuous effort to improve service delivery. Cost pressures and increasing demands from a tech-savvy public have left them without any choice other than aligning with the digital transformation that continues apace in the private sector.

As government organizations tend to lag in the adoption of reforms, they usually trail behind the private sector in the digitalization effort. However, what cannot be disputed is their commitment to shape public services through digital transformation [24, 26].

The rest of the chapter highlights the key trends in DG and the critical success factors in the adoption of digital technologies.

### Leading Global Trends in Digital Government

Digital technologies have been advancing rapidly. Technologies ranging from automation to IoT have been gamechangers in public service delivery. AI and deep machine learning (ML) have enabled machines to surpass humans in many types of information processing, e.g., visual and pattern recognition, in which robots excel humans. AI further adds to the data generated by IoT. Along with AI, IoT has enabled governments to automatically collect and distribute voluminous amount of data and information from various tech-enabled devices. 4IR technologies have enabled governments to improve their operational efficiencies while delivering greater value to citizens.

This section offers a broad brush of the key digital-transformation trends that are sweeping across public services the world over. Among the trends sampled are digital connectivity and IoT, AI and automation, cybersecurity and protection, citizen-centered applications, big data and analytics, digital-government platforms and personalized digital services, digital identity, cloud computing, and blockchain.

#### Digital Connectivity

Local, state, and federal governments are using 4IR technologies to improve their citizens' lives. For example, with one of the world's fastest wireless internet, the ROK is also a global leader in internet-penetration rates [23, 32]. That has led the ROK government to tap into the tidal wave of digital technology sweeping its society. Its foray in DG has been motivated by the government's desire to move in tandem with the larger society and to further accelerate the country's digital transformation.

The ROK government has quickened digital-technology adoption through continuous public investments in modern technology. Such investments have powered the economic growth of the nation. So much so that the ROK is one of the most developed countries in the world. Its membership in the OECD, a rich-country club, testifies to its envious position [15].

In the UK, the gov.uk website marked the start of the UK government's effort at greater digital connectivity and DG. The website serves as a one-stop information hub for all government departments. It also enables one to search for almost any information on a specific sector of the government from the comfort of one's home. Online services also improve the quality of life for those with physical infirmities, and offer options for those whose work and lifestyle demands do not conform to typical daytime office hours. In the first year of its launch alone, the UK government saved around £42 million [23].

Similarly, Turkey's Social Aid Information System has consolidated multiple government data sources into one system to provide citizens with better access and faster decisions on its various aid programs [23].

Estonia's 1.3 million people use electronic identification cards to access more than 160 services online including voting, paying taxes, receiving unemployment benefits, and registering property. Estonia's success as a leader in the digitalization of public services comes partly from its X-Road system. As a data-exchange platform, X-Road enables data to be exchanged and shared between Estonians, the government, and the private sector [23, 27, 31]. With this system, all of Estonia's governmental databases and registries are fully electronic and accessible [16]. Medical records are easily transferable across hospitals. Made possible by X-Road, the task of filing taxes, which is typically an onerous task, takes only three minutes in Estonia [8, 9]. While giving absolute control to the owners of data, the system allows for any newly developed digital services to be easily integrated with other existing digital services. According to the Government of Estonia, X-Road has helped save 820 years of working time [37, 38].

Admittedly, Estonia is a small economy. Nevertheless, its achievement should inspire other countries in their DG journeys.

### IoT and Smart Cities

Smart cities aim to create digitally connected environments to help local and regional governments offer more and speedier local services. Road sensors, traffic cameras, and built-in sensors in cars track and manage traffic flows. Additionally, IoT works in the background to enhance public transportation, public safety, and sustainability. The Lower Colorado River Authority Texas, USA, for example, has installed sensors along the Colorado River to track water levels in its efforts to prevent potential flooding. Through IoT, smart meters enable cities to save energy. Automated street lights and electricity grids are other areas where digital technologies have improved city- and municipal-government's efficiency while making the lives of citizens a lot better [26].

Not only has city management been made that much easier through AI, the aged are being taken care of in their own homes. For example, in Finland their transfer to old-folk homes is delayed as the use of IoT in their homes enables the aged to stay alone longer than before. Sensors installed in the homes of these aged persons monitor their movements. Public authorities are alerted and act immediately if the sensors sound the alarm that the aged might be in some difficulty. These sensors have also reduced the number of visits by welfare staff to the homes of the aged. Also, robots are utilized to dispense medicines at the right time and with the right dosage [31, 33].

The IoT has also enabled governments to build smart cities, especially across the USA and in Europe. London is one such city. It was recently voted as the top smart-city government in the world. It won that accolade for its ability to gather, process, and analyze data and information to improve citizen services. Seoul too figures prominently as a smart ‘city of the future’ [43].

The IoT enables the gathering of location data through sensors placed at strategic locations. Data therefrom also enables governments to predict dust-storms in particular areas in the UAE and floods in Indonesia. Sensors across the city of Warsaw enable the visually impaired to navigate the streets with the help of their mobile phones. Location data fed by bus commuters while playing video games on buses have helped Mexico City to comprehensively chart bus routes and their timings [8].

As city and local authorities utilize data in a ‘smart’ way, they are able to continually improve services, thereby giving citizens better value for their tax money. Indeed, by 2030, around 40% of local and regional governments are expected to employ IoT to turn infrastructure, like roads, streetlights, and traffic signals, into platforms for improving people’s lives [1, 18].

### AI and Automation

AI has enabled automation of work processes. That in turn has allowed the release of human capital to jobs that are unamenable to automation. It is projected that AI in the USA has the potential to free up 30% of government jobs by 2020 [15]. Government organizations are increasingly aware that to meet the needs of citizens well and to reduce the operational costs, they will have to invest in AI and automation.

Areas where AI is particularly valuable include public services that are delivered through face-to-face interactions with users, such as health and social services, border services, and social security. In these areas AI and cognitive chatbots have been roped in to create more citizen-centric experiences without human involvement. They also help eliminate paperwork and save much time working on data.

Automated call centers using chatbots have revolutionized social services in the USA government. The USA has also increasingly used AI relating to facial recognition in law enforcement. As AI can do minute image analysis on CCTV video footage, such analysis can help solve criminal cases as well. Fingerprints and DNA data too have proved handy in identifying suspects with the help of AI. Also, the USA government has leveraged data to support decision making [4, 10].

Education is another sector that will benefit from AI as students of ‘generation Y’ increasingly populate the education system. With the massive amounts of data that the education sector has, AI will be able to curate content and tailor learning to suit the learning history and needs of individual students. This not only personalizes education delivery, but it also enables educators to proactively address student’s needs and improve teaching effectiveness.

Through automation too, governments have introduced online tax assessments, procurements, and payments. Estonia and Malaysia are examples of such automation. In Estonia, people even vote from the comfort of their homes, thanks to electronic identification cards. They no longer need to waste time in queuing up to vote [16, 20]. In Malaysia, hitherto, court sentences were sometimes inconsistent. This would no longer be an issue as the courts have begun to use AI in ensuring consistency in sentencing [44].

In the nursing homes of Japan, robots are utilized to offer care to the old patients. The Japanese government reckons that 8% of nursing homes have lifting robots that can provide physical assistance to the aged and infirm. Japan's national robot strategy projects that by 2020, robots will attend 80% of the elderly receiving care [34].

Increasingly, AI is being advanced across healthcare services, especially in the developed world, as a diagnostic tool for many diseases. By analyzing massive quantities of data through AI, clinical staff can identify patterns and streamline healthcare processes. This would help improve the health of populations and lower the cost of healthcare.

For example, Watson, an IBM health-oriented computer, can diagnose cancer and offer prescriptions at an accuracy that beats those of human doctors. PR China has adopted the AI-powered IBM Watson in public healthcare [2, 26]. We now have the technology to undertake surgical operations with the aid of AI. Similarly, Denmark is coming up with telemedicine solutions for people with chronic disorders, so that patients need not be admitted into hospitals. Instead, they may recuperate in their homes while being monitored by healthcare professionals via video conferences [5].

AI provides governments with an opportunity to not only modernize their systems, but to also make them more resilient to citizen demands. Although automation is more ubiquitous in the private sector, the future is bright for automation in the public service [27].

### Big Data and Analytics

Data has been likened to oil as it is the fuel for the digital economy. Another adage is that data is sunlight as it will underwrite everything in the digital world. Whatever the metaphor, data and its analysis lead to greater public service benefits through improved service delivery and evidence-based decision-making. As governments are data-rich, they are now able to consolidate enormous quantities of data and use sophisticated analytics to learn more about the state of service delivery. What was once a tedious process that took an inordinate amount of time in collecting and analyzing data, is now a simplified and autonomous process. AI helps crunch real-time data to assist in areas such as traffic monitoring and weather forecasting. Data analytics also helps solve housing and transportation problems and easily identify reasons for the high incidence of a disease in any specific location [3, 17, 39].

In the ROC, for example, legislators used an AI-powered platform to aggregate data on views regarding a proposed legislation on ridesharing in the country from over 4,000 different stakeholders. Based on the analysis of the viewpoints expressed and agreement of the stakeholders, the Taiwanese legislatures ratified seven new regulations [2].

To add legitimacy to big data, in 2009, the USA government gave open data a legal and privacy framework. It led to the creation of the website data.gov, as a repository of government tools, resources, and information on anything from energy and science to global development and health. Today, more than 85,000 data sets are available to help businesses and citizens conduct research, develop web and mobile apps, and create design visualizations. To populate data troves, government departments are required to identify and share their most valuable data. Competitions, such as 'Apps for America' and 'Apps for Democracy,' have been organized to attract talented developers to build applications that use government data [4, 7, 36].

Additionally, automation has allowed for the integration of databases, which enables the mutual sharing of data by related departments. This enhances interagency collaboration and speeds up

service delivery. For example, in Malaysia, the immigration department, the department for registration of births and deaths, national taxation board, police, and customs all share a common database. This allows for the issuance of passports in as less as one hour. It also allows for the blacklisting of the errant to prevent them from leaving the country [1].

The use of big data continues to grow. Governments across the globe are actively exploiting AI to capture, analyze, and share data to fuel innovations and redesign citizen services [7].

### **Citizen-oriented Apps**

Across the world, the workforce is increasingly becoming mobile. This has been made possible with the help of smartphones. In the USA, for example, as much as 70% of its workforce will be mobile by 2020. Governments have exploited this mobility by providing citizen-oriented apps for easier access to and delivery of public services. These apps also aim to engage communities in codesigning public services. Apps for public libraries, parks and recreation, and motor vehicles provide information and services at speeds never imagined before. Enterprise-oriented apps in the USA boost the government's efficiency by reducing the time employees spend on paperwork and other mundane tasks. One such example of convenience is where USA citizens can apply for and ask questions about government services by swiping to the left on their smartphones rather than having a 30-minute phone conversation [17].

As the penetration rates for smartphones increase, citizen-oriented apps enable governments at all levels to reach more people. This will bring citizens and government closer together.

### **Digital Government Platforms and Personalized Digital Services**

Digital platforms that offer omni-channels, e.g., mobile devices, internet, social media such as Facebook, and chatbots for service delivery are catching on in developing countries as well, even as developed countries proceed apace. With these platforms, governments are engaging citizens and meeting their needs expeditiously and conveniently.

Additionally, these digital platforms provide citizens across the world with more information than ever before. They also help citizens to complete more government transactions in less time. For example, citizens can file taxes and register businesses and properties online. By simplifying these processes, governments are improving citizen engagement and satisfaction. These digital platforms also enable governments to create a personalized citizen experience. They not only give the people what they want, they also free up government manpower to focus less on routine issues and more on bigger issues.

Denmark has moved ahead in providing personalized digital services. For example, citizens who are about to retire are presented with retirement planning options when they log into their portals. Denmark has also launched the Digital Post, a government-provided digital letterbox where citizens receive communications from the government. Over 90% of Danish citizens aged 15 and above have their personal digital postboxes. They use these digital postboxes to communicate with public agencies, thereby cutting costs and time across the public service [5].

Additionally, governments have continued the digitization of documents for ease of access and analysis. The national- and local-level governments in Japan are committed to this process. In 2014, Japan launched the website [data.go.jp](http://data.go.jp). This website is essentially a digital catalog of the government's open data. It renders greater access to data contained in public documents. Such digitalization

obtained a boost from the 2019 Act of Digital Government Procedures. In keeping with this law, progress in converting paper-based procedures into the digital format is still progressing in Japan. However, there still are a lot of rules implemented based on paper procedures and the government is seeking to overcome this lag so as to keep up with the digital age [25, 28, 30].

Digitalization has also enabled the Danish Business Authority to replace paper forms with online processes [5]. This digitalization allows both domestic and foreign companies in the country to seamlessly execute their operations. It is crucial for Denmark as it enables the government to track money laundering. Other benefits include a better identification of tax dodgers [21].

Through such digitalization of services and processes, governments have been able to reap greater efficiency and cost savings. Digital services and processes have also transformed employees and citizens into more independent digital users. They have made citizens more empowered and motivated to becoming even more savvy in digital technologies.

### Digital Identity

Digital identity is a collection of electronically captured and stored identity attributes that uniquely describe a person within a given context. It provides public- and private-sector entities efficient ways to reach citizens, especially the poorest and most disadvantaged, who without the necessary identification papers are unable to establish their identity. Digital identity, combined with the extensive use of mobile devices, enables citizens to participate in social, political, and economic lives of their society. It enables the citizens to access basic services and the governments to achieve efficiency gains. Among the countries that have adopted digital identity systems include Albania (eID and e-Passport), Chile (eID and e-Passport), Estonia (mobile eID), Finland (mobile eID), India (Aadhaar, unique ID), Moldova (Mobile eID), and Nigeria (National eID) [41, 42].

In Denmark, citizens use their digital IDs, called the NemID, to interact with government agencies, banks, and the private sector for accessing a whole range of services. Some sectors have even gone as far as allowing citizens to schedule appointments with their hairdressers by logging in with their IDs [5].

For digital identity systems to be widely used, there must be a political commitment, and a data-protection-and-privacy mechanism in place. Extensive coverage and an appropriate design will also go a long way in maximizing the contribution of digital identity to improving citizen lives.

### Cloud Computing

Cloud computing is gaining increasing prominence in government digitalization efforts as it helps public service organizations to make evidence-based decisions and improve productivity and citizen services. It offers the security for government databases in the cloud and helps hasten innovation in government using technologies in the cloud without the need to buy hardware. However, it requires governments to have an eye on cost-effectiveness. Accordingly, the focus has been to make cloud computing cost-effective, and to create workforce strategies to enable greater utilization of cloud-computing power [45].

The pay-on-demand model for cloud services also shifts capital costs to maintenance costs, thus giving agencies greater flexibility with their IT budgets. The cloud also allows agencies to shed their physical data centers and all the costs related to maintaining legacy technologies. These can result in millions of dollars in annual savings [46].

### INDIA'S UNIQUE ID: AADHAAR

In 2009, the Indian government started to enroll its 1.2 billion citizens in a digital-identity system. The system, provided for free, is to enable each person with a unique identity number, called Aadhaar. That number will constitute a proof of identity when an individual avails a public service. The Unique Identification Authority of India (UIDAI) was established to design and manage this process.

Employing state and private agents to enroll citizens, UIDAI has registered more than 1 billion people. Aadhaar numbers have been linked to the delivery of liquefied petroleum gas subsidies, public distribution system rations, and other social protection programs. Eventually, the goal is to connect Aadhaar to myriad other public and private services through a variety of partnerships.

The data captured by enrolling agencies includes biographical information such as name, gender, date of birth, and address, along with 10 fingerprints, two iris scans, and a photo. This data is securely sent to UIDAI for verification and elimination of duplicate registration. Once the digital identity is verified, a unique identification number (the Aadhaar number) is issued to the registered person, who receives a printed letter containing the number through mail. Public and private service providers can then authenticate the person's identity online using the Aadhaar number and a fingerprint scanning device.

Any public or private entity can now use the Aadhaar number to authenticate a user against the UIDAI database. When Aadhaar is used for authentication, service providers simply send a request to UIDAI for verification of an identity ("is this person who he or she claims to be?") and receive a 'yes' or 'no' in response. Data remains with the UIDAI, and is not shared or accessible by other public or private entities.

Sources: [40, 42].

### Blockchain

Organizations have traditionally recorded transactions in ledgers. These are kept safe to protect the integrity of data. The blockchain technology replaces this traditional system with a digital ledger. Data recorded in a blockchain are unalterable except by the original person who had registered a transaction in it. Distributed only to the parties related to the transactions, the blockchain manages in minute detail who is allowed to have access to a data and tracks who has done so.

Blockchain offers the benefits of security, efficiency, and speed for public-sector organizations. As such, public services, especially in the developed world, are increasingly harnessing the blockchain technology to carry out services such as digital currency/payments, share issuance (USA) land registration, voting in elections (Colombia, Estonia), identity management (India, PR China, and Estonia), healthcare (Estonia), corporate registration (USA, UAE), taxation, and entitlements management [19].

The spread of the blockchain in the public service signifies that governments are convinced that this technology can create value in service delivery. Notwithstanding, to harness its full potential, this technology has to be adapted to the individual requirements of each country.

### Security and Protection

Citizens are ever-increasing their online presence, and governments have massive amounts of sensitive data stored online. The World Economic Forum, a think-tank and conference organizer, identified cyberattacks and failure of critical systems as two of the most dangerous global risks. Beyond financial losses, cyberattacks may pose serious reputation risks for companies as well as for governments [41].

To protect vital data, governments have created national cybersecurity strategies to ensure constant improvements in cybersecurity and data protection. They have also developed information-sharing mechanisms to detect and respond to cyber threats more quickly. The UK Fusion Cell, for example, brings experts from government and the private sector together in an information-sharing and threat-analysis hub.

Laws have been passed in some nations, such as Malaysia, the UK, and the USA, on cybersecurity and data privacy. The EU's General Data Protection Act and the California Consumer Privacy Act came into force in July 2020 to protect private data [35]. The US Department of Homeland Security puts out instant alerts of cyberattacks so that networks across the government and private-sector information technology systems are safeguarded. The US National Cybersecurity Protection System for example, regularly provides “intrusion detection, advanced analytics, information sharing, and intrusion prevention capabilities” [26].

### Critical Success Factors in Digital Transformation

Digital technology alone is inadequate to bring about DG. It must be complemented with the requisite leadership, digital capabilities, clear strategy, and the development of a culture that supports a digital government. Based on the brief review of country experiences in DG, this section highlights the critical factors that are prerequisites for a comprehensive digital transformation in the public service.

#### Digital Leadership Ensures Smooth Transition to DG

The relative progress across countries suggests that the digital agenda must be dictated from the top political and bureaucratic leadership. Estonia's and Malaysia's successes in DG are mainly attributed to the political commitments of their governments towards their country's digital agenda [1, 27].

In Malaysia, political leadership initiated the move toward DG as part of the broader agenda to digitalize the economy. A similar political drive to improve the efficiency and effectiveness of public services through expanded digitalization can be observed in countries such as Latvia, and the OECD countries. All these countries have similar objectives. They all emphasize knowledge development, customer-centricity, digital skills, digital security, AI application, and e-government to intensify digitalization in the public service.

Taking queue from the political leadership, public service leadership must also recognize the role of technology in improving operational efficiency and achieving organizational outcomes, including enhanced service delivery. Public service leadership must also convince the public service at large that the change to digital models of governance is the way forward if the public service is to keep abreast and stay relevant with the times.

Public service leadership should ensure that the right technologies are adopted and that there are adequate digital capabilities in the government for exploiting them. Public service leadership

should also possess skills to design and implement an appropriate DG strategy. Leaders should be technically savvy enough to be able to discern the emerging trends in DG and adapt them to their respective services.

### **Culture Should Support the Transition to DG**

Apart from setting the strategy and adapting useful digital technologies, leadership is also fundamental to fostering a culture that supports the transition to DG. Such a culture will include the readiness and willingness to constantly adopt digital technologies when there is a clear benefit in terms of operational efficiency and delivery outcomes. The adoption of digital trends itself will have the salutary effect of fostering a culture of innovation and collaboration.

The new culture must be outward-oriented in that it should listen to and engage with citizens. Asking users to comment on service options and acting on user feedback quickly and continually can help ensure that digital technologies are relevant to meeting the needs of citizens and the business community.

An entrepreneurial culture where the public service takes steps for adopting digital technologies even if there is a risk that these technologies might not deliver the expected improvements in services, needs to be fostered. Senior managers need to endorse such a culture and give young officers space and confidence to experiment. Without such a culture, inertia might prevent a sustained movement toward DG.

Collaboration in providing end-to-end services has the potential of increasing efficiency and citizen experience. Greater collaboration among stakeholders should be engendered to ensure rapid and effective solutions for citizen needs, using digital technology. Many government officers are so busy with small tasks that they cannot afford to about what valued services governments should deliver to the people [30].

The change from analog to digital must also be sustained. As the leadership responds to the ever-burgeoning demands from a consumerist public, it should ensure that the momentum of change is kept apace. Otherwise, the force of status quo will nullify the progress. Adequate incentives should be installed to change employee behavior and mindset in the desired direction.

### **Strategy is Vital for DG migration**

A well-defined digital strategy with a detailed roadmap is another critical factor in ensuring an orderly migration to DG. A clear strategy will enable the public service to respond to threats and opportunities with alacrity while promoting an innovative and collaborative culture. A global digital strategy for the government should be the basis for the development of departmental digital strategies. For example, the Digital Transformation Office at the Ministry of Economy, Trade, and Industry, Japan sets an overall strategy and directs digitalization in government and private sectors [28].

The strategy should advocate a comprehensive approach to digitalization of the public service for enhancing citizen experience. It should aim for the online delivery of as many of the public services as possible. For example, through DG, the Malaysian government has made 90% of its public services accessible online.

The strategy must also aim at a root-and-branch transformation of systems, processes, and organizational structures. It should also embody initiatives to improve evidence-based decision-

making through the use of big-data analytics. For example, the strategy of Digital India is to transform India's governance so that every part of the government is able to unleash the potential of digital technologies in improving operational efficiency and service delivery, and foster collaboration among government bodies, businesses, and citizens [24, 42]. For example, the department of water supply and sanitation in the state of Punjab, India has adopted robots to clean sewerages [47].

The roadmap to implement the digital strategy should address the following key elements: culture, leadership, workforce, and procurement. It should detail how to engage stakeholders and win their backing. As part of the action plan, intended outcomes should be spelt out and a performance management system instituted to track and measure the progress against the intended outcomes.

In developing this roadmap, the digital plan should identify obstacles that could impede digital transformation, and devise strategies to overcome the barriers. It should identify what employee capabilities are needed and how they are going to be equipped with those skills.

Without an overall plan of action, a DG implementation faces the risk of being uncoordinated as organizations jump onto the digital bandwagon and adopt technologies indiscriminately without considering their compatibility and interoperability with those in other public services. Such uncoordinated adoption can also lead to inefficient resource use, duplication of effort and platforms, and consequently, poor public service performance.

Roughly 60% of government agencies in Nordic countries have a digital strategy that aims to modernize public services. These countries focus more than others on radically digitalizing organizational processes and operations. This is partly the reason why public services in the Nordic region are high-performing and digitally mature. The overarching aims of the Nordic digitalization program for the public service are to

- advance interdisciplinary and cross-sectoral research on public service digitalization and support capacity building for research;
- generate applied research that will be useful to practitioners and policymakers in each participating country as well as across national boundaries;
- promote increased cooperation between researchers, service providers, and users at all levels, and across public, civic, and private sectors;
- develop innovations and new digital solutions for modernizing public services as well as better understanding the potential impact of digitalization on public organizations and employees; and
- consider security, privacy, and ethical implications as well as other possible societal risks of digitalization, e.g., cybersecurity, data governance, and increased social inequality.

### Upskilling Employees

A tech-savvy workforce is integral to any organization's digital transformation strategy and its execution. Given rapid advancements in digital technology, governments should invest in upskilling their leaders and employees in information and communication technology (ICT) skills if they

want to see their DG agenda through. Further, there is a big asymmetry of information between IT vendors and public officers. This leads to higher costs, longer timeframes, and greater inconveniences in developing user-friendly services. It is therefore necessary for governments to reinforce their IT capabilities [25, 28, 30].

Government leaders and employees should have more than just technical skills. They should also have team building, research and analysis, and project management skills. Additionally, employees should have an entrepreneurial and risk-taking mindset to pursue innovation and citizen-engagement.

Recruiting people with the necessary skills can address skill gaps in government. Creating internship and fellowship programs and hiring for short-term assignments are some of the recruitment strategies. With millennials increasingly entering the workforce, the skill gap should narrow over the years. However, given the resource constraints, governments are hard pressed in recruiting top talent [11].

#### DIGITAL STRATEGY OF THE US DEPARTMENT OF THE TREASURY

The efforts of the US Department of the Treasury provide a model for an effective digital strategy. The department has a detailed plan of action for each milestone mentioned in the White House's Digital Government Strategy, along with a process to monitor and track the progress.

The strategy articulates some of the basic tenets of digital transformation, e.g., openness, consumer feedback, citizen engagement, and a governance structure designed to develop and deliver digital services to citizens. The strategy also emphasizes the need to upgrade and adopt new technologies and instill transparency, both within and outside the department.

Importantly, the department has placed the citizen at the heart of its digital strategy. Apart from formalizing feedback processes through online satisfaction surveys, the department regularly publicizes its implementation milestones and open-data initiatives, through traditional and social media. Citizen engagement is further enhanced through regular focus groups and competitions such as MyMoneyAppUp, and inviting citizens to develop next-generation mobile apps that could help Americans shape their financial future.

The treasury department has also built a governance structure to monitor the progress of digital initiatives through the formation of the Digital Government and Innovation at Treasury (DiGIT) Working Group. A technology review board oversees investments in technology. The department has implemented tools to collect and analyze website metrics. It also tracks its own progress on the digital transformation roadmap.

**Source:** Eggers and Bellman [10].

Nevertheless, a few governments have found ways to attract or nurture IT talent for their digital projects. The ROK, for example, has centralized much of its government IT infrastructure in a few data centers that provide various e-government services to citizens. The size and breadth of these centers make it possible to offer IT staff promising careers with the added challenge of improving

a variety of online services and tackling the challenges of managing a huge data center [23, 32]. In the UK, the government actively attracts talent from the private sector by offering fast-track career opportunities. For example, the government CIO and the head of digital services had previously spent most of their careers in the private sector. In addition, high-performing graduates are offered fast promotion opportunities in IT [36].

As in the UK, the Japanese Ministry of Economy, Technology and Industry (METI) hires IT professionals from the private sector as project managers for its IT services. This enables METI to develop digital services more effectively and efficiently [28].

Still, even developed countries, and not just the emerging ones, face challenges in recruiting people with the right digital skills. Educational institutions providing formal as well as non-formal training need to be more effective in equipping students with the digital skills that the public and private sectors need. The governments of the ROK and Estonia, for example, are making huge efforts to improve the digital skills of their workers for their economies [23, 32, 38, 39].

### **Citizen Engagement**

In the digital journey, citizens play a prominent role. They not only prompt governments to shift to DG but also demand that they be consulted in the design of digital services. Crowdsourcing ideas through competitions and hackathons are some of the ways in which governments have engaged users and developed user-centric digital services.

Accessing skills in the wider community through open data, transparency, and cocreation allows citizens to harness their skills and make a contribution toward improving public services. Open data from crime records, train times, and other sources have been used by the civic society and businesses to create apps by themselves.

Roughly 20% of government agencies in Belgium and New Zealand engage citizens in cocreating digital services at a significant level. Canada stands out in responding to citizen demands. However, it is poor in cocreation in digital transformation by citizens. To enable greater citizen engagement, processes have to be redesigned [10].

In 2011, the Netherlands set up i-NUP, its government-wide implementation agenda for e-government services. The agenda prioritizes citizen-centered design by boosting convenience, simplifying procedures, and pruning red tape. Now most municipalities are connected to a single access number [40].

To promote greater engagement with businesses, the Dutch government has launched a comprehensive digital-infrastructure project. Led by the national digital-governance agency, Logius, the project's steering group includes central and local governments and public IT agencies. Together, using world-class standards, they have devised technical specifications for 13 central databases and their interconnections. They have also created a government-wide dashboard to highlight project status and risks. Conferences and social media have been roped in to disseminate and refine key lessons with public-sector IT managers around the country. As a result of these initiatives, physical visits to municipalities and government offices have decreased significantly, by as much as 50% in some cases [21].

On the demand side, DG will be of no avail if citizens are not geared to using the online services made available. In this respect, the digital divide in the society and within the government needs to be narrowed so that more digital citizens are developed to make online services meaningful. For

**SINGAPORE: PROVIDING A PLATFORM FOR COCREATION**

By providing access to more than 3,000 government datasets, the government of Singapore has cocreated more than 110 apps with its citizens. Examples include StreetSine, a co-brokering platform for real estate agents, and myENV, a mobile app that provides real-time information on Singapore's weather. To facilitate cocreation, the government plans to progressively add more datasets and explore other platforms. "The emergence of new infocom technologies calls for fundamental rethinking and transformational shifts in the way we look at e-government," said Teo Chee Hean, Singapore's deputy prime minister. "Governments must take on the roles of a facilitator and enabler—to collaborate with the public, private, and people sectors in creating new solutions, new businesses, and new wealth."

**Source:** Eggers and Bellman [10].

example, in 2017, roughly 70% of Chile's citizens preferred registering and updating their data at physical municipal offices. They disliked online public-sector platforms due to a lack of the necessary technological literacy. With only 22% of the population being e-literate, the Chilean government is unable to go full steam with the adoption of digital technologies. In this case, the mismatch between technological requirements and citizen knowledge prevents the full realization of DG [14].

**ICT Infrastructure**

Developed countries have soared ahead in DG, partly because of their heavy investments in R&D. For example, the ROK government has invested heavily in R&D, focusing on technologies tied with the fourth industrial revolution, e.g., AI, augmented reality, IoT, and big data [15]. However, legacy and disparate IT systems create a stumbling block in integrating data and data systems. Agencies will have to find a way to manage such issues of interoperability of IT systems. Additionally, developing countries find resource constraints to be a stumbling block in their migration to DG. Not only are the new technologies pricy, but they also require constant updating. The pay-on-demand services based in the cloud could partly overcome this problem.

By 2020, IoT-connected platforms and devices have produced over 40,000 exabytes of machine-generated data. Data management and storage systems must be able to handle the high capacity and keep scaling in proportion of the data growth. A similar requirement applies to the public service as well, though it might not handle such enormous amounts of data.

Apart from upgrading broadband facilities, many governments have set up dedicated units headed by chief digital officers. In Malaysia, the deputy director-general (digital government) of the Malaysian Modernization and Management Planning Unit (MAMPU), is tasked with the implementation of DG. In the UK, strong central leadership and implementation capability are provided by the Government Digital Service of the Cabinet Office. The Dutch too have entrusted the central leadership for DG to the national digital-governance agency, Logius [23].

In Denmark, IT Projektraad, a digitization council reporting to the Ministry of Finance, was established to better coordinate large-scale IT projects across the government and generate cost efficiencies. The council functions as its central IT steering group to ensure that the proposed benefits of IT projects are realized. The council does this by using a test-and-learn approach, and

by pilot-testing projects. It issues specific guidelines for government agencies on planning their IT investments. It also develops and shares best practices, conducts risk evaluations for projects over a certain cost threshold, participates in project reviews, and helps oversee the government's IT project pipeline. Such central oversight has helped the Danish government reduce unnecessary investments, enforce common standards, and build greater project synergies [5, 23].

Given these experiences, it is crucial for any government that is intensifying its migration to DG, to have a dedicated digital-transformation management office at the prime minister's or president's office level to direct government-wide implementation of the DG strategy. This office must be clothed with the highest level of authority to deliver results.

## Conclusion

This chapter has portrayed the public service digital evolution. It has sketched how governments can accelerate their rate of progress towards DG.

Technological advancements in the recent past have created a platform through which governments have sought to improve public services. Digital technologies have forced governments at federal, provincial, and local levels to rethink how they could provide better services. As such, digitalization of public service institutions is one of the biggest reforms that is taking place in the world today. This is because all governments are convinced that DG is the way forward for increased operational efficiency as well as improved services. With DG, governments have the ability to do more with less and to connect deeply with citizens.

DG is a work in progress and is proceeding apace. However, due to the variations in pace, there is a wide range of digital maturity in public services across the world. There are also differences in digital adoption among the public services of individual countries.

To accelerate the development of DG, governments should show digital leadership by committing resources to digitalization. Governments should continue to invest in upgrading their digital infrastructure. They should expand data storage and sharing so that there is greater integration across systems and databases. Such investments should keep the user at the center of a digital transformation program. Collecting and processing feedback can also be extremely helpful in digital transformation. A culture of innovation should be fostered. Also, a public service should ensure that its workforce has the requisite skills to introduce digital technologies in service delivery.

However, investments in digital technologies will not be of much avail if any digital divide across a nation is not addressed. Citizens must be equipped with the skills and knowledge to access services online. The education system should be modernized to develop IT skills among the young.

Of course, the ultimate objective of DG is to put all services online. To achieve that, governments should engender trust among their citizens. That will require governments to be mindful of data privacy and security. If citizens are assured that their personal data are inviolable, they will feel empowered and will increasingly be willing to go digital. That will be an added boost to DG.

Having seen the commendable progress in DG across a sample of countries and having observed how these countries have overcome the challenges they faced, one could conclude that digitalization of the public service is the way forward.

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## CASE STUDY 1

# DIRECT BENEFIT TRANSFER SCHEME, INDIA

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### Abstract

Direct benefit transfer (DBT) is an important application of digitalization of public service delivery in India that has transformed the process of delivering benefits to deserving beneficiaries. It does so by preventing leakages in the delivery mechanism, thereby causing significant reduction in the cost of transactions, and ensuring timely, efficient, transparent, and convenient transfer of benefits. This case study presents the goals, objectives, and strategy, and the governance structure adopted for planning the DBT scheme in India.

The chapter identifies the key resources for the implementation of the scheme and lists out important activities for its successful implementation, which has resulted in desired outcomes for beneficiaries as well as for the government. The case analysis recognizes several critical success factors of the scheme such as availability of digital identity of citizens in the form of Aadhaar, the proliferation of bank accounts in rural areas, ubiquitous availability of mobile telecom network, and strong commitment of the government in implementing the scheme. The study summarizes the important challenges that were overcome for digitizing the beneficiary records and designing a process for flow of information to various stakeholders as well as in the actual transfer of benefits to the beneficiaries. The case analysis enumerates insights and learnings from the implementation of DBT, which can be of immense value for replication of the scheme in other countries.

### Introduction

Governments all over the world have taken recourse to transfer benefits in the form of cash for lifting identified sections of the society from poverty and ensuring social equity and inclusion for its citizens. Cash transfer to beneficiaries made its appearance as a policy intervention around the 1980s in the countries of Latin America, the USA, Mexico, some African republics, and southeast Asian nations [1]. The beneficiaries were identified on the basis of economic and social parameters. The primary objective of these interventions was poverty alleviation and reduction of inequality either in the form of conditional cash transfer (CCT) or unconditional cash transfer (UCT). In the case of CCT, the government encourages citizens to participate in its welfare programs and promotes desired behavior among its citizens by transferring money to persons who meet certain criteria such as enrolling children in schools, receiving vaccinations, and doing family planning [2]. In the case of UCT, the cash transfer is done unconditionally [3] on the premise that giving cash to citizens allows them to have autonomy over their own lives.

Governments across the globe have faced several challenges in the transfer of benefits to beneficiaries of government schemes. Based on interactions with various stakeholders, it is understood that some of the important challenges pertain to the correct identification of the beneficiary, devising operationally efficient and transparent processes of transfer of benefits, taking care of the convenience of beneficiaries, ensuring timely payment of cash benefits, and laying down accountability of officials responsible for the transfer of benefits [4]. These challenges can be classified into two major areas. The first problem area pertains to the authentication of identity of the deserving beneficiary while the second area includes the problems associated with the process of delivery of benefits to the identified beneficiary.

The first problem area of authentication of identity of the beneficiary includes two types of common errors. The first type of error arises from the exclusion of deserving beneficiaries who are left out in the delivery process. This may be either due to an inefficiency or mala fide intention on the part of authorities or can result from the beneficiaries' inability to prove their eligibility to be included in the scheme. The second type of error pertains to the inclusion of undeserving beneficiaries, i.e., the people who did not qualify for the benefits in the first place as well as those who continue to benefit even after they cease to be deserving. This error may be caused due to the inability of the authorities to review and revise the list of beneficiaries on a regular basis.

Another problem area in the transfer of benefits pertains to the problems in the actual process of delivery. These include the inability to ensure timely delivery of benefits, leakages in the delivery mechanism due to presence of several intermediaries, high cost of processing the transactions, difficulties in manual reconciliation of financial benefits, and the complexity of some beneficiaries availing benefits in several government schemes. Each of these issues results not only in a loss to the exchequer but also causes dissatisfaction among the beneficiaries, thus leading to a poor perception of the governance of schemes.

Technological advances in digitalization of public service delivery have been leveraged in India in the form of an innovative solution, called the DBT Scheme [5]. This scheme aims to overcome these problems and ensure timely delivery of benefits to deserving beneficiaries by preventing leakages in the delivery mechanism and causing significant reduction in cost of transactions. This ensures an efficient, transparent, and convenient transfer of benefits, thereby resulting in a reduction of poverty at the household level.

DBT has been made possible in India due to (1) availability of a unique identity of the citizens (commonly referred to as Aadhaar number); (2) widespread data connectivity through mobile phones; and (3) enhanced coverage of beneficiaries with bank accounts, which has been achieved through another ambitious government scheme called the Pradhan Mantri Jan Dhan Yojana (PMJDY) [6]. Aadhaar is generated by the Unique Identification Authority of India (UIDAI) using biometric identification of the beneficiary. Collectively, these three enablers of DBT are often referred to as the Jan Dhan, Aadhaar, and Mobile (JAM) trinity. The JAM trinity has been leveraged in an innovative manner for implementing the DBT scheme.

Under the DBT scheme, beneficiaries are identified through their Aadhaar numbers. Monetary benefits such as pensions, scholarships, and wages for public works done under government schemes are directly credited to the bank accounts of the beneficiaries. The beneficiaries are then able to withdraw the money with the help of their mobile connectivity, using the Aadhaar Enabled Payment System (AEPS) at kiosks and micro-ATMs located in the villages. In this way, the delivery system

of the government has been reformed by reengineering the existing process in welfare schemes for simpler and faster flow of information/funds and ensuring accurate targeting of the beneficiaries, deduplication, and reduction of fraud. DBT brings efficiency, effectiveness, transparency, and accountability in the government system and infuses confidence of citizens in the governance.

The implementation of DBT has resulted in bringing about a paradigm shift in the identification of targeted beneficiaries, facilitating cash-in and cash-out facilities for beneficiaries, and effective monitoring of the scheme through IT enablement. As of 7 November 2020, 351 schemes across 51 ministries of the central government had adopted DBT [7]. In 2019–20 alone, till January 2020, more than 3.3 billion DBT transactions had taken place in which more than USD30 billion had been transferred to the beneficiaries. Cumulatively, the amount transferred through the DBT scheme was more than USD130 billion, with estimated savings of around USD20 billion by way of deduplication and increased efficiency.

Conceptually, the implementation of DBT appears to be a fairly simple process. It involves seeding of Aadhaar number of the beneficiary in the database of the DBT scheme as well as in the bank account held by the beneficiary. With the help of this common key of Aadhaar number, the payment, which is to be made to the beneficiary can be easily mapped to his or her bank account and made seamlessly without the intervention of any intermediary. A flowchart of the DBT scheme is depicted in Figure 1.

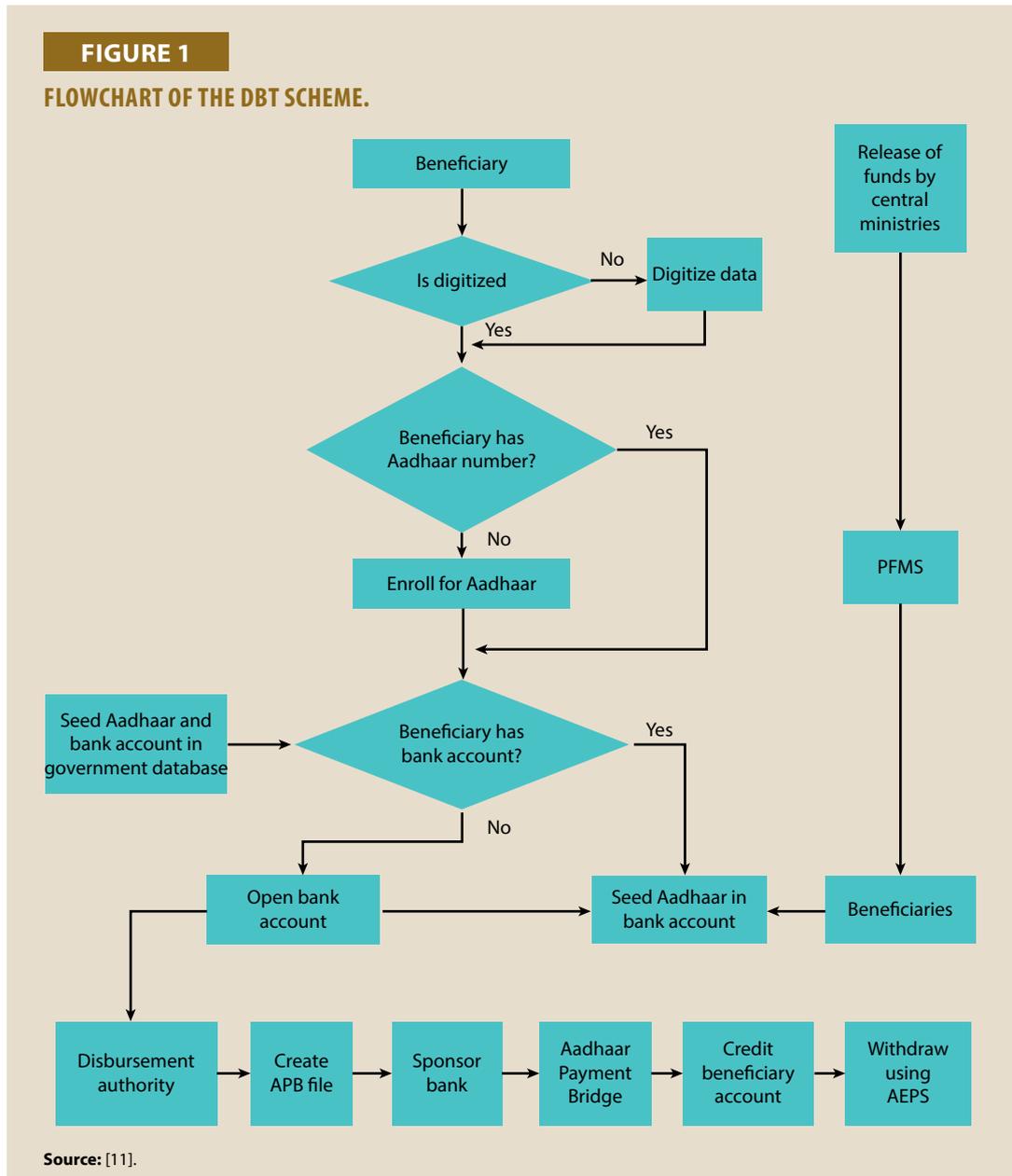
However, implementation of this seemingly simple solution throws up immense challenges in a complex country like India. Several of these challenges are covered in the case study. It is inferred that these challenges can only be overcome with a strong commitment of the government and by leveraging the technological ecosystem of digitalization and connectivity. Learnings from the case analysis can provide valuable insights for implementing this innovative solution in other countries that face similar challenges in the delivery of benefits to their citizens.

The rest of the chapter is organized as follows: section 2 provides a background of evolution of DBT in India while section 3 outlines the focus and scope of the case analysis. Section 4 covers the analysis of the case through the ‘Policy Modeling Canvas’ consisting of issues/problems in the earlier system of delivery, goals/objectives of the DBT scheme, governance structure envisaged for its implementation, and resources deployed and activities undertaken for achieving desired outputs and outcomes for the beneficiaries. Section 5 provides an analysis of success factors of the scheme while the lessons learnt and insights from the case analysis are covered in section 6.

## **Background of Direct Benefit Transfer in India**

Government of India recognized the need to strengthen the country’s social safety network and improve the delivery mechanisms of poverty-alleviation programs in order to enable the target groups to access earmarked goods and services at affordable costs. This was deemed to be possible only by overcoming the inefficiencies in the prevailing system of delivery of benefits to citizens. Accordingly, in the Union Budget of 2011–12 [8], it was recommended that direct-subsidy transfer to the target group should be planned to improve the efficiency and reach of welfare benefits for the underprivileged.

In accordance with the recommendations, a task force was constituted on 14 February 2011 by the Ministry of Finance to suggest a general-solution framework for the direct transfer of subsidies to beneficiaries, while also making specific recommendations for kerosene, LPG, and fertilizers, which were three important elements of subsidy, affecting a large population of citizens at that



time. The task force was headed by eminent technology expert Nandan Nilekani, founder member of Infosys Limited, a leading Indian multinational providing business consulting, information technology, and outsourcing services. Nilekani is also widely recognized as the architect of the Aadhaar unique citizen identifier system, which was launched in January 2009. The task force included secretaries of seven government departments that were major contributors to the subsidy outgo of the central government as well as the Director General of UIDAI, the body responsible for providing the Aadhaar cards in India.

The task force adopted the following guiding principles for preparing the framework [9] of DBT:

- The new system should be designed in such a way that goods move in the supply chain at market prices rather than introducing two different prices for the same good (market price and subsidized price), as that creates incentives for pilferage and diversion.

- The new system should be such that beneficiaries have a choice to receive subsidies in the form of subsidized goods and services or as cash, based on their own preferences, preferably at any participating locations rather than restricting the service-delivery point to a specific location.
- The new system should have a core subsidy management system (CSMS) for the purpose of maintaining bookkeeping information on entitlements and subsidies such as identification and deduplication of beneficiaries, tracking movement of goods, prediction and aggregation of demand, and grievance handling.
- The new system should be designed in such a way that it is possible to transfer the cash component of subsidies directly and in real time to the bank accounts of beneficiaries through CSMS.
- The new system should facilitate integration of all subsidies and entitlements to the beneficiary under one umbrella through the CSMS.

The task force submitted its recommendations in June 2011 with a proposed framework of DBT for LPG, kerosene, and fertilizer subsidies. The proposed framework envisaged the integration of Aadhaar, enterprise resource planning (ERP) systems, nodal banks, and payment gateways, along with logistics, training, education, and outreach modules for replacing kerosene, LPG, and fertilizer subsidies with cash transfers. The committee recognized that although the proposed solution was technology-centric, its success would depend not only on the judicious use of technology but also on political will, good governance, incentive-compatible solution design, a structured transition plan, meticulous project management, effective supervision, audit, and execution.

Subsequent to this, the Prime Minister constituted a coordination committee called the National Committee on Direct Cash Transfers [10], which was mandated to coordinate action for the introduction of direct cash transfers to individuals under various government schemes and programs. After several meetings by the committee for preparing the ground for the new scheme, the DBT scheme came into effect on 1 January 2013 with seven fully centrally funded government schemes covering 20 districts. In April 2013, the government decided to extend the DBT to 27 schemes pertaining to scholarships, women, child, and labor welfare in 78 more districts from 1 July 2013. The Planning Commission released a handbook on DBT [11] in 2013 which provided a step-by-step approach for implementation of DBT in a systematic manner. It provided a compilation of standard operating procedures issued by concerned departments for a quick rollout of DBT.

DBT was further expanded across the country on 12 December 2014 with seven new scholarship schemes and the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) in 300 identified districts with higher Aadhaar enrollments. Electronic Payment Framework was laid down in Feb 2015 for ensuring uniformity by all ministries and departments and their attached institutions/public sector undertakings. The framework was made applicable for all central sector (CS) schemes and centrally sponsored schemes (CSS) as well as for all schemes where cash components were transferred to individual beneficiaries.

A DBT Mission was created to act as the nodal point for the implementation of DBT programs. The Mission was transferred to the Department of Expenditure in July 2013 and continued to function until 14 September 2015. To give more impetus, the DBT Mission was placed in Cabinet Secretariat with effect from 14 September 2015.

## Focus and Scope of Case Analysis

The objective of this chapter is to provide a comprehensive view of the DBT scheme, which has been successfully rolled out in India, with a view to facilitate its replication in other countries. The case study is based on the Policy Modeling Canvas which includes the key building blocks of the DBT project in the conceptualization stage as well as in the implementation stage, as depicted in the Annexure. The case study highlights the problems being faced in the earlier modes of disbursement of subsidies, the need for adopting DBT, and the key objectives of DBT that benefit the citizens as well as the government. It further outlines the strategies adopted by the stakeholders in achieving these objectives and the resources that were instrumental in the success of the DBT scheme. It aims to identify the critical success factors of DBT through the systematic framework and highlight the lessons learned from the case analysis.

A broad overview of the DBT scheme was gathered from related websites, newspaper reports, published research papers, reports published by various government organizations such as Planning Commission, DBT Mission, UIDAI, Telecom Regulatory Authority of India (TRAI), and other government departments. Insights on on-ground planning and implementation of DBT scheme were obtained through in-depth interactions with senior officials associated with DBT at various government departments such as the DBT Mission, UIDAI, National Informatics Centre (NIC) under Ministry of Electronics and Information Technology, Ministry of Petroleum, and Ministry of Rural Development, among others. Open-ended questions regarding DBT were asked to the selected respondents who were directly involved in DBT rollouts in their respective departments with a view to elicit information on the challenges faced and lessons learned from their experience with the DBT scheme. Although DBT covers a vast gamut of beneficiaries in 351 schemes spread across 51 ministries of Government of India, efforts were made to identify learnings from the case on three important components of DBT, i.e., digitalization, process of benefit transfer, and actual transfer of benefits to beneficiaries. It is felt that in spite of diversity of DBT schemes, these basic components remain constant across the ministries and therefore the learnings from the case are relevant, irrespective of the nature of a scheme and the domain to which the scheme belongs.

## Case Analysis through the Policy Modeling Canvas

Business Model Canvas (BMC) is a strategic management and lean startup template for developing a new business model or documenting an existing one. It is a visual chart with elements describing a firm's or product's value proposition, infrastructure, customers, and finances. The building blocks of the BMC are identified and connected to each other to realize a business process. BMC is a very useful tool used by many researchers and practitioners. Thus, taking the idea from BMC, this case is analyzed through the Policy Modeling Canvas (PMC), which has been decided as the standardized framework for consistent representation and analysis of government-digitalization policy cases. The case study is depicted in the PMC, which is illustrated in the Annexure.

The various building blocks of PMC are described below.

### Issues/Problems

The conventional method of subsidy distribution described in section 1 suffered from several lacunae such as wrong targeting of beneficiaries, leakages in the delivery process, and ineffective service delivery, which gave rise to inefficiencies in the system. As a result, these schemes often struggled to achieve their goals. It has been estimated that this kind of delay and other hurdles left

a huge leakage gap of 2% of the GDP every year [12]. The government was trying to solve both short-term and long-term challenges over a period of time, to ensure that benefits reached the intended beneficiaries well in time and without any pilferage on the way. Digitalization of public service delivery was one of the solutions that was chosen by the government to find a lasting solution to the issues as listed below:

- **Identification of eligible beneficiaries:** This is one of the most challenging issues faced in disbursement of subsidy. As an illustration, most of the subsidy schemes are based on the income level of the recipient being below a certain threshold. However, no error-free system is available for identifying beneficiaries as it is extremely difficult to accurately assess income.
- **Duplication of beneficiaries:** Even when eligible beneficiaries are identified correctly, lack of electronic databases of beneficiaries and the lack of a common unique identifier often leads to the same beneficiary receiving similar benefits from multiple schemes. For example, the same beneficiary may be receiving subsidy for both the fuels, kerosene and LPG. Such duplication of beneficiaries will result in leakage of revenue.
- **Slow and inefficient delivery process:** The delivery process in the manual system is slow, inefficient, and costly. In case of cash benefits such as pensions and scholarships, the payments have to be processed manually and may result in errors, leading to delays. Moreover, payments made through cheques and demand drafts may be costly as well as time-consuming.
- **Pilferage of benefits in delivery process due to the presence of middlemen:** In the traditional system of delivery, several middlemen are involved in the disbursal of benefits. For example, in case of the Central Sector Scheme of Scholarship for college and university students [13], financial assistance is provided to the meritorious students having family income of less than INR600,000 per annum to meet a part of their day-to-day expenses while pursuing higher studies. Before the scheme was onboarded on DBT, cash benefit to the beneficiary was routed through the respective boards of state governments to the treasury of the state government and then to the student through his/her educational institute. As a result of the complex processes, there was no accountability for delivery of benefits and often the benefit of government schemes did not reach deserving and eligible beneficiaries in a timely manner.

### Goals/Objectives

In order to overcome the issues/problems faced in the distribution of subsidy through conventional means, the government desired to utilize principles of digitalization for delivery of services. As per the background note [14] of first meeting of the National Committee on Direct Cash Transfers held on 26 November 2012, the government contemplated the introduction of direct cash transfers to reduce corruption and eliminate waste with better targeting, cutting out duplication, and eliminating leakage. It was felt that this digitalized system of delivery had the potential to free up the administrative system to focus on development rather than on exercise of controls. It was expected that the new system would ensure that India could maximize the benefits from the expenditure on welfare schemes and thus achieve overall human development. It was envisaged that DBT could become a strong institutional arrangement and serve as the platform for modifying and transferring benefits to people depending on the needs and circumstances.

### Strategies

Strategy is a method or high-level plan chosen among several options to achieve the desired goals. Strategy can also be defined as “a general direction set for the government organization(s) to achieve a desired state in the future” [15]. In the present case, the government had the option to continue with traditional methods of service delivery with incremental improvement or to go for transformational changes in the process of delivery, through digitalization. The government decided on transformational change. It chose the strategy of digitalization of processes for direct transfer of benefits in spite of potential pitfalls such as nonavailability of legal unique identity of beneficiaries, nonavailability of universal access to banking, and less-than-desired availability of mobile connectivity in rural areas. For this strategy to succeed, apart from addressing the above-mentioned pitfalls, there was also the requirement of evolving detailed rules and procedures for facilitating interoperable transfers between backend infrastructure consisting of the database of beneficiaries, payment systems, banks, clearing houses, and the Aadhaar platform. Further, the strategy required setting up of inbuilt checks and balances for traceability, preventing fraud, and facilitating audit of transactions.

Overall, it is evident that the strategy adopted was quite complex, even though the principle behind this appears to be quite simple. In order to provide a clear roadmap for execution of this strategy, the government set up a task force of secretaries of key ministries, led by the eminent technocrat Nandan Nilekani to suggest a workable solution. The committee provided its recommendations in June 2011 and the first phase of the DBT scheme was rolled out in three important areas of fertilizer, LPG, and kerosene subsidies on 1 January 2013. With the success of the pilot phase, the digitalization strategy was continued and resulted in a paradigm shift in the way benefits are distributed to beneficiaries.

### Governance

Governance describes the formal government institutions, private companies, and partners involved in the digital government (DG) transformation and relationship between them. Governance also refers to the way decisions and rules concerning the government digitalization are set and implemented.

In the present case, the governance mechanism refers to several important stakeholders in the government who were assigned the responsibility of driving the DBT scheme. At the outset, a National Committee [16] on Direct Cash Transfer was set up on 25 October 2012 under the Prime Minister of India. The committee was assisted by an Executive Committee convened by the Planning Commission, which was the designated apex agency for overseeing the rollout of DBT. These committees were supported by three mission-mode committees, namely, Financial Inclusion Committee, Technology Committee, and Implementation Committee on electronic transfer of benefits. Overall, the responsibility for implementing the scheme was assigned to the DBT Mission in July 2013, which continued to function until 14 September 2015 under the Department of Expenditure. To give more impetus, the DBT Mission was directly placed under Cabinet Secretariat with effect from 14 September 2015. The DBT Mission [17] has been entrusted with the responsibility of implementing DBT in all government subsidy/welfare programs throughout the country.

Among other stakeholders, UIDAI is an important institution for governance of the scheme as it is responsible for the timely issue of the unique-identifier Aadhaar number as well as for facilitating seamless verification of beneficiaries. NIC also has an important role in governance as it has been tasked with developing a system for preparing the list of beneficiaries as well as for developing a portal for funds transfer, called Central Planning Scheme Monitoring System (CPSMS). The

National Payment Corporation of India (NPCI) under the Reserve Bank of India too has an important role to play in the governance mechanism as it has developed the Aadhaar Payment Bridge System, which uses the Aadhaar number as a central key for electronically transferring government subsidies and benefits in the Aadhaar-enabled bank accounts (AEBA) of the intended beneficiaries [18]. Thus, it is a multi-stakeholder governance mechanism, which requires close coordination among the responsible agencies.

### **Beneficiaries**

Beneficiaries refer to any citizens or businesses who would benefit directly from the government digitalization policy. In the present case, the beneficiaries are citizens as well as the government. For citizens, the proposed solution of DBT promises improved convenience with seamless benefit delivery, greater financial inclusion, and elimination of middlemen, thus resulting in less corruption. At the same time, it benefits the government by plugging revenue leakage. This also results in better governance through direct monitoring of government expenditure to deserving beneficiaries at much lower cost, which leads to higher citizen satisfaction.

### **Resources**

Resources are the key inputs, i.e., time, money (financial resource), personnel (human resource), equipment, and supplies, which are used to produce outputs and outcomes. In the case of DBT, the key inputs for implementation are the enabling government policies for promoting DBT, a proper beneficiary identification system for central schemes and central support schemes, availability of the Aadhaar system for beneficiary verification, provisioning of bank accounts to beneficiaries for enabling financial inclusion, and the availability of clearly laid down processes for smooth fund transfer between PFMS and bank accounts of beneficiaries.

### **Activities**

Activities describe the actions associated with delivering project goals and objectives. In other words, they are what the organizations and their personnel do in order to achieve the goals of the digital-government-transformation policy. In case of DBT, some of the important activities in its implementation are identification of central schemes and central support schemes that can be included in DBT, identification and enrollment of beneficiaries in the departments' welfare schemes, capturing beneficiaries' bank account details in the system at the time of enrollment, and seeding the beneficiaries' bank accounts with Aadhaar. Further, it is essential to formulate a standard operating procedure for DBT payment and to ensure adherence to timelines for payment by financial institutions.

### **Outputs**

Outputs are the direct and immediate results associated with the government digitalization policy. They indicate the achievement of the project in the short term. In case of DBT, the outputs of the DBT Mission have been more precise targeting of beneficiaries, timely transfer of cash/kind benefit to the intended beneficiaries, avoidance of fund leakages during service delivery, leading to judicious utilization of funds, transparency in processes, and reduction of corruption.

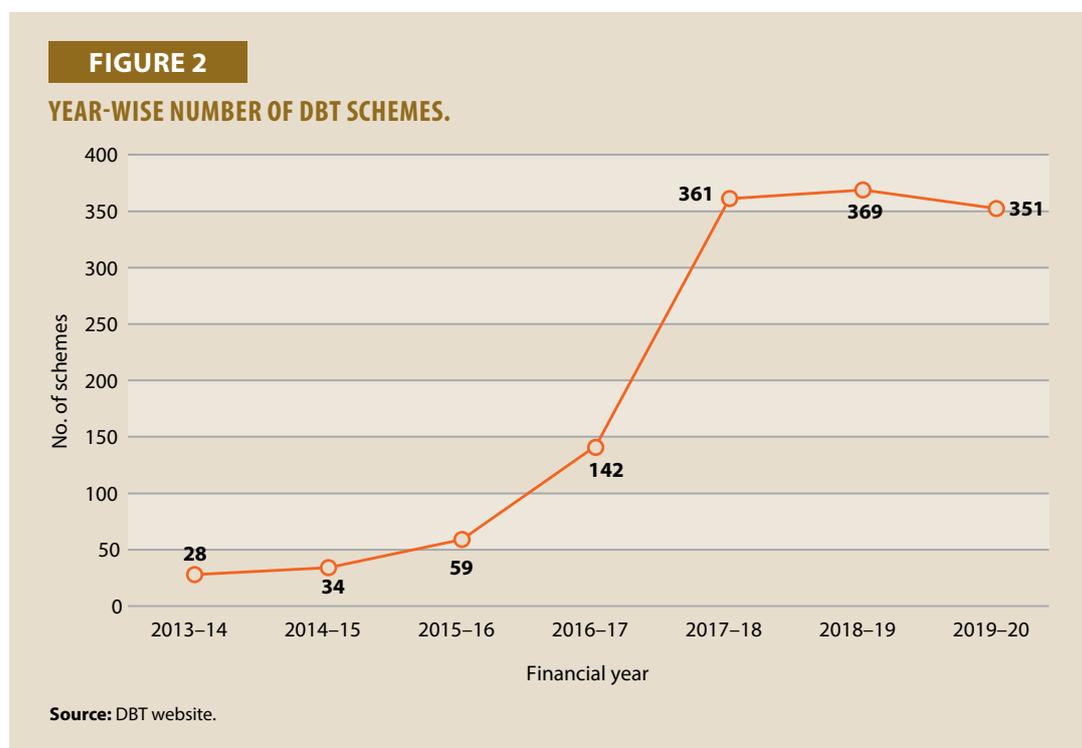
### **Outcomes**

Outcomes are specific and quantitative mid-term or long-term results that are caused by the digital-government-transformation policy. These are measured by key metrics including financial perspectives or user perspectives. In case of DBT, the scheme made a humble beginning on 1 January 2013 with the implementation of seven fully centrally funded government schemes covering 20

districts. As per data available on the DBT website, this had expanded to 351 schemes in 51 ministries by 7 November 2020. There were nearly 570 million beneficiaries of DBT and transfer of more than INR 9 trillion (USD132 billion) had already taken place, with more than 4.3 billion transactions taking place in FY2019–20 alone. The scheme had resulted in saving of more than INR 1,700 billion (USD24 billion) due to elimination of nonexistent beneficiaries by deduplication. An important outcome of the scheme has been significant improvement in citizens' perception of governance.

## Analysis of Critical Success Factors

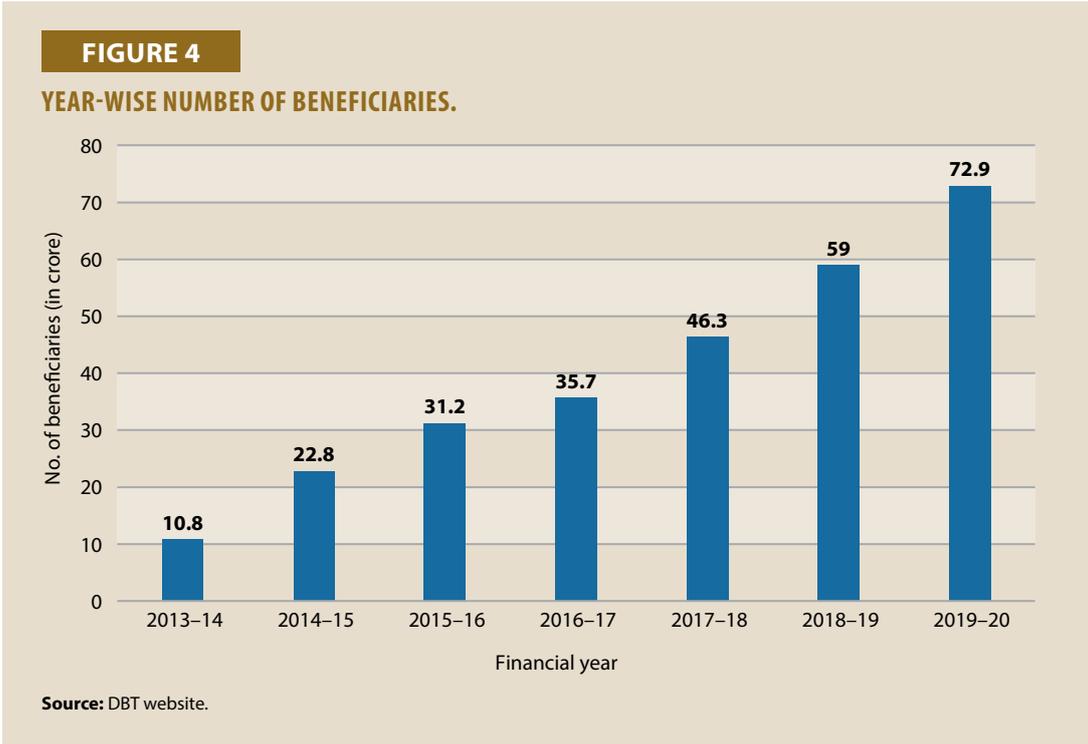
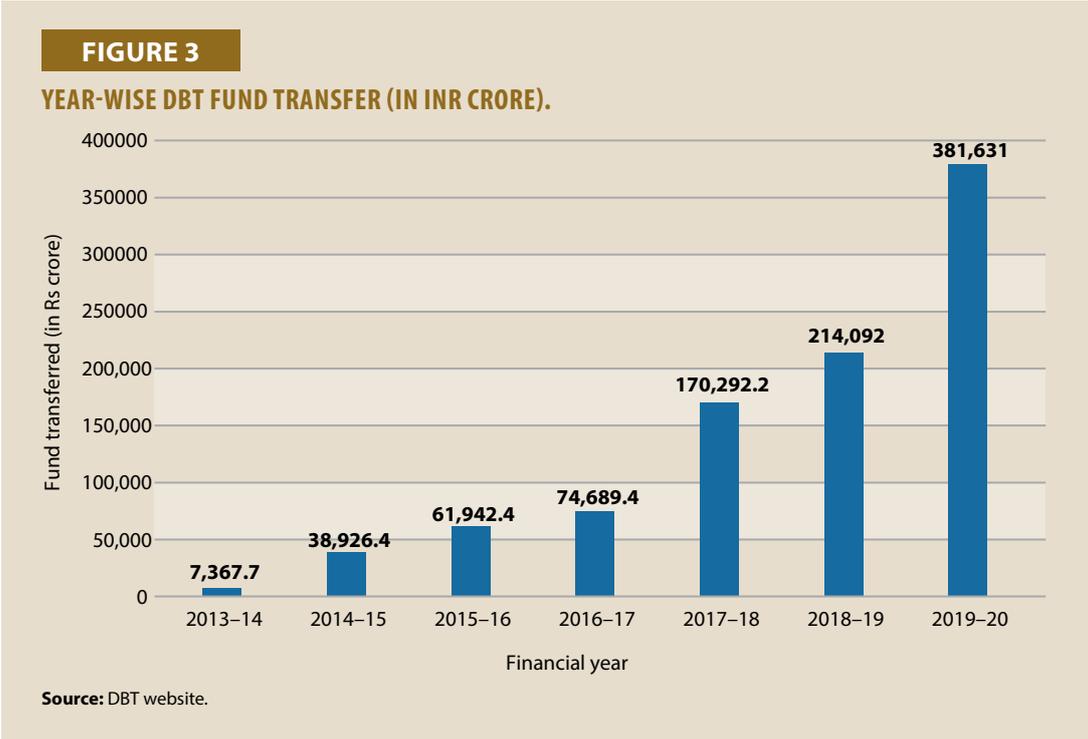
The DBT scheme has been a resounding success in spite of several legal, regulatory, and technical challenges that were faced by the implementing ministries. This is evident from the fact that the coverage of the DBT scheme has expanded from seven schemes in 2013 at the time of inception to 351 schemes in 51 ministries, as on 7 November 2020, as depicted in Figure 2.



Details of the scheme available on the official website of DBT Mission indicate that transfer of about USD55 billion had taken place during 2019–20 as shown in Figure 3. Cumulatively funds of around USD137 billion had been transferred since the scheme's inception in 2013.

The number of transactions had increased to more than 4.3 billion in 2019–20. The number of beneficiaries saw a significant jump from about 100 million in 2013 to more than 729 million in 2019–20 as seen from the graph on year-wise DBT beneficiaries depicted in Figure 4.

The success of the scheme is all the more praiseworthy and deserves a deeper analysis because it has been implemented in a complex country like India, which is geographically vast with significant differences in the level of digital infrastructure. Moreover, India follows the federal system of governance in which state governments have significant freedom in terms of implementation. Welfare, social security, and information technology, among others, fall in the 'Concurrent List,'



which implies that these subjects can be dealt with by central as well as state governments. This duplication of responsibility has the potential of giving rise to tension in uniform implementation of schemes across the country. In such a scenario, the implementors have to overcome several technical, legal, political, and regulatory issues to ensure the success of a scheme. Technical issues involve ubiquitous availability of the telecom network at affordable rates while legal and regulatory issues require allaying user apprehensions regarding data security and privacy. In view of the

achievements under the DBT scheme, in spite of the complexities mentioned above, it is important to look at the factors that have led to the tremendous success of the scheme.

These critical success factors can be broadly classified into five categories, namely, aligned vision, prioritized goals, pragmatic implementation, enablers, and strong foundations in terms of legal underpinnings, ease of access, and adoption by citizens. Specific initiatives that were visible for successful DBT implementation in India are summarized in Table 1 and described in following subsections.

**TABLE 1**

**CRITICAL SUCCESS FACTORS IN DBT IMPLEMENTATION.**

Success factor category	Related success factors in DBT
Aligned vision	Strong political support extended by successive governments.
Prioritized goals	Establishment of DBT Mission for monitoring at the highest level of Cabinet Secretariat, with the aim of evolving a common shared roadmap among diverse stakeholders.
Pragmatic implementation	Development of a unified Public Finance Management System for ensuring uniform processes in seamless transfer of funds from the Consolidated Fund to beneficiary bank accounts, and the development of Aadhaar-Enabled Payment System for ease of transaction.
Enablers	Availability of a unique digital identity in the form of Aadhaar, timely launch of Jan Dhan scheme for promoting financial inclusion in rural and remote areas, and availability of ubiquitous mobile telecom infrastructure.
Strong foundations	Introduction of enabling legislations for use of Aadhaar in disbursement of benefits. Social marketing initiatives for voluntary adoption of DBT.

These critical success factors are discussed below:

**Strong Political Support**

One of the important success factors of DBT is the continuous political support that it has received since its inception in 2013, with the result that the scheme had delivered a cumulative saving of USD24 billion by 31 December 2019 [19]. The support has continued unabated even with change in government from United Progressive Alliance (UPA) to National Democratic Alliance (NDA) in the year 2014. During the first meeting of the National Committee on 26 November 2012, the then Prime Minister, Dr. Manmohan Singh, had emphasized that the Aadhaar platform and financial inclusion must be strengthened to ensure the success of DBT. These sentiments were echoed by the then President of India, Pranab Mukherjee, in his address to the Parliament on 21 February 2013.

When the new government led by NDA came to power in 2014, there was speculation on the fate of DBT as well as Aadhaar. However, the new government endorsed both the schemes at a high-level meeting in early July 2014. The government targeted universal Aadhaar coverage by June 2015 and expansion of DBT implementation in 300 districts on priority with respect to key schemes including MGNREGA and PDS [20]. Thus, DBT continued to get government patronage. The new government gave further impetus to the DBT scheme by opening over 320 million bank accounts under the Pradhan Mantri Jan Dhan (PMJDY) scheme of financial inclusion. Without bank accounts, Jan Dhan was just not possible as nearly 58% of India's population was outside the banking coverage at that time. In this way, the political support for DBT, Aadhaar, and PMJDY were critical factors for the success of DBT.

### **Establishment of DBT Mission**

DBT Mission was created in the Planning Commission to act as a nodal point for implementation of DBT. The Mission was transferred to the Department of Expenditure in July 2013. As a demonstration of importance of the DBT scheme, the administrative control of the DBT division was shifted to the Cabinet Secretariat from the finance ministry's expenditure department with effect from 14 September 2015 [21]. Since the Cabinet Secretariat is a higher government body that facilitates smooth transaction of business in various ministries and departments, the change in reporting of DBT Mission implied that activities of the DBT Mission were much wider in scope and not limited to any one ministry or department. This move signaled the government's intent to take up DBT as an important initiative. It resulted in high focus and priority for rollout of DBT across central ministries as well as in state governments. Such centralized oversight with an integrated command structure also facilitated evolution of uniform business processes for diverse DBT schemes across 56 central ministries over time.

### **Public Financial Management System**

The DBT scheme works on Public Financial Management System (PFMS), which was started as the Central Planning Scheme Monitoring System (CPSMS) of the Planning Commission in 2008–09. It was to be a pilot in four states of Madhya Pradesh, Bihar, Punjab, and Mizoram for four flagship schemes. After the initial phase of establishing a network across ministries and departments, it was decided to undertake a national rollout of CPSMS to link the financial networks of central and state governments and their agencies. The scheme was included in the 12th Plan initiative of the Planning Commission and Ministry of Finance. In December 2013, the Union Cabinet approved the national rollout of PFMS for all states and schemes for a period of four years till 2017. An amount of INR1,080 crore was allocated for the implementation. Under this plan, the mandate to develop the required modules and other related requirements was given to the PFMS team by the Cabinet.

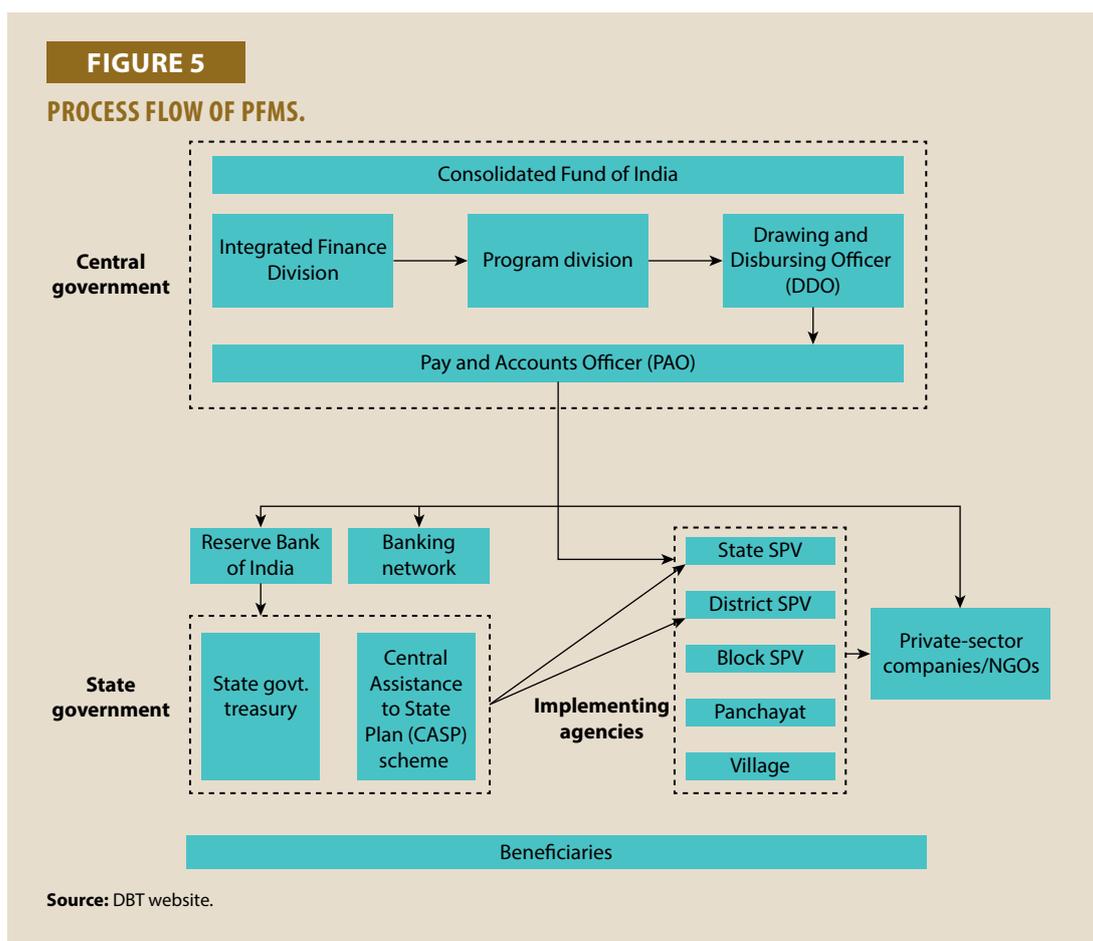
The PFMS serves as a real-time, reliable, and meaningful management information system and effective decision support system for the DBT scheme. It establishes an efficient fund-flow system as well as a payment-cum-accounting system. It serves as a platform for payment, accounting, and funds transfer for DBT; tracks funds from top to bottom; and detects and minimizes float (unutilized funds). It also helps in moving from cash-based to utilization-based accounting, and in moving from post-facto to real-time accounting. Further, PFMS standardizes processes and reports for all schemes and stakeholders, and facilitates transparency and auditability. With these design objectives, PFMS is configured for budget allocation, issue of sanction and bill generation, disbursement of funds, accounting and reconciliation, facilitating electronic payments at central as well as state level, and beneficiary management and generation of reports on releases, utilization, and advances.

DBT to bank accounts of beneficiaries through PFMS is implemented with the purpose of bringing all schemes involving components of cash transfer to individual beneficiaries. DBT can be affected either by the central government through pay and accounts offices in central sector (CS) schemes where funds are directly transferred to the beneficiaries of CS schemes or by state governments and their agencies in case of central assistance to state plan (CASP) schemes, where fund is transferred from the Consolidated Fund of India (by respective ministries of the central government) to the Consolidated Fund of the respective state government. In both cases, the Integrated Finance Division (IFD) of the respective central ministry controls the transfer of funds through PFMS to the program division (PD).

In CS schemes, implementing agencies (IAs) identify beneficiaries as per scheme guidelines and upload details on CPSMS with digital signature. The PD in the ministry prepares e-sanction and

uploads the list on CPSMS with digital signature. In the next step, the drawing and disbursing officer (DDO) of the ministry prepares e-bill in CPSMS and forwards it to the principal accounts officer (PAO). The latter is required to coordinate with the concerned pay and accounts offices to facilitate payment and compilation of accounts by preparing digitally signed electronic payment file for direct payment through an accredited bank.

In case of CASP schemes, the PAO-DBT module is used for transferring fund on receipt of beneficiaries' details from a state government or its agencies in similar manner. The agencies can be special purpose vehicles (SPV), nongovernmental organizations (NGOs), or private-sector companies. A schematic diagram of process flow through PFMS is given in Figure 5.



**Digital Identity (Aadhaar)**

‘Aadhaar’ is a Hindi language word that means ‘foundation’ in English. India’s digital identity program is named Aadhaar as it was envisaged to act as a foundation of several government programs. The primary objective of the program launched in 2009 was to ensure that benefits of social-welfare programs went to the right person, while mitigating fraud and reducing wastage. However, Aadhaar has since metamorphized into the most credible identity document. Apart from other applications, it is being widely used for meeting ‘know your customer’ (KYC) requirements for various public services such as opening a bank account and acquiring a mobile SIM card. Over the years, this digital identity has been developed for financial transactions where biometric verification is required for deposit and withdrawal of cash through the Aadhaar-Enabled Payment System (AEPS). As a result, Aadhaar has grown into one of the largest biometric identity programs in the world. Within a period of 10 years

since its launch in 2009, more than 1.25 billion citizens had already received the unique 12-digit Aadhaar numbers by the end of 2019 as per data available at the website of UIDAI [20].

When the DBT scheme was launched in 2013, Aadhaar already had around 600 million citizen enrollments, which amounted to approximately half of India's population [22]. The initial selection of 20 districts for seven schemes was based on a preponderance of Aadhaar enrollments in these districts. Instructions were issued that completing Aadhaar enrollment of remaining beneficiaries was top priority. After this, the Aadhaar number was seeded into the digitized databases of beneficiaries. The databases of beneficiaries were sent to UIDAI for verification, deduplication, and cleaning of data. Further, an exercise was carried out for opening bank accounts of all beneficiaries and Aadhaar numbers were seeded in the bank accounts of these beneficiaries. With this, the stage was set for seamless transfer of funds to bank accounts of all verified beneficiaries in 2013 through the Central Planning Scheme Monitoring System (CPSMS) of the Ministry of Finance and Aadhaar Payment Bridge System (APBS) of the National Payment Corporation of India (NPCI).

DBT was further expanded to 78 districts on 1 July 2013 as the speed of Aadhaar enrollments picked up. Later, to overcome legal and regulatory challenges for the use of Aadhaar and to provide legal backing to the Aadhaar unique identification number project, a money bill named The Aadhaar (Targeted Delivery of Financial and other Subsidies, Benefits and Services) Act, 2016 [23] was passed in Parliament. As per section 7 of the Aadhaar Act 2016, any individual who is desirous of availing any subsidy, benefit, or service for which the expenditure is incurred from the Consolidated Fund of India, is required to furnish proof of possession of an Aadhaar number or undergo Aadhaar-based authentication. Accordingly, UIDAI issued a circular dated 15 September 2016 [24], which mandated the issuance of a gazette notification by central and state governments for schemes that intended to use Aadhaar for beneficiary identification. With these interventions, Aadhaar has become the cornerstone for success of DBT in India. As per the recent survey carried out by Dalberg Advisors in 2019 titled '*State of Aadhaar- A Peoples Perspective*' [25], Aadhaar is most commonly used by residents for bank accounts (94% of Aadhaar holders), LPG subsidy (86%), and public distribution system ration (82%).

### **Financial Inclusion (Jan Dhan)**

In order to overcome the slow pace of opening of bank accounts for expanding the number of beneficiaries under DBT schemes, a massive drive for financial inclusion was launched by the Prime Minister Narendra Modi on 15 August 2014. It has been named the Pradhan Mantri Jan Dhan Yojana (PMJDY), which is an integrated approach to bring about comprehensive financial inclusion and provide banking services to all households in the country [26]. The scheme ensures access to a range of financial services like availability of a basic savings bank account, access to need-based credit, remittance facility, insurance, and pension. PMJDY provides a platform for universal access to banking facilities in rural as well as urban areas with at least one basic banking account for every household. Every bank account is on the core banking system (CBS) of banks. Mobile banking using USSD facility on even basic feature phones is also being supported.

As per the progress report of PMJDY available on its website [27], more than 370 million accounts had already been opened as of 8 January 2020 under the PMJDY scheme, with a total deposit of more than Rs 1,085 billion (approximately USD15 billion). However, opening of bank accounts was not considered sufficient by the government as beneficiaries needed a banking outlet in rural areas for withdrawal of money. Since opening of bank branches was a tedious and costly process

in rural areas, the Reserve Bank of India introduced banking correspondents (BC) in the year 2006. The BC is authorized to offer services such as cash transactions where the bank does not have a branch and is entitled to a commission on DBT transfers. BCs have played an important role in DBT as beneficiaries are able to avail their services for withdrawal of cash through micro-ATMs which are simple POS machines. The number of BCs has grown after the focus of the government on DBT, with more than a million BCs now operational across the country. Sufficient availability of BCs has also been a factor that has spurred the success of the DBT scheme.

### Ubiquitous Mobile Telecom Infrastructure

In a diverse country like India, mobile technology provides the best option for transfer of benefits to citizens living in remote and far-flung areas. Telecom in India underwent a revolution much before DBT was envisaged by the government in 2013. As a result, almost ubiquitous mobile coverage was available at the time DBT was introduced by the government. The report published by the Telecom Regulatory Authority of India [28] on completion of 20 years of its existence in 2017 states:

“Starting from a nascent market that had a little over 14.5 million phone connections in 1997 and “telephone on demand” was an early policy goal, we have grown to become the second-largest telecom market in the world, boasting of over 1.15 billion subscribers today. Along with better connectivity, the Quality of Services (QoS) and affordability of telecom services have also grown by leaps and bounds. The dawn of the Internet-age ushered in a new wave of changes, creating immense opportunities for both service providers as well as users of Internet services. At the end of 2016, India had over 391 million Internet users, of whom 236 million were making use of broadband Internet services. These numbers are only growing day by day.”

As per the subscription data published by TRAI for the period ending 30 September 2019 [29], overall tele-density of India stood at 90.52 telephone connections per 100 persons while total number of mobile connections and number of broadband connections were 1.173 billion and 606.41 million, respectively. According to a report by the BBC UK [30] published in March 2019, India boasts of the cheapest rate of data in the world with the cost of per GB of data being just USD0.26, as compared with USD12.37 in the USA, USD6.66 in the UK, and USD8.53 being the global average. This leads to India having the highest data consumption of 9.8 GB per smartphone user, as compared to 7 GB in North America, 3.1 GB in Latin America, 6.7 GB in Western Europe, 4.5 GB in Central and Eastern Europe, 3 GB in Middle East and Africa, 7.1 GB in northeast Asia, and 3.6 GB in southeast Asia and Oceania region. These figures were published in June 2019 in *The Hindu*, a leading newspaper of India, based on a study by Ericsson, a Swedish telecom equipment maker [31].

While transfer of cash under DBT can be made directly to the bank accounts of beneficiaries through PFMS, withdrawal of the amount can be a challenge for them due to a paucity of bank branches and ATMs in rural areas. This has been overcome with the advent of mobile money which is the technology that allows people to receive, store, and spend money using a mobile phone. However, the requirement of mobile money system can be met only in the presence of a robust telecom network. Further, authentication of the beneficiary too can be done with the use of one-time password (OTP) to the mobile phone linked with the Aadhaar number of the beneficiary. Therefore, the availability of mobile telecom infrastructure is a prerequisite for delivering benefits of DBT in rural areas. Widespread availability of mobile network in India and affordable data rates have facilitated the success of DBT.

### **Enabling Legislations**

In spite of the strong support of the government for DBT and Aadhaar, questions were being raised regarding the legal validity of Aadhaar for benefit transfer on the plea that personal details of citizens were being sought in violation of fundamental rights enshrined in the Constitution of India. The Supreme court had, in the interim order passed on 23 September 2013 in the K.S. Puttaswamy versus Union of India case, noted that use of Aadhaar cannot be made mandatory by the government [32]. This was a big setback for the government's intention to use Aadhaar as the document to establish the identity of DBT beneficiaries [33].

The government demonstrated its strong support to the Aadhaar platform by ensuring its legal validity by bringing the Aadhaar Bill, 2016 and getting it passed as a Money Bill. With this, the rollout of DBT was streamlined and UIDAI issued a circular on 15 September 2016, under Section 7 of the Aadhaar Act, which made it mandatory for the participating departments to notify the use of Aadhaar for disbursement of benefits under DBT. This enabling legislation was required as there was opposition to the use of Aadhaar for DBT, citing privacy concerns. Further, the government won an important legal battle in September 2018 when Supreme Court upheld the validity of the Aadhaar Bill, which was challenged before it. This sequence of events, which demonstrates a strong commitment of the government to advocate for the enabling legislations, is another important factor in ensuring the success of DBT.

### **Social Marketing Initiatives for the Adoption of DBT**

It is well understood that systematic social marketing initiatives are key to voluntarily changing consumer behavior for a social cause [34]. Social marketing campaigns are required to promote seamless adoption of any new system of governance by citizens [35].

The implementation of DBT implied a paradigm shift in the way subsidies were transferred to beneficiaries. This change was bound to be resisted by the beneficiaries, both due to a lack of trust in the new system as well as an apprehension about the potential inconvenience in adapting to a new system. Such resistance from the beneficiaries could result in a significant bottleneck unless it was overcome with a sustained social-marketing campaign that highlighted the benefits accruing through social as well as financial gains. For example, the scheme for Direct Benefit Transfer of LPG (DBTL) subsidy, also called as Pratyaksh Hanstantrit Labh (PAHAL) scheme was launched on 1 June 2013, in which the system of having two prices (market price and subsidized price) was proposed to be done away with. Instead, a cash subsidy of the difference between the market price and the subsidized price of LPG cylinder was directly transferred to the beneficiary's bank account. This change was opposed by consumers to such an extent that the government was forced to suspend it.

The government then constituted a committee [36] to review the scheme and submit its recommendations after consultation with the stakeholders. One of the recommendations of the committee related to education and awareness of consumers, which were deemed to be very crucial to the success of the scheme. The modified scheme was relaunched on 15 November 2014, backed by an extensive information-education campaign. The result was that it became a resounding success [37] and was one of the major contributors (11.2%) of the total number of DBT transactions in 2019–20 as per the status available on the DBT website on 1 April 2020. Moreover, more than 10 million beneficiaries voluntarily surrendered their LPG subsidy as a result of this campaign [38]. The estimated saving due to this scheme alone has been reported to be more than USD8.5 billion [39]. This reflects the importance of social-marketing initiatives as one of the critical success factors for the DBT scheme.

## Lessons Learned and Insights from the Case Analysis

During the discussions with the stakeholders, it emerged that although DBT is a simple-looking scheme that involves seeding of a common identifier in the form of the Aadhaar number in beneficiary databases and bank accounts for seamless transfer of funds, its practical implementation in a complex country like India has been very challenging. An in-depth study of the rollout of the DBT scheme provides several insights that are valuable for avoiding pitfalls during implementation of similar schemes in other countries.

The lessons learnt can be broadly categorized into three major areas, namely, digitization of data, process flow, and transfer of benefits. Insights from each of these areas are detailed below.

### Digitization of Data

This phase of the project is a steppingstone for the success of the scheme, as preparation of the beneficiary database and integrating it with the DBT software poses design, infrastructural, operational, as well as human-resource challenges. At the outset, it is essential to design a dynamic and integrated database system that can capture all necessary beneficiary data and facilitate fund transfer.

The database design varies depending on the requirement of the implementing department as it is not amenable to standardization across departments. For example, in case of LPG subsidy, the unique requirement for DBT is to provide the first installment of subsidy in advance to the beneficiary as well as to limit the number of LPG cylinders that can be provided in a year. Obviously, there is no such requirement in the case of the MNREGA [40] scheme. Thus, each scheme of DBT is unique in itself and therefore the database design is required to be tailor-made to suit the domain requirements. Considering the fact that 351 schemes across 51 ministries have already been brought under DBT, database design remains one of the most important challenges. To overcome this challenge, a single specialized agency, NIC of Government of India, was deployed to create database designs for almost all DBT schemes. This decision enabled the development of in-house expertise in developing IT solutions for DBT.

Once the design is finalized by the department, the next challenge is to persuade custodians of data to part with it. The reluctance may be due to data privacy concerns, business rivalry, and fear of power shift. In case of LPG subsidy, the databases of gas connections were with the respective oil marketing companies (OMCs). While deduplication of multiple connections held by a customer within the same OMC was easy by seeding each account with Aadhaar, it was a challenge to weed out customers who had more than one LPG connection with different OMCs. For this, it was necessary to enable sharing of customer data among all the OMCs. Finally, a solution was found by assigning the deduplication work to the NIC, which assigned a unique LPG ID to each LPG connection and used the Aadhaar as well as demographic criterion for creating a ‘suspect and clear’ list, which was sent back to OMCs for verification.

### Process Flow

One of the important learnings in DBT is with respect to overcoming the challenges in seeding Aadhaar in multiple databases. The Aadhaar numbers of the beneficiaries have to be first seeded in their bank accounts as well as in the databases of DBT schemes. Unless this step is completed successfully, subsequent steps in DBT cannot take place. Convincing the beneficiaries to submit the required documents like Aadhaar and bank-account details to enroll in the DBT program is a key challenge. This was achieved through proper dissemination of information about the process

flow through an intensive information-education campaign on different media as well as through direct outreach to the beneficiaries with the use of SMSs, calls, and public announcements.

However, even after successful seeding, the process flow may result in cases where the amount is not successfully transferred. For example, in the MNREGA scheme, it was observed that beneficiaries seeded the same Aadhaar number in multiple bank accounts. As per the process flow, the amount could be transferred only in the bank account that has been seeded the last. In some cases, beneficiaries gave those bank account numbers in DBT scheme databases for receiving benefits that were not their latest seeded accounts. Benefit transfers to such accounts were attempted by the system but could not be successful due to the obvious mismatch. To overcome this problem in process flow, it was decided to first validate the account number in PFMS before attempting the payment. Similarly, delays in verification of documents submitted by LPG customers for seeding of Aadhaar were a major source of dissatisfaction among the LPG users. This was overcome by using biometric verification to avoid the delay.

### Transfer of Benefits

After completion of digitization and process flow, challenges faced in actual transfer of benefits through the PFMS system offered several learnings. Pradhan Mantri Kisan Samman Nidhi (PM-KISAN) is a central sector scheme with 100% funding from the government. Under the scheme an income support of INR6,000 per year is provided to all farmer families across the country in three equal installments of INR2,000 every four months. In this scheme, payment is validated by the payment system only in cases where there is an accurate match of three data points, namely Aadhaar, land records, and bank accounts [41]. Land records by their inherent nature are very old and it is difficult to correct even minor spelling mistakes due to the legal issues involved. In such cases, the system does not allow the subsidy payment to be made. As a result, the government relaxed the requirement for Aadhaar till November 2019 to facilitate subsidy disbursement. Even then, disbursement of only 43% of the budgeted amount for 2019–20 could be made till October 2019.

Similar difficulties were faced in the transfer of benefits in the case of MNREGA [39] scheme also. During discussions with concerned officers of the MNREGA project team, it was revealed that the names of beneficiaries were often recorded with their nicknames (which were more often used by them) in the NREGASoft package [42] while the names in Aadhaar cards were the actual names. This mismatch prevented the fund transfer to the beneficiary. In such cases, block-level officers were authorized to certify the nickname and allow payment of the subsidy. In case of minor spelling mistakes in name, fuzzy logic was used to ascertain the equivalence of names and allow the payments.

Another important challenge in the transfer of benefits pertains to the issue of financial inclusion of the population residing in remote and rural areas. This challenge has two important dimensions. The first dimension relates to the opening of bank accounts for beneficiaries. The second dimension relates to ensuring an adequate number of banking channels such as ATMs, bank branches, and POS machines for the withdrawal of the money deposited through DBT in bank accounts of the beneficiaries. These challenges were overcome by launching a national movement for opening bank accounts through the Jan Dhan scheme of the government and by promoting Aadhaar-Enabled Payment Systems at POS machines of BCs, which worked as micro-ATMs for the beneficiaries.

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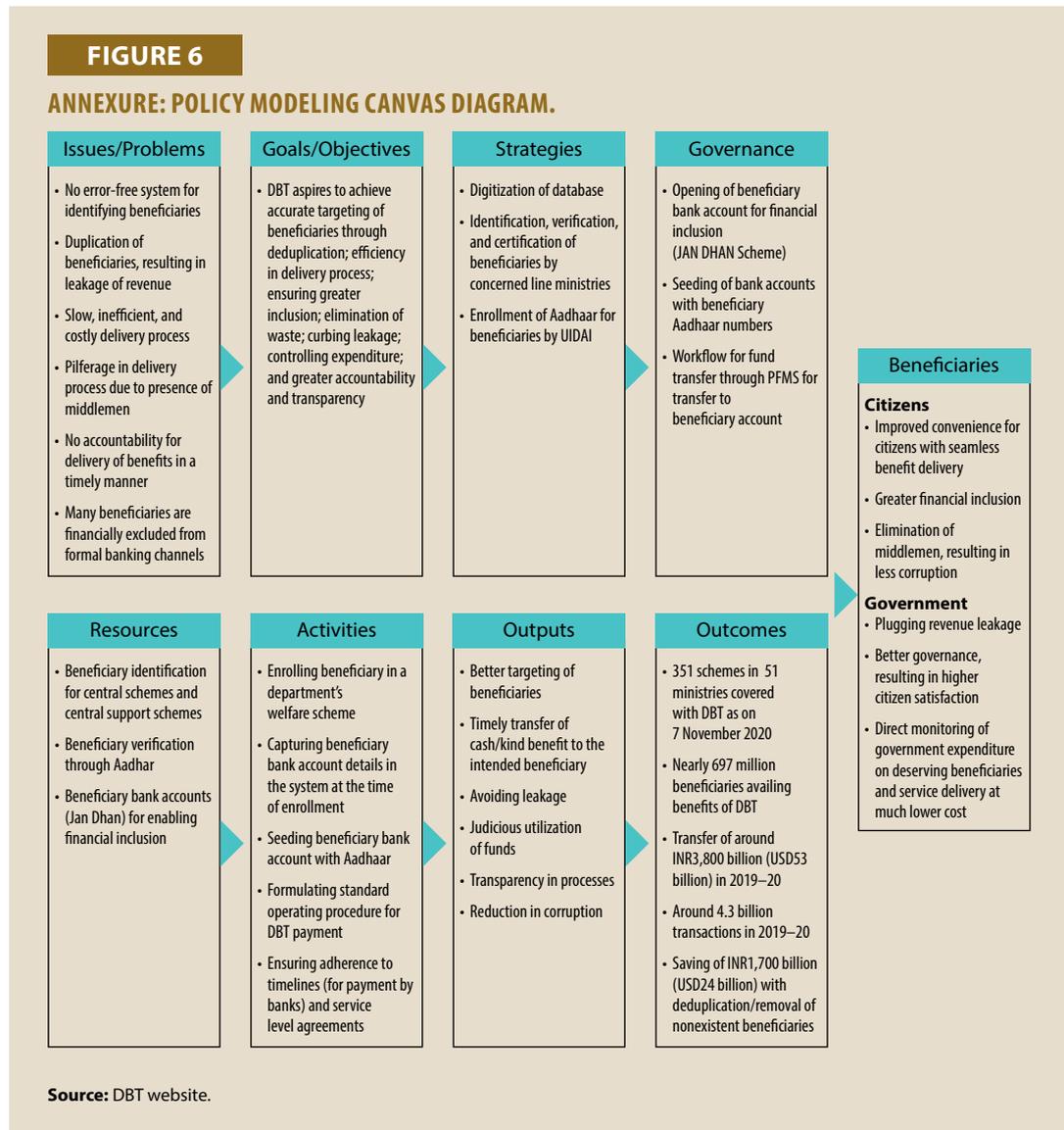
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## Annexure: Policy Modeling Canvas Diagram



## CASE STUDY 2

# INNOVATION IN DELIVERING PUBLIC HEALTH SERVICE THROUGH SEHATPEDIA, INDONESIA

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### Abstract

Indonesia is faced with serious problems in public-health service delivery because its citizens live in dispersed geographical areas ranging from urban, rural, and even remote areas, mainly because Indonesia is an archipelagic country consisting of about 17,000 big and small islands. The total population was around 225 million with a population density of 142.5 per sq km in 2015.

In recent years, an acceleration of information technology (IT) has led to a spread of health-related information to citizens through social media. However, not all information is from trusted sources. At times, it can be inaccurate and misleading. These issues triggered the Government of Indonesia, through the Ministry of Health, to undertake innovations to solve the problems. To address the issues, the Ministry of Health created an e-health service delivery program called *Sehatpedia*. It is an online health application that allows citizens to get all health-related information freely, safely, and easily. One of the interesting features of *Sehatpedia* is the 'live chat with doctor,' which enables a user to consult with a doctor directly. Indeed, this program involves many public- and private-sector doctors, supported by funding and physical facilities from the ministry. However, the role of the ministry is very strong to make *Sehatpedia* implementable and sustainable for citizens.

### Introduction

Health is one of the priority issues for the government in terms of public service delivery. Today, governments in developed as well as developing countries pay much attention to public-health services that are delivered to their citizens. To ensure better public-health services at the national level, several countries have improved the service quality, with innovation being a major driving force for ensuring optimal services [1, 2, 3]. World Health Organization (WHO) notes that the improvement in technology has contributed to a significant increase in global health quality in the past three decades [1]. In Indonesia too, innovation in public health services has contributed to the betterment of public health services [4, 5].

Being a developing country, Indonesia pays more attention to IT as an enabler of change. IT has positively impacted many government policies and transformed the way the government delivers public services to citizens.

Historically, the Ministry of Health has faced serious challenges in delivering public health services to all citizens, especially to the people living in dispersed geographical areas. With its 225-million population in 2015, Indonesia was the third most-populous country in Asia after PR China and India. Indonesia also had the highest population among ASEAN countries [6] but with a population density of 142.5 per square kilometer in 2015 [7]. The dispersed makeup of its demography made it difficult to post information on health matters, among other things [8, 9]. Dispersion of the population also made it difficult to deliver public-health services across Indonesia. Meanwhile, WHO [7] data shows that the rate of population growth had increased over the years. For example, in 2005, the population growth was 4.6%; in 2010 it was 4.9%; and in 2015, it became 5.4% [7]. Also, the fact that most people are living in urban areas cannot mean that those who are living in rural and isolated areas can be treated differently in accessing public-health services.

So, based on geographical and socioeconomic factors, public-health service delivery in the hinterland and rural areas, notably in small and remote islands is being optimized by the Ministry of Health. Delays in delivery of public-health services are primarily caused by geographic and income disparities [10]. In order to increase the quality of health for citizens, a proper distribution of accurate and credible health information is required, which has been channeled through social media or other internet means. All information is easily received by everybody at any time and in any place, by the use of IT that has rapidly grown among people. However, the information received is directly shared with others without filtering it, because there is no one in charge to check if any misleading information has been distributed to citizens.

The use of IT, including social media and the internet, is required for delivering public-health services to a huge population scattered across a wide geographical area, and ensuring that misleading information on public health matters is not delivered to citizens. It has been seen that advancement in IT has positively contributed to increasing public health service in many countries [11, 12, 13, 14].

For Indonesia, the use of IT as an instrument in delivering public-health service across islands, providing affordable healthcare for the poor, and promoting good health, is very important. In accessing various health services, the use of IT is essential in providing equal opportunities for citizens. In view of this, the Ministry of Health developed an innovative e-health application in 2018 called Sehatpedia as a panacea to the problems faced in the health sector.

### **Focus and Scope of Case Analysis**

IT can be a means of increasing public-health services in many countries. It offers innovative ways that can be employed to minimize the gaps in public service delivery to users and to promote equal access to health service delivered by the government [11]. IT development is very important for achieving the goal of efficient public-health services in the modern era.

In Indonesia, IT was used to develop an e-health service program called the Sehatpedia. The program is an IT-based health-service application that was conceived and developed by the Ministry of Health to enable prompt and efficient response to public health problems. Sehatpedia is expected to improve public-health service delivery affordably to the populace while also saving time and energy of users.

Sehatpedia is an innovation in public service delivery, primarily aimed at improving public-health service delivery and raising the quality of health of Indonesians who are the direct beneficiaries.

For this reason, Sehatpedia is specifically useful in the promotion of good health of citizens, minimizing the spread of unfounded and unreliable health information shared among citizens through social media, and reducing the long queues for patient registrations in national hospitals throughout Indonesia.

This study focuses on how the best practice of Sehatpedia is implemented in Indonesia. Implementation of Sehatpedia is not merely influenced by one factor but supported by various factors. The determining factors promoting the feasibility of Sehatpedia usage in Indonesia are analyzed through the Policy Modeling Canvas, which will be discussed in detail in the next section.

The scope of this study consists of analyzing the main and supporting features of Sehatpedia. Currently, it has eight established features that can be easily and freely accessed by citizens, while one more feature is under development. However, the scope of this study is limited to one prominent feature of Sehatpedia, namely, ‘live chat with doctor,’ which provides a wide opportunity for everyone to obtain consultation on one’s health concerns with the general as well as specialized doctors.

There are more than 600 doctors across 34 national hospitals who are tasked with delivering health-consultation services to Indonesians. However, other features of Sehatpedia are discussed in this chapter as supporting parts of this application. Meanwhile, Sehatpedia also provides new features in its response to COVID-19 in Indonesia, which are accessible by all citizens. This will be presented in the appendix section of this chapter.

### Case Analysis through the Policy Modeling Canvas

Sehatpedia is an e-health application developed by the General Directorate of Public Health Service of the Ministry of Health in February 2018. The first idea for an e-health application came from a directive of the President of Indonesia, Joko Widodo. The Minister of Health, accompanied by the top officials of the ministry (comprising the General Secretary of the Health Ministry, the General Directorate of Public Health Service, and the General Directorate Secretary of Public Health Service) responded to the President’s directive. It was implemented by the then Minister of Health (2014–19), Dr. Nila Moeloek, towards the end of 2017 as a symbol of public-health service delivery in the digital era. Between February and March 2018, at the headquarters of the Ministry of Health in Jakarta, Sehatpedia was introduced as the first official digital e-health application. The name Sehatpedia was coined from a combination of two words. The first is *Sehat* meaning healthy, and the second is *Pedia*, which is a general and commonly used word that refers to learning.

Sehatpedia is categorized as an innovation in public sector, though it is not the first online health application in Indonesia. Several e-health applications have been developed by the private sector previously. These include the *Klik Dokter*, *Go-Dok*, *ApaSakitKu*, *AloDokter*, *Dokter Diabetes*, *Halo Doc*, *OnCom (Online consultation & Mentorship)*, *PakDok*, *Alo Medika*, and the *Yes Doc* [15, 16]. The creation of Sehatpedia was inspired by two existing online health applications, namely, *Klik Dokter* and *Halo Doc*.

*Klik Dokter* is a digital application containing health articles while *Halo Doc* is a digital application containing features to chat or consult with doctors. However, *Halo Doc* is a paid application with access restricted to paid subscribers. Notably, health articles and chats with doctors were the first features displayed on Sehatpedia when it was launched on 20 September 2018.

### Features

There are nine features in the Sehatpedia application, namely, live chat with doctor, health care, health articles, e-policy, online registration, live fit, e-magazine, e-journal, and medical ID, with the last feature being under development. All features are available freely and can easily be accessed by citizen users. Each individual only requires a memory of 15.75 MB on his/her smartphone for the features to work. The features require three to seven minutes to download, depending on the mobile signal strength and the capability of the smartphone.

**Live chat with doctor:** This feature provides a relative ease to citizens in accessing health information from a host of doctors ranging from general doctors, dentists, and specialists across 34 national hospitals under the Ministry of Health. A total of 638 doctors are registered on the Sehatpedia application, including 54 general doctors, 72 dentists, and 512 specialist doctors. This feature limits users to consult with up to three doctors a day. This is aimed at providing an opportunity to other users to chat with the same doctors. However, according to the national health regulation issued by Ministry of Health, the doctors are prohibited from giving medical prescription to users through this feature because they get no access to physically examine the users.

**Healthcare:** Citizens can access information from the relevant hospitals as well as experienced doctors who are ready to consult through the Sehatpedia application.

**Health article:** This feature provides health education for all citizens, including how to prevent diseases as part of the prevention and promotion efforts initiated by the Ministry of Health. It provides 200 published health articles written by doctors and other medical personnel at the 34 national hospitals. In addition, there are notable contributions from health officials at the General Directorate of Public Health Service, Ministry of Health.

**E-journal:** The e-journal feature in Sehatpedia is a compilation of health journals written and arranged by doctors and medical experts under the employment of the Ministry of Health. There are also contributions from others who are not from the ministry. The Research and Development (R&D) Agency at the Ministry of Health is the main producer of health-research articles and journals as part of this feature.

**E-policy:** Citizens, stakeholders, and others concerned with health can access all government policies on health. These comprise acts, derivative laws, and national guidance for doctor service.

**Live Fit:** This is a specific feature aimed at promoting a healthy lifestyle among Indonesians. The government program aimed at promoting healthy lifestyle and habit (In Indonesia, it is called as *Germas*) is ingrained in this feature. It promotes various activities like running, walking, cycling, and others. Using the feature, these activities can be monitored and controlled, so that people can select a sports activity and its duration.

**Online health treatment registration:** This feature is interlinked with all national hospitals in Indonesia ([sirs.yankes.kemendes.go.id](http://sirs.yankes.kemendes.go.id)), containing an online registration link for people willing to do outpatient treatment in the national hospitals under the Ministry of Health. The aim of this feature is to prevent long queues when patients register for medical checkups at the national hospitals, thus, making the public service more efficient and effective. Also, this feature is connected with other public-health services, especially for those who are members of the national

health assurance, Jaminan Kesehatan Nasional (JKN). Through this feature, those enrolled in the JKN membership can access JKN programs easily and quickly.

**E-magazine:** The e-magazine feature provides information on all healthcare services and new health practices, both in Indonesia and in the world. The main contributors to the e-magazine are officials and staff at the General Directorate of Public Health Services, Ministry of Health. This magazine is converted to a digital format, so that everyone can access, download, and share the information provided by the e-magazine.

**Medical ID:** In near future, Sehatpedia will develop a feature called Medical ID. It will display health data of the Sehatpedia user. The feature contains individual health data that will be integrated into all public-health service facilities in future. Figure 1 highlights the various applications of Sehatpedia.

### Issues/Problems

The Sehatpedia application was conceptualized as a panacea to three important national issues namely: (1) public-health service delivered by the government is restricted by geography, time, and human resources; (2) large number of people queuing up for using the facilities in the hospitals; and (3) dissemination of untrusted health information on social media.

The first one deals with the issue concerning the expanse of Indonesia and its population being dispersed across 17,000 islands. The large area of Indonesia leads to a disparity in delivery of public-health services because of limited number of healthcare workers and resources. It is impossible to seamlessly deliver health services directly to citizens in the hinterland, remote, and frontier islands. As a result, public-health services are easily accessible in urban areas where there are health centers, compared with rural areas where there is limited access to health agencies and centers.

In 2013, the National Statistics Board of Indonesia noted that there were health-quality gaps between West Indonesia and East Indonesia. Those who inhabit the eastern part of Indonesia have lower quality of health compared to those who occupy the western part of the country. For example, the death rate of children in *Maluku* islands located in the eastern part of Indonesia is 2.5 times higher than the mortality rate of children in *Java* and *Sumatra* islands. These big islands are in the western part of Indonesia. In addition, the mortality rate of toddlers in rural areas is higher than those in urban areas [17].

Second, huge number of patients are using health facilities in hospitals. Long queues of patients during registration for outpatient medical checkup, for example, is a perennial problem. Generally, patients come to hospitals directly to register for medical checkup at the counter (on the spot). This becomes a problem when most of the patients visit a hospital concurrently. Apart from a long waiting period in getting health services at the hospital, public-health servants are not effective in providing health services because they are constrained by limited working hours and the large number of people they have to attend.

Then there is the issue of untrusted health information being distributed on social media through WhatsApp, Facebook, Twitter, and Instagram, which are the most commonly used information channels in Indonesia [18]. Often, most health information is shared among the public by unknown information sources and this impacts those who need genuine health information. Consequently, many people who need medical action are disadvantaged due to misleading health information.

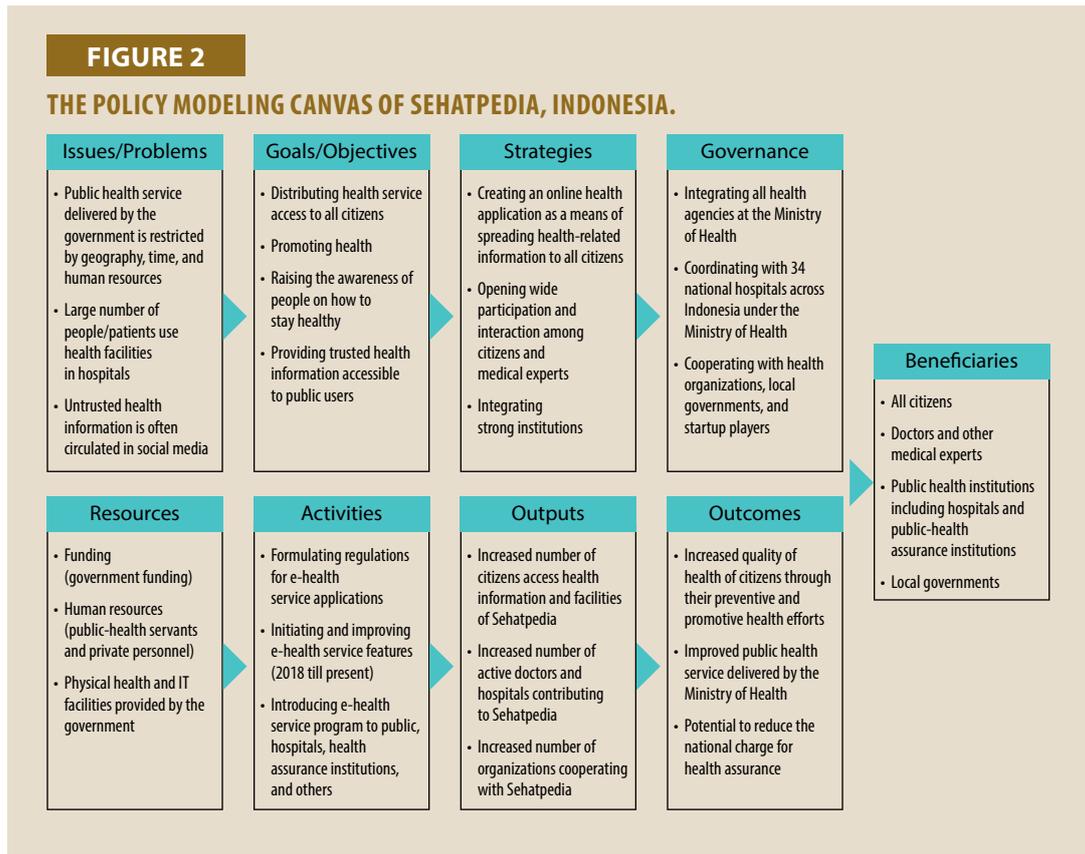
**FIGURE 1**  
THE SEHATPEDIA APPLICATION FEATURES.



Source: Ministry of Health, Indonesia.

**Goals/Objectives**

Sehatpedia was developed to respond to three current health challenges in Indonesia, namely, making health service accessible to all citizens of Indonesia, promoting health awareness among people to keep themselves healthy, and providing trusted health information to the public. These goals are linked with each other, leading to one ultimate goal of improving the health quality of all Indonesians.



Sehatpedia is an open and free online health information application that can be accessed by all Indonesians regardless of where they live. It allows all citizens to get health information and access equally. In this way, people will get new and reliable health information, leading to better health. Health awareness is one of the main goals of this application, along with reducing the number of patient visits to the hospital for medical checkups or getting direct treatment for mild ailments.

### Strategy

In order to improve health quality of all Indonesians, IT is utilized for spreading health information to all citizens. Creating an online health application, Sehatpedia, as a means of spreading health information to all citizens is the first strategy. This is aimed at increasing citizens' access to accurate and trusted health information directly and freely. Using Sehatpedia, citizens can optimize all available and existing features to improve their health quality as well as to validate any vague health information widely distributed among the public. It is important to filter untrusted or misleading health information to avoid dangers of following such guidance.

Encouraging wide participation and interaction among citizens and medical experts is the second strategy. Active participation of citizens is needed to improve the quality of public-health service in Indonesia. This will lead to in-depth interactions between citizens and medical experts, thereby enabling citizens to get first-hand medical recommendations and suggestions on health improvement.

Increasing interactions between citizens and medical experts requires integration of public-health institutions. This means that it is imperative to achieve coordination and cooperation across the sector. This is not only limited to health institutions, but also to non-health institutions. In this case,

the involvement of health agencies at the Ministry of Health, IT providers for the administration of Sehatpedia, and supporting agencies, is a must to implement the national health program. Sehatpedia is not limited to one institution but involves various strong institution linkages.

**Governance**

Governance pertains to the socioeconomic interactions among related actors ranging from citizens, business sector, social organizations, and government. It is a complex network aimed at promoting shared decision-making among actors [19]. A strategy to respond to issues/problems can be implemented, provided there is real action on the part of the institution that is responsible for it. In the Industry 4.0 era, creating the Sehatpedia is a landmark application for solving issues of irregularities or problems in accessing public-health services. It needs cooperation and collaboration among the General Directorate of Public Health Service at the Ministry of Health and the ministry’s many agencies, external agencies, and other relevant agencies.

In its internal structure, the Ministry of Health is required to coordinate 35 national hospitals across Indonesia under the General Directorate of Public Health Service. However, only 34 hospitals are directly coordinated by the General Directorate of Public Health Service to provide e-health services through Sehatpedia. Each national hospital in Indonesia has specialized and general functions based on their main duties as provided in Table 1.

**TABLE 1**  
**NATIONAL HOSPITALS UNDER THE MINISTRY OF HEALTH.**

No	Hospital	Specification/ Specialization	Class/ Type	City/Province
1	RSUP Dr. Hasan Sadikin	General hospital	A	Bandung/West Java
2	RSUP Dr. Kariadi	General hospital	A	Semarang/Central Java
3	RSUP Dr. M. Djamil Padang	General hospital	A	Padang/West Sumatera
4	RSUP Dr. Mohamad Hoesin	General hospital	A	Palembang/South Sumatera
5	RSUP Dr. Sardjito	General hospital	A	Yogyakarta/ D.I.Yogyakarta
6	RSUP Dr. Wahidin Sudirohusodo	General hospital	A	Makassar/South Sulawesi
7	RSUP Fatmawati	General hospital	A	Jakarta Selatan/DKI Jakarta
8	RSUP H. Adam Malik Medan	General hospital	A	Medan/North Sumatera
9	RSUP Nasional Dr. Cipto Mangunkusumo	General hospital	A	Jakarta Pusat/DKI Jakarta
10	RSUP Persahabatan	General hospital	A	Jakarta Timur/DKI Jakarta
11	RSUP Prof. Dr. R.D. Kandou	General hospital	A	Manado/North Sulawesi
12	RSUP Sanglah Denpasar	General hospital	A	Denpasar/Bali
13	RSUP Dr. Seoradji Tirtonegoro Klaten	General hospital	A	Klaten/Central Java
14	RSUP Dr. Rivai Abdullah	General hospital	C	Banyu Asin/South Sumatera

No	Hospital	Specification/ Specialization	Class/ Type	City/Province
15	RSU Surakarta (BBKPM Surakarta)	General hospital	C	Surakarta/Central Java
16	RSUP Dr. Sitanala	General hospital	C	Tangerang/Banten
17	RSUP Dr. Tadjuddin Chalid	General hospital	B	Makassar/South Sulawesi
18	RSUP Ratatotok Buyat	General hospital	C	Minahasa Tenggara/ North Sulawesi
19	RS Ibu dan Anak Harapan Kita	General hospital	A	Jakarta Barat/ DKI Jakarta
20	RSUP J Lemeina*	General hospital	Newly built	Ambon/Maluku
21	RS Jantung dan Pembuluh Darah Harapan Kita	Heart and blood vessel hospital	A	Jakarta Barat/ DKI Jakarta
22	RS Jiwa Dr. Marzoeki Mahdi	Psychiatric hospital	A	Bogor/West Java
23	RS Jiwa Prof. Dr. Soerojo Magelang	Psychiatric hospital	A	Magelang/Central Java
24	RS Kanker Dharmais	Cancer hospital	A	Jakarta Barat/ DKI Jakarta
25	RS Orthopedi Prof. Dr. R Soeharso Surakarta	Orthopedic hospital	A	Surakarta/Central Java
26	RS Jiwa Dr. Radjiman Wediodiningrat Lawang	Psychiatric hospital	A	Malang/East Java
27	RS Jiwa Dr. Seoharto Heerdjan	Psychiatric hospital	A	Jakarta Barat/ DKI Jakarta
28	RS Mata Cicendo	Eye hospital	A	Bandung/West Java
29	RS Paru Dr. Ario Wirawan	Pulmonary hospital	A	Salatiga/Central Java
30	RS Paru Dr. H.A. Rotinsulu	Pulmonary hospital	A	Bandung/West Java
31	RS Penyakit Infeksi Dr. Sulianti Saroso	Infectious disease hospital	A	Jakarta Utara/ DKI Jakarta
32	RS Pusat Otak Nasional	Brain hospital	A	Jakarta Timur/DKI Jakarta
33	RS Paru Dr. Goenawan Partowidigdo Cisarua	Pulmonary hospital	A	Bogor/West Java
34	RS Stroke Nasional Bukit Tinggi	Stroke hospital	B	Bukit Tinggi/West Sumatera
35	RS Ketergantungan Obat	Drug dependency hospital	A	Jakarta Timur/DKI Jakarta

**Source:** Ministry of Health.

**Notes:** RSUP is the acronym for Rumah Sakit Umum Pusat Sanglah, which means Central General Hospital, while RS indicates Specialized Hospital.

\*Officially established in 2019, it is not connected with the Sehatpedia application yet. The other 34 national hospitals are connected with Sehatpedia.

In total, 34 out of the 35 national hospitals under the Ministry of Health, are connected with the Sehatpedia application. The RSUP J Lemeina, located in Ambon City in the Maluku Province was categorized as a general hospital in 2019. It has been excluded from the Sehatpedia application.

The General Directorate of Public Health Service also coordinates with external agencies of the Ministry of Health for proper functioning of the e-health application. During the early days of Sehatpedia development, cooperation was interlinked with two online applications of the business units in the health sector namely, *Klik Dokter* and *Halo Doc*. Additionally, the General Directorate of Public Health Service also coordinates with startup players.

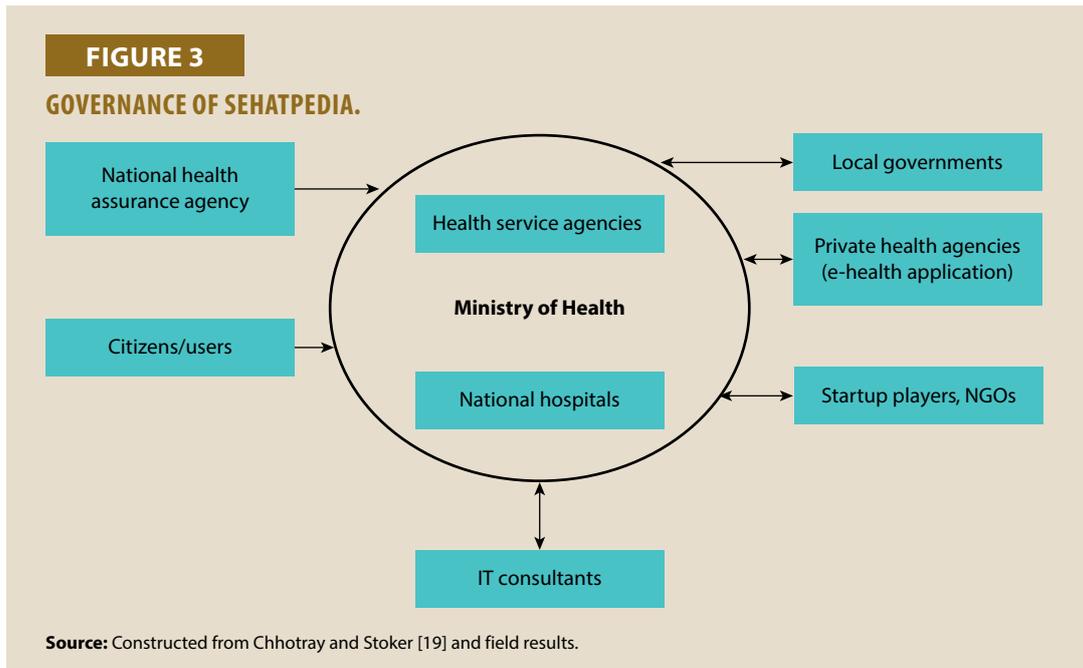


Figure 3 outlines the governance of Sehatpedia. The Sehatpedia application has attracted nine organizations outside the Ministry of Health comprising startup players, private health agencies, and nongovernment organizations (NGOs) to develop an e-health application in Indonesia. Also, the existence of national health assurance agency is testimony to the cooperation available in Sehatpedia. All agencies work together to build and run the national e-health application of Sehatpedia.

**Resources**

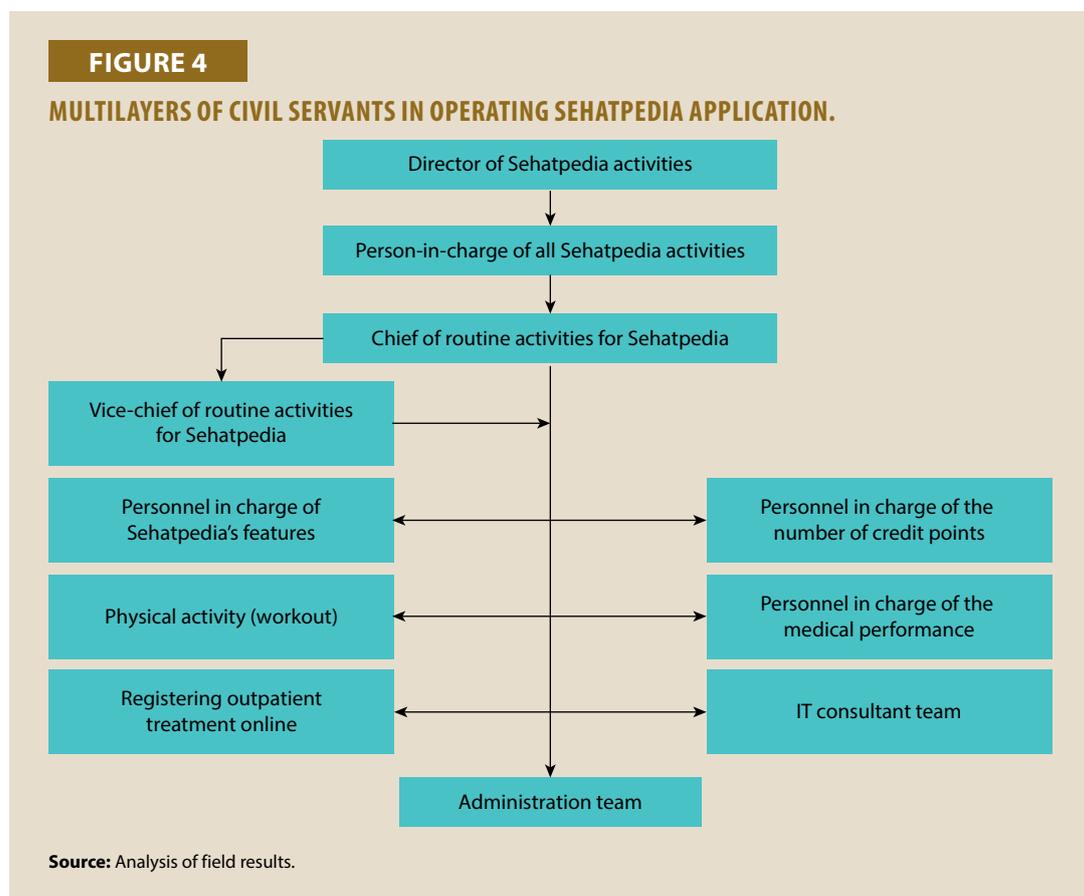
Each activity conducted by an organization must be supported by the availability of sufficient resources, which form the key capital for ensuring the daily operations of the organization. In building the e-health application of Sehatpedia, there were three key resources, namely, governmental funding, human resources (public health servants and private personnel), and physical health and IT facilities from the Ministry of Health.

The national e-health application in Indonesia is fully funded by the Ministry of Health with allocations from the yearly national budgets. The Ministry of Health, through the General Directorate, Secretariat of Health Service, has spent IDR200 million or approximately USD14,328 to develop the Sehatpedia application in 2018.

Annually, the total budget for development and maintenance is estimated at around IDR400 million (USD 28,656). The budget is allocated by the Ministry of Health. It is spent on four important things. First, it is used to pay the salaries of IT consultants and technicians. Sehatpedia is a digital health application on Android and smart systems. To operate it, the Ministry of Health must hire IT consultants and technicians. Second, it is used to introduce and disseminate Sehatpedia features to citizens. Third, it is used to monitor and evaluate the progress of the Sehatpedia program. Fourth, it is used for technical coordination among Sehatpedia actors.

Human resources to run the Sehatpedia application are mostly civil servants at the Ministry of Health. A total of 25 public-health servants are in charge of this (mostly the public servants at the Ministry of Health). Based on the Decision of General Directorate of Health Service Number

HK.02.02/I/2255/2019 about the Sehatpedia Application Team, these public servants are scattered across multiple layers of structures and echelons under the General Directorate of Public Service at the Ministry of Health as highlighted in Figure 4.



The management team of Sehatpedia is officially appointed by the Director-General of Public Health Service. Structurally, the Director-General of Health Service is tasked with directing all Sehatpedia activities. The Secretary, Directorate of Health Service is the person-in-charge of all Sehatpedia activities. The Head of Organization, Law, and Public Relations is in charge of the routine activities of Sehatpedia. The Head of Law Advocation and Public Relations is the vice-chief of Sehatpedia routine activities.

The lower cadre of staff consists of staff at the General Directorate of Health Service. They are the persons in charge of features of Sehatpedia application like live chat, health articles, health journals, and e-policies; physical activity (workout); registering outpatient treatment; number of credit points; and medical performance.

The IT team is drawn from the Division of Program and Information at the General Directorate of Health Service, the Centre for Data and Information, as well as private IT consultants. They develop and manage the Sehatpedia application, including expansion of its networks. Meanwhile, the administrative team consists of the law advocate and public relations officer responsible for the management of hospital data, e-policies, and health articles. This team also evaluates the active participation of doctors who undertake consultations in live chats as well as the number of health articles written and published by medical staff or doctors at national hospitals every month.

The number and composition of public-health servants in the management team of Sehatpedia is not limited to medical doctors. It also includes medical experts such as nutritionists, nurses, and pharmacists who contribute to the writing of health articles. In early 2019, there were 638 doctors comprising 54 general doctors, 72 dentists, and 512 specialist doctors who worked in 34 national hospitals. However, there is no data mentioning the number of medical experts like nutritionists, nurses, and pharmacists who contribute to the Sehatpedia application.

Physical facilities are important amenities that support the Sehatpedia application. The General Directorate of Public Health Service provides physical facilities such as internet connection, software, and hardware devices. Hardware includes advanced computers to enter and save supporting data, and smartphones to access and monitor data. Internet connection in the Ministry of Health is linked with all internet networks around Indonesia. Besides, a conducive working environment is provided for those who work in the implementation of the Sehatpedia application.

### Activities

Activities describe the tasks carried out by public health servants in running the business scheme of the Sehatpedia application. They comprise the management team at the General Directorate of Public Health Service and medical experts. They work together to carry out activities such as formulating regulations of e-health service programs, initiating and improving e-health service features (2018 till date), and introducing improved e-health service programs to the public, hospitals, health assurance institutions, and others.

The first activity is the formulation of regulations to bolster and guarantee the practices of the Sehatpedia application. Several regulations are issued, e.g., the Decision Law of General Directorate of Public Health Service Number: PR.03.02/I/1567/2019 about Sehatpedia as medical performance type and the Decision of General Directorate of Health Service Number HK.02.02/I/2255/2019 about the Sehatpedia Application Team.

The second activity, i.e., initiating and improving e-health service features (2018 till date), is a cofunction of the management team of Sehatpedia, comprising public servants from the Ministry of Health and private/external IT consultants hired by the Ministry of Health. There are routine activities that need monitoring and evaluation from the Ministry of Health after getting feedback from users. There are also activities that require regular monitoring of the progress following global issues.

The third activity is the introduction of e-health service programs to the public, hospitals, health-assurance institutions, medical communities, and others. To introduce them, Sehatpedia's team socializes the features of Sehatpedia to the public. This socialization is aimed at introducing the advantages of Sehatpedia, including its latest features. The forms of socialization include visiting crowded public places (like public sports facilities and places), visiting offices, presenting health workshops and exhibitions, and advertising Sehatpedia through online media.

### Outputs

To determine the success the Sehatpedia, the development and measurement of key performance indicators would be required [20]. There are three outputs and indicators for measuring the progress of Sehatpedia, as given in Table 2.

Based on the data from the Ministry of Health, the number of users who downloaded, installed, and used features of Sehatpedia was 58,000 at the end of 2019. Every day, there are more than 100

TABLE 2

## THE OUTPUTS AND KEY PERFORMANCE INDICATORS OF SEHATPEDIA APPLICATION.

Number	Outputs	Key performance indicators
1	The number of citizens who access health information and facilities of Sehatpedia	The number of citizens who download, install, and use features of Sehatpedia application. The more citizens download, install, and use features of Sehatpedia, the more effective the application is
2	The number of active doctors and medical experts who contribute to Sehatpedia	The number of doctors at each national hospital and medical experts contributing to live chats, journals, or other health information There is public acknowledgment for the 10 most active doctors and the 10 best national hospitals in Sehatpedia
3	The number of organizations that cooperate with Sehatpedia	The number of institutions that cooperate with Sehatpedia The more the number of external institutions that cooperate with Sehatpedia, the more feasible is its implementation

**Source:** Analysis results.

users who consult with a doctor using the ‘live chat’ feature. The number of doctors at each national hospital and medical experts who contribute to the live chat and health articles is recorded by the Sehatpedia management team. There is an increasing number of doctors at national hospitals who wish to be included in the application. Also, nine organizations from both, public and private agencies, cooperate with Sehatpedia.

### Outcomes

Outcomes are the results obtained from outputs. According to Roker [21], output is concerned with the short-term achievement of objectives, whereas outcome is concerned with the long-term achievement of objectives. Outcome is the more immediate impact of a program or an activity and is not far separated from outputs. Outcome will reinforce the result of outputs over an extended period of time.

The Sehatpedia application is expected to have three outcomes at least. All the three outcomes are meant to increase the health quality of citizens through preventive and promotive health efforts undertaken by the citizens themselves, improve public-health service delivery by the Ministry of Health, and potentially reduce the national charge for health assurance. The outcomes are aimed at raising the health quality of Indonesians as part of the related sustainable development goals (SDGs).

Sehatpedia is aimed at contributing to the achievement of the SDGs. This means that Sehatpedia’s outcomes impact the outcomes of other national programs. It is rather difficult to attribute the achievement of the health goal of SDGs to Sehatpedia, as the achievement can be contributed by many other health and non-health programs that are also focused on achieving the SDGs. Notwithstanding, the measurement of the outcomes of Sehatpedia is still in progress as the program was launched only in the early 2018.

### Beneficiaries

A government program must have goals and offer benefits for beneficiaries. Beneficiaries are those who receive direct and indirect benefits or those who have an interest in or are affected by a

government program. The beneficiaries are not limited to users. In a broader context, beneficiaries comprise those who are involved in this program.

The beneficiaries of the Sehatpedia application include citizens as active users, doctors, and other medical experts as contributors to the programs; public health institutions including hospitals and public health-assurance institutions that support the implementation of this program; as well as the local government.

Citizens will receive all health-related information and consultation with doctors. Citizens are the main priority of Sehatpedia as an innovative means of receiving public-health services.

One key benefit for doctors and medical experts who contribute actively to the Sehatpedia application is the prestigious recognition from top management in hospitals and from the Director-General of Public Health Service at the Ministry of Health. This recognition serves as a major input in the assessment of their performance. Nowadays, based on directive of the Minister of Health, each national hospital has plans for giving incentives to doctors and medical experts/staff who contribute the most to the operations of Sehatpedia. Consequently, the concerned hospital will enjoy a good reputation as a public agency. Moreover, Sehatpedia is expected to reduce the number of patients who are treated in hospitals. This, in turn, will reduce the charges for national health assurance borne by the national health assurance agency.

For local governments, Sehatpedia will assist health agencies at local governments in increasing the health quality of the local populace, reduce the expenditure of health agencies tasked with providing equal health service to people, and accelerate the dissemination of updated health information from the Ministry of Health and other health agencies within Indonesia and from many countries around the world.

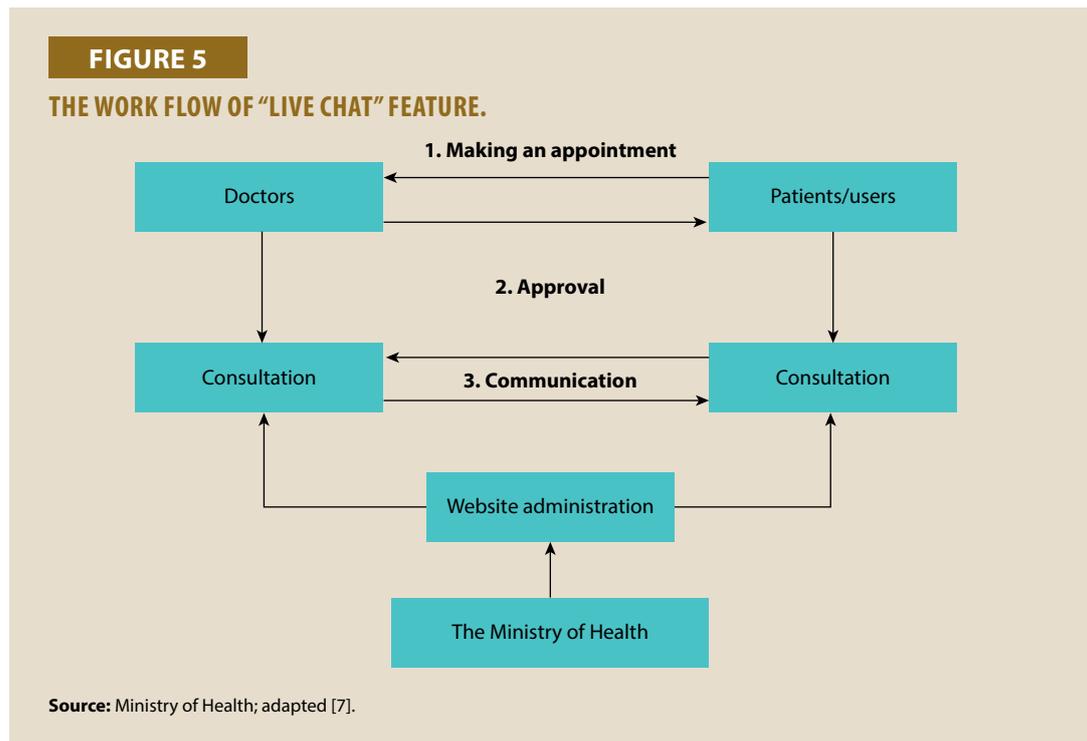
## Case Analysis of Success Factors

### Increasing Citizen Participation with 'Live Chat'

Sehatpedia provides easy access to all health information for citizens. All Sehatpedia features have benefits for users depending on what they need. The 'live chat with doctor' feature is aimed at providing trusted and accurate health information through direct consultation between patients and doctors. As of January–February 2019, this feature provided free health consultation by ten categories of doctors. These included 54 general doctors, 72 dentists, and 512 specialist doctors in areas of mental illness, skin and genitals, pediatrics, internal disease, orthopedic, heart, ear-nose-throat, and eye.

In 2019, the live-chat feature was the most used feature of Sehatpedia. It successfully attracted people to download and install the application. Of the 58,000 users of the Sehatpedia application, at least 100 users benefitted from 'live chat with doctor' per day. It means that there were more than 100 doctors providing health information to Sehatpedia users every day.

The live-chat feature provides the opportunity for each user to consult with three different doctors per day. It limits the consultation time to 15 minutes per chat with a doctor on the same day. It means that each person has the opportunity to chat as long as a total of 45 minutes per day with three different doctors. The reason for the time limit is to ensure that other users also benefit from the service and consult with the same doctors. Each doctor has a time allotted that must be appreciated by all users.



This feature is a specific type of digitalization in which citizens are active users of health information through communication between patients and doctors. Other features offer health information, but users cannot receive direct feedback from doctors or medical experts. The users can message the IT administrator of Sehatpedia to deliver any feedback. Thus, the IT administrator and the health management team of Sehatpedia can deliver prompt responses to the suggestions from the users.

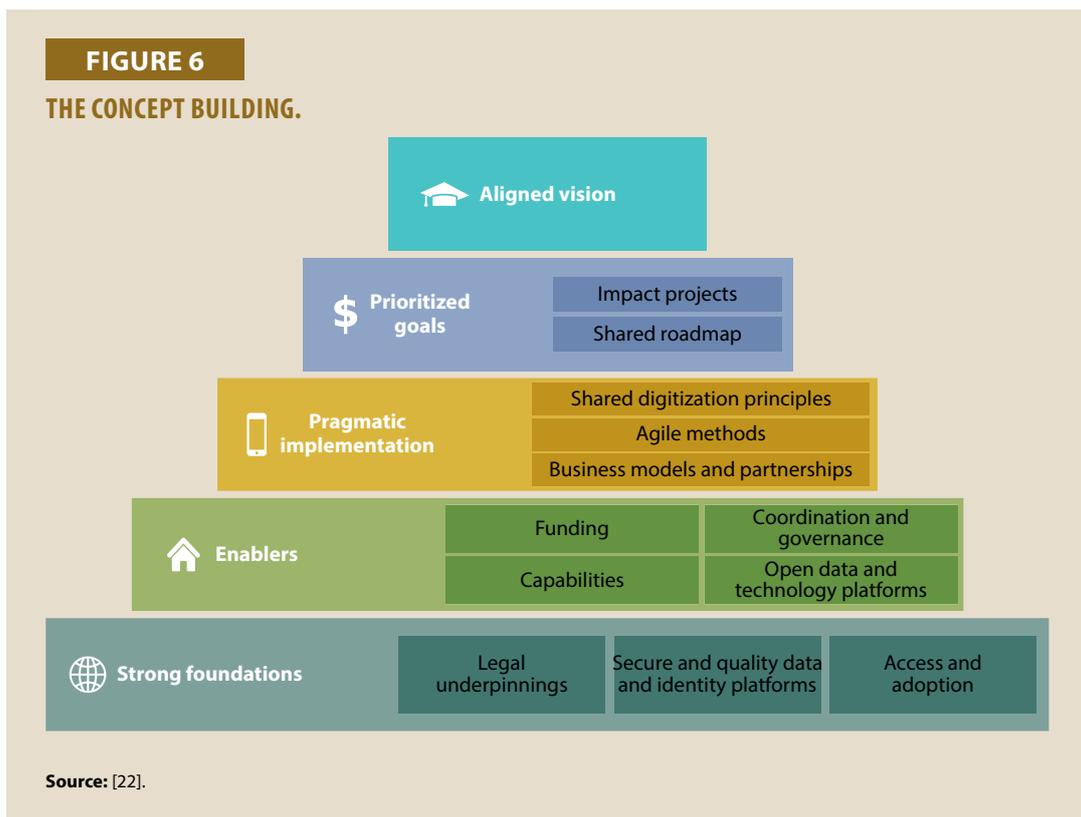
The live chats provide many benefits for users because they can consult directly with the selected doctors who are experts in their medical fields, freely and unconstrained by place and time. To enable seamless functioning of the live-chat feature, a user is asked to seek an appointment from a doctor prior to a direct consultation. After a doctor gives an appointment for consultation, the user can chat with the doctor to get the required health information.

Citizens who need to ask about their health problems (diseases, treatment, or other health information) can use this feature. Based on monitoring and evaluation of consultations by the hospital-management teams, doctors, and the health-service-management team, enquiries on mental health in the live chats rank first among other live-chat consultations provided by Sehatpedia.

Generally, all features of Sehatpedia are similar. The ‘live chat with doctors’ feature has a special additional feature that allows for interactions between patients and doctors. Determination of doctors’ availability is another component of this feature. Other features are passive e-health services that allow users to access them anywhere anytime without the need to determine if a doctor is available.

#### **Building Blocks to Make Sehatpedia Successful**

The concept of building blocks in the digitalization of public service was developed by Arthur D. Little in 2018. He draws the building blocks as a pyramid by placing strong foundations at the lowest level and placing the aligned vision at the highest level.



The five main building blocks are illustrated in Figure 6. These are aligned vision; prioritized goals (impact project and shared roadmap); pragmatic implementation (shared digitalization principles, agile methods, business models, and partnerships); enablers (funding, coordination and governance, capabilities, and open data and technology platform); and strong foundations (legal underpinnings, secure and quality data and identity platforms, and access and adoption). Each of the building blocks is detailed as follows:

**Aligned vision:** The Sehatpedia application was developed as a national health development program during the 2015–19 period. In the mid-to-long-term planning document covering the period 2015–19, one of the national health program objectives is to enhance the health of Indonesians through greater access and equal distribution of health services across the nation. This necessarily includes improvement of access and quality of basic public-health services in remote, rural, and frontier areas.

The national health programs are based on three key pillars, namely, healthy-life paradigm; reinforcement of health services; and national health guarantee. Reinforcement of health services is conducted with the aim of improving access and quality of health services, optimizing the referral system using a continuum-of-care approach, and health risk-based intervention. Sehatpedia is a directive of the President, Republic of Indonesia to the Minister of Health in response to the imperatives of Industry 4.0.

The features of Sehatpedia are in line with national health programs in the mid-to-long term planning document of 2020–24 (RPJMN 2020–24). This document has the theme, “Indonesia is a middle-high income that hopes to be prosperous, inclusive and sustainable.” This planning document dictates that public-health services must increase the access and quality of services

through focus on primary healthcare. This is to be done through improvements in prevention and promotion efforts that are supported by innovation and technology utilization.

**Prioritized goals:** The prioritized goal of Sehatpedia is equal distribution of health services to all citizens by means of providing current, accurate, trusted, and free health-related information. Providing equal distribution of e-health services to all citizens will have a high impact on other health-service goals. As mentioned previously, the three goals of the Sehatpedia application include equal health service access to all citizens, promoting people's awareness on how to maintain their health, and providing trusted health information to the public.

The end goal of the Sehatpedia application is to increase people's awareness in both urban and rural areas on carrying out measures to prevent ill-health and promote better health. In the long term, those goals can increase the quality of public-health services and reduce the charge of national health assurance.

The Ministry of Health constantly improves Sehatpedia's features and its quality, based on the roadmap of national-health programs. The nine features of Sehatpedia will be updated. The new features that will be released include providing free health-service access to all public hospitals under the coordination and supervision of the Ministry of Health and the local governments.

**Pragmatic implementation:** The Sehatpedia application is expected to contribute towards improving the national health quality. For this reason, continuity of the Sehatpedia application is a key priority of the Ministry of Health. There are three pragmatic methods in Sehatpedia that ensure its continued success. These are involvement of outsiders and citizens to improve Sehatpedia features, creation of internal competition at the Ministry of Health, and giving rewards to medical personnel at all national hospitals under the ministry.

First, involvement of outsiders and citizens is aimed at improving Sehatpedia's features. Outsiders are those who are involved in many cooperation schemes like IT consultants, startup organizations, local governments, and other health agencies (private and public). While citizens are users who always give feedback (criticisms and suggestions) on the Sehatpedia application, health personnel are involved in the running of this application.

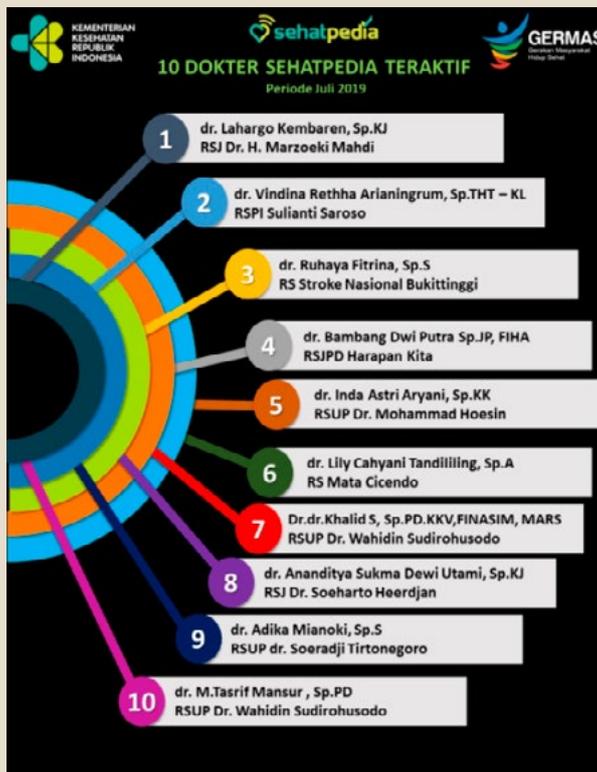
Second, the Agency for Organization, Law and Public Relations at the Ministry of Health enjoins all doctors and medical personnel at all national hospitals to contribute to the Sehatpedia application, especially in the 'live chat with doctor' and 'health articles' components. The administration team of Sehatpedia will evaluate the performance of doctors and national hospitals to recognize the most interactive doctor in live chat as well as the most participating hospital in the monthly publication of health articles.

Every month, the 10 most-interactive doctors are acknowledged, and the ten-most active hospitals are widely publicized and announced at meetings of the Ministry of Health, involving the heads of national hospitals. This selection is also shared with citizens. This method leads to an achievement evaluation of each hospital, prompting the respective leaders to motivate all medical personnel to be active in live-chat consultations and to write health articles.

Third, there are several rewards given to doctors and hospitals that are in the top-10 rankings. In case of doctors, they receive an additional salary incentive (in the planning/preparation phase of

**FIGURE 7**

**10 MOST ACTIVE MEDICAL DOCTORS BY HOSPITALS.**



Source: Ministry of Health, Indonesia.

**FIGURE 8**

**10 MOST POPULAR HEALTH ARTICLES PUBLISHED BY HOSPITALS.**



Source: Ministry of Health, Indonesia.

the Ministry of Health). Non-financial rewards are provided to doctors who contribute the most. In case of hospitals, they are rewarded by the Ministry of Health on the national health day and on other important health events. The number and type of incentives are adjusted according to the existing condition and capability of each hospital.

**Enablers:** Enablers of Sehatpedia are important in promoting the existence of this application under uncertain conditions. The three enablers of Sehatpedia are improvement of internal human resource capability, standardization of open data, and support from external organizations. All three are related.

First, improvement of medical and nonmedical human resources at the Ministry of Health, including its 34 national hospitals, is very essential. The annual funding support from the Ministry of Health must be followed by a reinforcement of personnel of the Sehatpedia application team and improvement in medical experts' qualifications, which is achieved through short training courses for the Sehatpedia application team. This training can also be part of the requirements in the medical career progression set by the Ministry of Health.

In addition to coordinating and cooperating with 34 national hospitals and all other hospitals around Indonesia, the Ministry of Health also cooperates with all public-health service agencies at local governments, the public health assurance agency, and healthcare startup organizations.

Second, Sehatpedia is an open-access system, i.e., everyone is allowed to access it freely, anywhere, and anytime. To facilitate easy access, standardization of open data on Sehatpedia is important. Besides, Sehatpedia has to respond to the ever-changing health demands of citizens and in meeting global health issues. Data of Sehatpedia application are safely stored and distributed by the Ministry of Health to all users. In this context, standardization of open data is also supported by updating the latest information, features, and technology of Sehatpedia.

Third, support of external organizations is inevitable in using the Sehatpedia application. There are nine nongovernment and business organizations that have cooperated with the Sehatpedia team. They are in the health, social, academic, and business startup sectors. The nine organizations are *Komunitas emergensi Indonesia* or *Kreki* (social); *Gerakan Garasi* (social); *Kejora* (social); *Fakultas Kedokteran Gigi Indonesia* or Faculty of Dentistry, University of Indonesia (academic); *Prudential Indonesia* (business); *Zi Care* (business); *Pro Sehat* (startup); *Good Doctor/Grab Health Service* (business); and *Helfa* (startup). A few of them are prominent e-health business players in Indonesia.

Cooperation among organizations is to achieve two main purposes of both the Ministry of Health and partner organizations. The first purpose is aimed at improving the capabilities of Sehatpedia's personnel in responding to the ever-changing public needs, current technology, and latest data. The second purpose involves fruitful cooperation to expand the social and business activities and networks of partner organizations.

To make sure that the enablers of Sehatpedia are working well, the team of Sehatpedia undertakes ongoing reviews of the application. Feedback is obtained from citizen users, doctors, hospital staff and leaders, external organizations, and other stakeholders. The evaluation is conducted every year.

Improvement of the Sehatpedia application is embarked upon whenever there is a need to improve or change the application. It comprises the Sehatpedia features, feedback from users, progress on capability enhancement of the Sehatpedia's management team, and pattern of cooperation with

external organizations. The Directorate of Public Health Service is the main actor in implementing the Sehatpedia application. All organizations co-act with the Sehatpedia team, under the supervision of Directorate of Public Health Service.

**Strong fundamental elements:** Fundamental elements are the basic components of the Sehatpedia application. These elements are composed of laws, availability of accurate data, and easy access to the application. They provide a base for enablers, pragmatic implementation, prioritized goals, and aligned vision.

First, law is a strong means of binding people's behavior in order to lay down directives. The Sehatpedia application is based on the Decision Law of the General Directorate of Public Health Service Number: PR.03.02/I/1567/2019 about Sehatpedia as 'Medical Performance' type. This law asserts that public health service can be delivered online. Using this system encourages active participation of citizens in improving their health quality.

Another law is the Decision of the General Directorate of Health Service Number HK.02.02/I/2255/2019 on the Sehatpedia application's team. This law contains the composition of the Sehatpedia management team comprising members from the Ministry of Health and the IT consulting agencies. As depicted in Figure 4, the Director-General of Health Service is the top manager of this application. It provides certainty that Sehatpedia is professionally and routinely managed by the Ministry of Health.

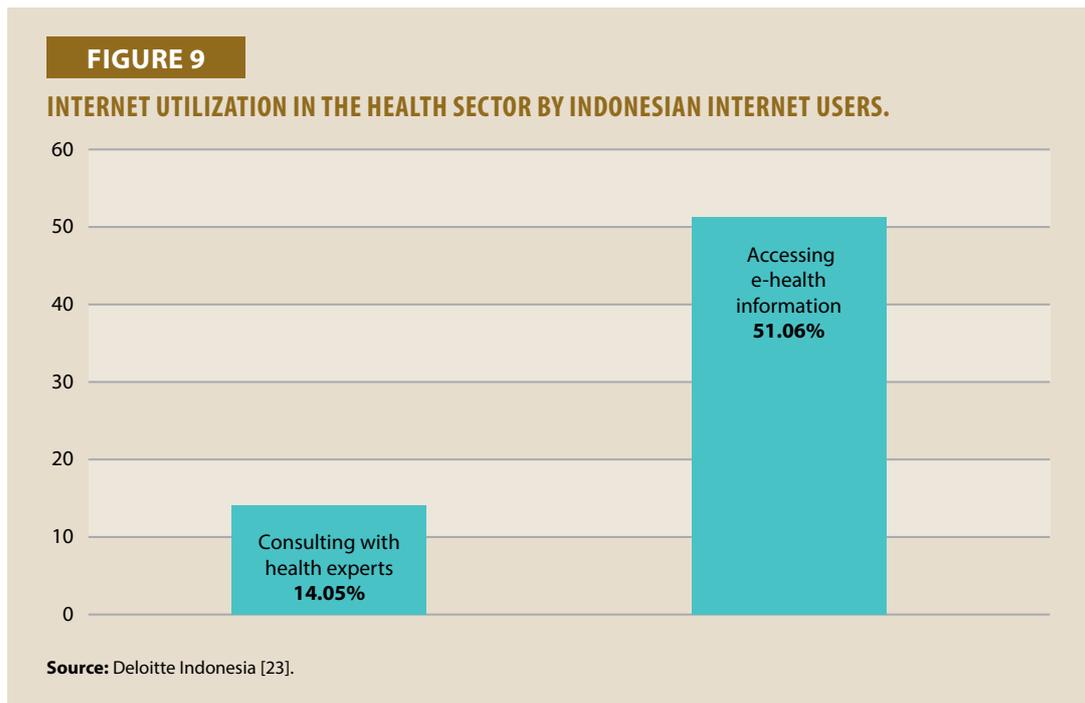
Using this law, the Minister of Health can easily coordinate with all public-health agencies in Indonesia in promoting the Sehatpedia application, particularly the health agencies and national hospitals under the supervision of the Ministry of Health.

Second, secure and quality data are strongly established to run the Sehatpedia application. To guarantee the integrity of data, the latest data are provided by medical experts such as general doctors, specialist doctors, medical personnel, public-health servants, academicians, and relevant experts who are able to contribute to the development of health information. Data and information in Sehatpedia are created by the Ministry of Health and saved through trusted networks to provide updated and correct health information to citizens and other institutions.

Sehatpedia is the means for citizen users to get all trusted health information sourced from the official medical experts. Citizens can access and adopt health information to increase their awareness on healthcare. Citizens can access the Sehatpedia application openly and freely. There are positive impacts for users of this application and incentives for doctors and medical personnel who are actively contributing to this application.

The Sehatpedia is freely accessible to all citizens of Indonesia. It is easy to be adopted by other countries that have similar characteristics in terms of wide geographical area, dispersed population, varied occupations, and availability of internet access. Research by Deloitte Indonesia in 2019 revealed that use of the internet in the health field in Indonesia is relatively high. About 14.05% of the citizens utilize the internet to access the e-health application and to consult with health experts. About 51.06% of the citizens use the internet to access e-health health information [23].

Improvement in health of Indonesia's population will have a positive impact on the national economy and life quality of the population. Sehatpedia is one of the means to achieve these goals.



Until 2019, there were about 58,000 users of Sehatpedia. In the long term, e-health is not only for use by people who are in the middle-high income category or those residing in urban areas, but also to benefit people who are in rural and remote areas, through internet access and smartphones.

### Lessons Learned and Insights from the Case Analysis

The Sehatpedia application was initially created and adopted from the business sector in mid-2018. It has since become successful in encouraging the active involvement of Indonesians. Sehatpedia is a part of the innovation in public-sector organizations (PSOs). According to Windrum's innovation typology [24], Sehatpedia is classified as an innovation in public service delivery.

Usually, innovation in the public sector is an adaptation of business practices [20]. However, such adaptation is not easy. The system, environment, and organizational pattern of the PSO are quite different compared to business organizations. Even the political factor is a determinant of innovation in PSOs [25, 26, 27].

Sehatpedia is the communication and consultation channel between citizens and doctors concerning health information. It is also aimed at increasing citizen access to public-health services. Sehatpedia provides all health information accurately and quickly including the disease type and its spread, public health facilities information, and health regulations.

Sehatpedia can be adapted by other countries, both in developing countries and developed countries. This is because IT has permeated across nations. Open and free access is the key to attract many citizens to utilize the Sehatpedia application. There are three clear lessons from Sehatpedia, namely, full support from government, public acknowledgement and incentives, and governance.

As part of the innovation in public service delivery, the Sehatpedia was created and developed by the central government. The application is fully and officially supported by the Ministry of Health.

The support from the Minister of Health is strongly influenced by the directive of the President to solve health problems using modern technology. Following this instruction, the Minister of Health directed the General Director-General of Public Health Service and General Secretary of Public Health Service at the Ministry of Health to form an e-health service team working to create and manage Sehatpedia.

The directive of the Minister of Health resulted in an extensive implementation the Sehatpedia application by the Ministry of Health. The support of top leadership is pivotal in allocating public resources such as funding, personnel, and facilities in establishing and developing the Sehatpedia application. The Ministry of Health has direct authority to coordinate the activities of the 34 national hospitals and other health institutions around Indonesia. Indeed, it gives broad guidelines to private health agencies outside of the Ministry of Health, like IT consultants and private e-health service agencies.

Special appreciation for doctors and hospitals who make active contributions to Sehatpedia is done through wide acknowledgment within the agencies at the Ministry of Health. There is a monthly ranking of the 10 most-active doctors and the 10 best hospital managements. The indicator to assess the most active doctors is the number of people who consult with the doctors in 'live chat with doctor' on Sehatpedia. The indicators to evaluate the best hospital management are the health writings on Sehatpedia that are published in e-magazines, health articles, and health journals.

Each month, the Ministry of Health announces the top 10 doctors and the top 10 hospitals in Indonesia to motivate other doctors and hospitals in contributing to the Sehatpedia application. The Ministry of Health is also preparing a special monetary incentive for doctors and hospital management that are ranked in the top 10 categories for their contribution to the Sehatpedia application. This is aimed at reinforcing the existing Sehatpedia features, and to further enrich Sehatpedia features, as well as to sustain the practice of Sehatpedia.

The Ministry of Administrative and Bureaucracy Reform holds a national annual public innovation competition called Sinovik. Sehatpedia participated in the Sinovik program. Sehatpedia was exhibited in many national and international exhibitions and competitions in fields of public-sector innovation, public service delivery, and health service.

Sehatpedia involves various public and private actors ranging from first creation up to development stage. Structurally, the Ministry of Health is the key actor for this activity. It is responsible for mobilizing all official staff and for promotions of Sehatpedia to all citizens. IT consultants, startup organizations, and business partners from the private sector make active contributions towards accelerating and updating the Sehatpedia features, based on citizen needs.

Governance is a complex and subtle process, with no clear boundaries for interactions among the actors involved in this process [28]. Therefore, mutual understanding of the working team is necessary for seamless functioning of Sehatpedia. Notwithstanding, it needs the strong roles of top leaders to lead other agencies under the supervision of the Ministry of Health.

### **Acknowledgment**

The author wishes to acknowledge the role of Rico Mardiansyah, the head of law and public relations at the General Directorate of Health Service, Ministry of Health, Indonesia for his vital contribution

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### **Appendix: Sehatpedia's Special Feature on COVID-19 Response**

At the end of December 2019, the outbreak of the infectious corona-virus disease (COVID-19) occurred in Wuhan City, PR China. Almost all countries are infected by it. Tens of millions of people are infected around the world (more than 200 infected countries and territories), including Indonesia. President of Indonesia, Joko Widodo officially announced the first case of two persons who were infected by COVID-19 in Indonesia on 2 March 2020. To prevent this infectious virus from spreading quickly to other countries and regions, the World Health Organization (WHO) had declared COVID-19 as a global pandemic on 11 March 2020.

The number of people infected by this virus in Indonesia is worrying. With a large population of about 225 million across thousands of islands, COVID-19 is predicted to spread widely and quickly. To prevent a widespread outbreak and to cut the chain of infection, the Ministry of Health has mobilized all resources across the nation. One of the Ministry of Health's policies to contain the outbreak and safeguard the mental health of the populace is to add two special features of COVID-19 in the online application of Sehatpedia. These features were launched on 23 March 2020.

The two important features are: (1) self-assessment and self-isolation, and (2) free mental health consultation. The first one is a way to involve people actively through self-awareness and self-honesty in doing the test to establish whether a person is infected by COVID-19 or not. There are three assessment types, namely, high-risk, middle-risk, and low-risk. If people are categorized as high-risk, they are asked to get special treatment in a hospital. If they are categorized as middle-risk or low-risk, they are directed to carry out the self-isolation program through Sehatpedia. Those who do self-isolation at home will always be monitored by the doctors and medical teams of Sehatpedia.

In a similar vein, the 'live chat with doctor' feature is especially aimed at those who get excessive anxiety and fear during the pandemic. People can pour out their feelings during these chats. By clicking this feature, they can consult with doctors and/or psychologist(s) freely to relieve their excessive anxiety and fear. This way, many people will be assisted in facing psychological issues during the COVID-19 pandemic. All main online features of Sehatpedia are appropriate to be used by all people. It enables the compliance of government policies including those relating to physical distancing, getting people to stay at home, and to work from home during the COVID-19 pandemic.

These features are very helpful for the Ministry of Health to identify people who are infected by COVID-19. From 23 March 2020 to 4 April 2020, the number of citizens who had consulted online using the Sehatpedia application was 1,740. During this period, 4,062 people did self-assessment for COVID-19 symptoms, while 256 people did self-isolation at home after doing the self-assessment.

Those who did self-isolation are assessed individually based on the online feature of self-assessment and self-isolation. There is no medical checkup physically (no rapid test or swab test) conducted by medical staff. In the feature of free mental-health consultation, Sehatpedia can help minimize stress or depression in people during the COVID-19 pandemic. As both these features are being used during the pandemic, they cannot be evaluated yet for their efficacy and effectiveness. However, these features are innovative ideas of Sehatpedia to ensure that the public health service is close to citizens so that they do not have to go to health centers directly during the pandemic.

**FIGURE 10**

**THE DIGITAL ECOSYSTEM OF SEHATPEDIA AND SPECIAL FEATURES FOR COVID-19.**



Source: Ministry of Health, Indonesia.

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## CASE STUDY 3

# IMPLEMENTING A SINGLE WINDOW FOR OPENING PUBLIC DATA, REPUBLIC OF KOREA

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### Abstract

This chapter introduces the Republic of Korea (ROK)'s Open Data Portal. Open Data Portal is a single window for opening public data to citizens and companies. It is a service that has been built and developed through the development of laws and systems, establishment of dedicated and supporting organizations, vision and strategy through master plans, portal construction, and subsequent operation of projects since 2010. Through these efforts, the ROK government has made a quantum leap in open data, and through this portal, numerous private companies have acquired and used the data. This has enabled creation of additional value. The success factors can be summarized as presentation of a clear vision and strategy, creation of a clear legal and policy base, active promotion by powerful institutions, creation of a single integrated window, and ongoing budget investment. Above all, opening public data as a major national agenda and making constant efforts is the biggest success factor.

### Introduction and Background

The ROK has established the world's best e-government system. It was ranked No. 1 in the UN e-Government Development Index and Participation Index for three consecutive years since 2010. This is illustrated in Table 1.

**TABLE 1**

#### UN E-GOVERNMENT SURVEY.

Rank	2010	2012	2014	2016	2018
E-Gov Development Index	1	1	1	3	3
E-Participation Index	1	1	1	4	1

Source: UN [1].

In particular, the ROK has made remarkable achievements in its efforts to open and use public data. As Table 2 shows, again the ROK has been ranked No. 1 for three consecutive terms from 2014 to 2019 in the Open Government Data evaluation conducted every two years by the OECD.

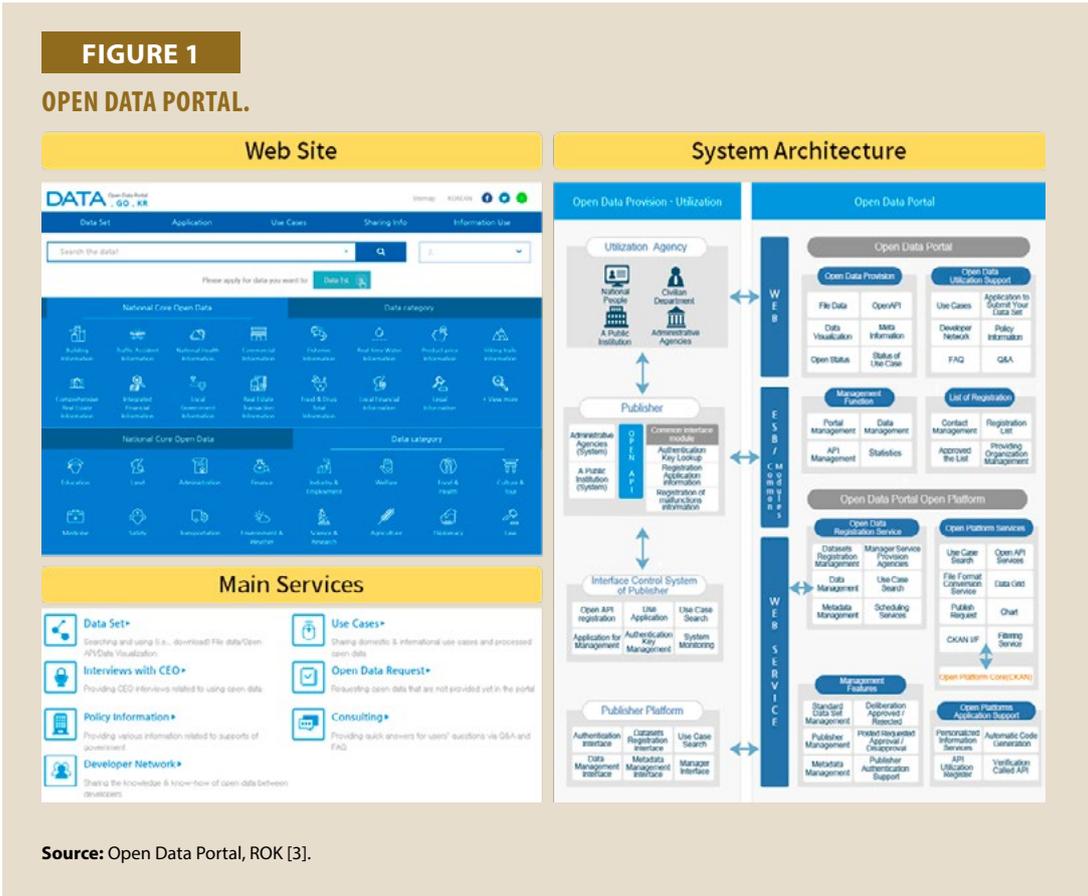
**TABLE 2**  
**OECD DATA INDEX.**

	2014	2017	2019
<b>Rank</b>	<b>1</b>	<b>1</b>	<b>1</b>
<b>Score</b>			
Total	0.979	0.94	0.93
Data availability	0.333	0.32	0.31
Data accessibility	0.333	0.29	0.29
Government support for data reuse	0.313	0.33	0.33

Source: OECD [2].

In order to see how the ROK has taken a step closer to implementing a smart government and also made efforts in the digitalization of public service delivery, this case study will analyze the Open Data Portal, which was established with the aim of making public data publicly available and free to use.

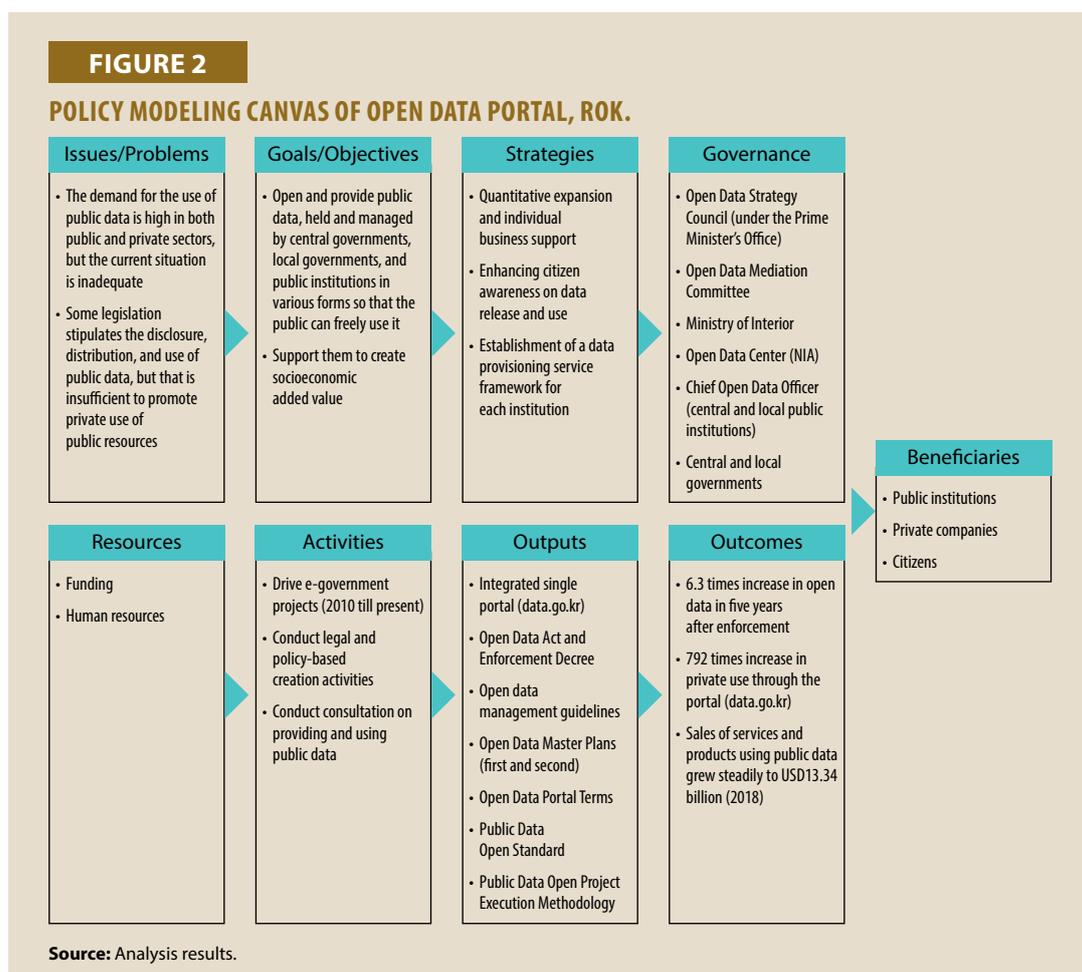
Open Data Portal is an integrated site that provides open data, which are generated or acquired by public agencies, in one place. The portal provides various data types such as files, open APIs, and data visualizations to allow the use of open data easily. Additionally, anyone can find open data that he or she wants via an easy and convenient search engine. Figure 1 illustrates the open data portal.



**Focus and Scope of Case Analysis**

This study intends to consider not only the service delivery system of the Open Data Portal, but also the digitalization process, i.e., the legal, institutional, and organizational systems that form the

basis of this portal. Also, by looking at the relationships and differences with similar portals, such as the knowledge portal, the study intends to help understand its exact use.



### Case Analysis through the Policy Modeling Canvas

Based on the Policy Modeling Canvas presented in Figure 2, the contents corresponding to each building block are analyzed and described as follows.

#### Issues/Problems

As the uncertainty and complexity of the external environment increased, the information and systems possessed by a single institution made it difficult to establish effective policies and promote businesses. With the rapid progress of the knowledge society, advanced knowledge and value created by linking diversified knowledge production bases from governments, corporations, and individuals emerged as major issues. At this point, as the government's major business functions and data were computerized through the promotion of public informatization projects, the establishment of information systems by departments and business units matured. As a result, public informatization shifted to the era of creating 'knowledge' and 'value' that are highly available through 'connection' and 'use' of distributed information resources.

The resources produced, owned, and managed by public institutions have the potential to create high economic and social value through private as well as public use. The public has demanded the

opening and sharing of national resources in a form that facilitates the creation of new businesses by converging with private resources, rather than receiving public services in the form of finished products. In particular, with the proliferation of smartphones, the demand for sharing and utilization of national resources necessary for developing mobile apps for day-to-day needs such as weather and traffic information has increased rapidly. For example, at the ‘Government 2.0’ open forum held at the National Assembly in December 2009, the ‘Seoul Bus’ app developer insisted that opening the public resource in the form of an open API enables the development of apps quickly and effectively [4].

Due to the needs of the times, it was considered urgent to establish a national shared infrastructure to manage and share various national resources with the public and private businesses. Also, in accordance with Article 51 of the e-Government Act [5] revised in December 2009, the need to promote the distribution management of national shared services through the establishment of a national shared service management system was also raised.

As such, the demand for public-resource utilization was high in both public and private sectors. However, the actual utilization status was insufficient. As a result of the 2009 survey on demand for public-resource utilization, 1,099 public institutions required the use of information resources possessed by other public institutions [6].

In addition, in the private sector, most public information was simply collected and used without prior consultation with public institutions. As a result, there were cases in which mobile app services using Seoul and Gyeonggi-do bus information (December 2009) and gas station price information (February 2010) were blocked because there was no prior consultation. It was also found that 61.6% of companies using public information were using it without prior consultation with state agencies [7].

Some laws and regulations such as public disclosure of public information (public agency information disclosure law); private distribution of public information (Basic Act on National Informatization); and private use of public information (Act on Online Digital Content Industry Development) included public information disclosure, distribution, and use. However, that was insufficient to promote the private use of public resources. Nevertheless, some public sectors with high private demand, such as weather information and patent information, provided the basis for enactment of individual laws and provided information to the private sector through related organizations.

Private portals were provided some public information by utilizing some of the necessary public resources in partnership with individual government agencies. Portals like Naver and Daum received some public resources, e.g., from the National Assembly Library (Thesis) and the Supreme Court (Judicial Precedent), through individual contracts and in the form of linked services. In addition, the number of private operators who create new businesses by utilizing public resources increased. Services provided by them included patent information services, auction information services, statistical information services, and weather information services.

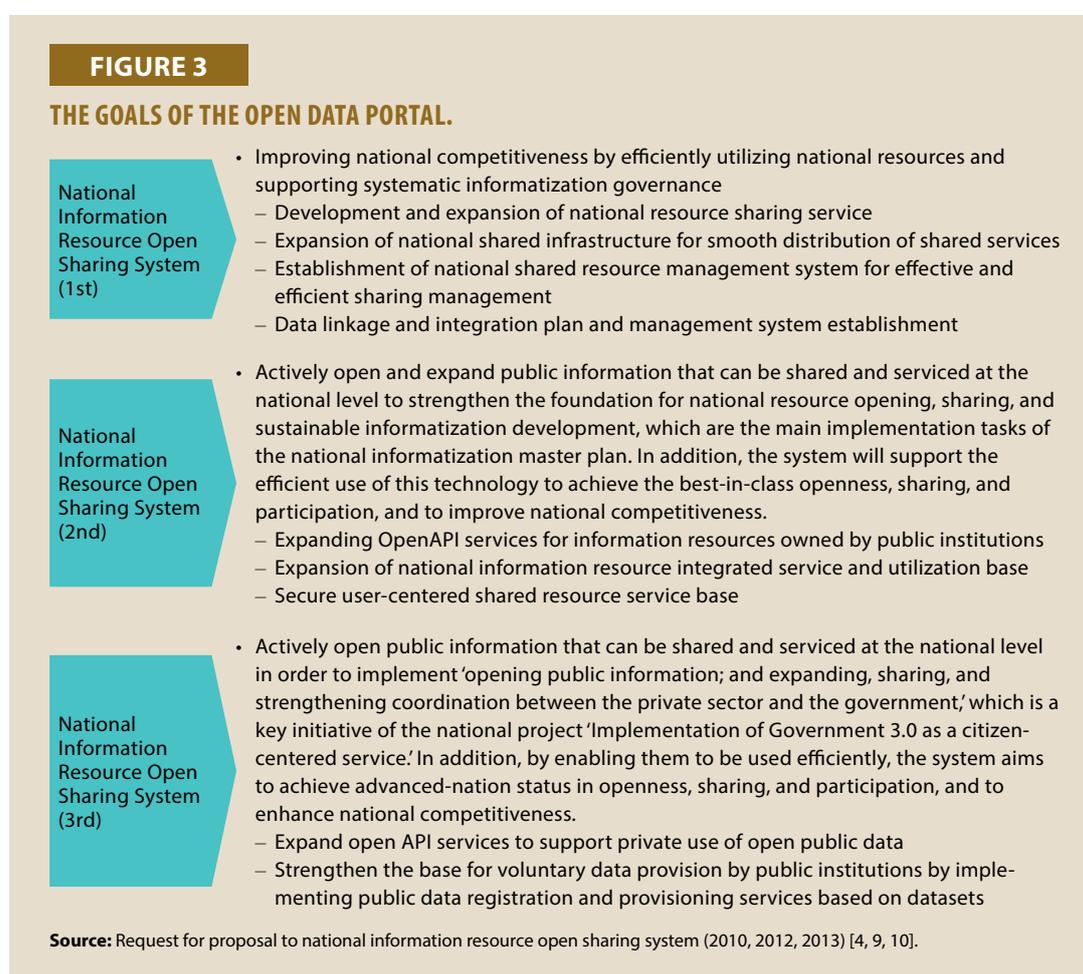
This did not mean that open and shared national resources were not achieved at all. Rather, these resources were sporadically promoted by domain and purpose in a limited way. Efforts to collect and distribute multi-agency information, such as the National Knowledge Portal, for joint use of administrative information; and the National Disaster Center and the National Traffic Information Center, for individual purposes existed. In one example, the National Statistical Office established

a national statistics portal (kosis.kr) to categorize statistical information on central administration, municipalities, finance, and public institutions by subject, institution, and name for public access.

### Goals/Objectives

The goal of the open data portal, as shown on the website of the Ministry of the Interior and Safety (MOIS), is to (1) open and provide public data held and managed by central governments, local governments, and public institutions in various forms so that the public can freely use it; and (2) support them to create socio-economic added value. [8]

Figure 3 illustrates the goals of the open data portal. These goals are expressed in various forms in the initial project for portal construction as discussed below. They are briefly summarized as (1) actively open information that can be shared at the national level; (2) support the public and private organizations to utilize the open information well; and (3) contribute to the formation of socioeconomic added value of the private sector, and to improve national competitiveness.



### Strategies

The ROK has established various strategies to realize the goal of open data. These strategies were planned in detail and performed sequentially by period through the first Open Data Master Plan [11] announced in December 2013 and the second Open Data Master Plan [12] announced in December 2016. The strategies established in the two master plans will be examined and analyzed in detail. These strategies are summarized in Table 4.

**TABLE 3**

**STRATEGIES FOR THE OPEN DATA PORTAL.**

	1st Open Data Master Plan (2014–16)		2nd Open Data Master Plan (2017–19)	
Policy stage	Initiation, stabilization		Expansion, development	
Role	Private sector	Beneficiary	Private sector	Partner
	Public sector	Provider	Public sector	Enabler
Strategy	<ul style="list-style-type: none"> <li>Quantitative expansion and individual business support</li> <li>Enhancing citizen awareness on data release and usage</li> <li>Establishment of a data provisioning service framework for each institution</li> </ul>		<ul style="list-style-type: none"> <li>Qualitative improvement and supporting industrial ecosystem growth</li> <li>Expansion of citizen engagement and data usage in everyday life</li> <li>Establishment of data-driven platform for government and public-private governance</li> </ul>	

Source: 2<sup>nd</sup> Open Data Master Plan [12].

**From Quantitative Expansion to Qualitative Improvement**

The public data opening in the first master plan focused on quantitative expansion and aimed to open it in stages at the government level. The goal was to increase the opening rate from only 16% in 2013 to 60% by 2016. This was to be done by identifying selective open areas through deidentification of personal information to secure third-party rights and encourage early opening by departments. In addition, the first master plan established a strategy to focus on openness by selecting 15 top priority strategic areas of openness that would have a large industrial ripple effect of opening public data. These 15 strategic areas were meteorology, transportation, land, food and drug, agriculture and livestock, culture and tourism, public policy, procurement, science and technology, environment, employment and labor, disaster safety, patents, maritime and fisheries, and health and welfare.

The second master plan focused on qualitative advancement in opening data. First, a large-capacity public data that was easy to converge and combine with private data, was opened. Examples cases of private-public data convergence are in areas of energy information, used car information, precision medical information, and auction information.

In addition, according to the technological innovations (e.g., IoT and big data), a new public data type required by businesses was selected and a strategy was established to open it by sector.

**From Individual Business Support to Industrial Growth Support**

In the first master plan, for supporting individual companies, a strategy was established to connect public data opening and business creation through the establishment of a cooperative network of data-holding organizations, supporting institutions (governmental councils), and the private sector. For customized support of each lifecycle of a company, infrastructure and consultation were provided to companies preparing to start up. One-stop customized comprehensive information for each growth stage was provided to these companies. In addition, during the stabilization period after the start-up, support for pioneering, market entry, and publicity for companies using public data was provided.

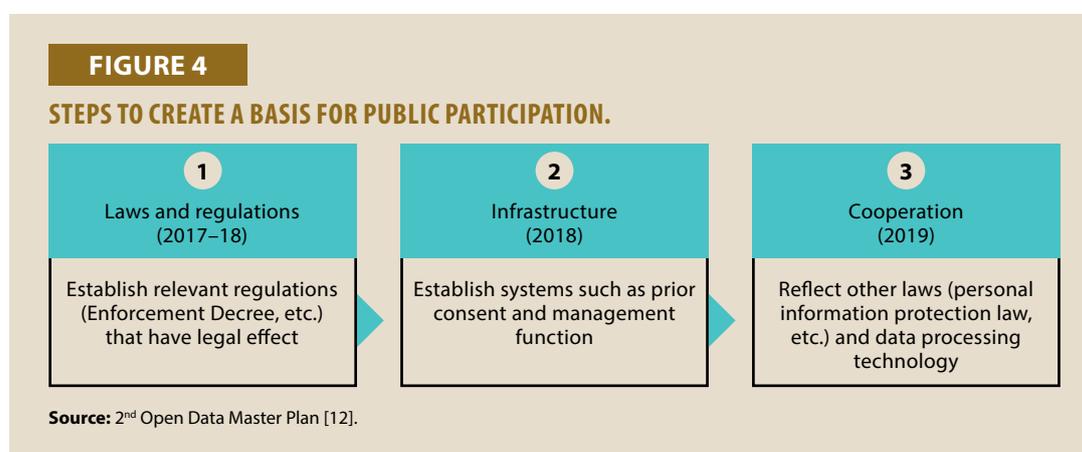
In the second master plan, the establishment of a data-using ecosystem to foster new industries was established as a strategy. A public-data-opening plan was established for new industries where high growth was expected. Also, pilot projects for companies that could serve as prime points for the use

of public data were discovered and promoted. In order to build a partnership for sustainable development and coexistence, a council for each industry group was formed and operated, based on public-private sector cooperation and industry-academia-research collaboration, among others.

#### From Citizen Awareness to Citizen Engagement in Data Usage

In the first master plan, to raise public awareness, in addition to the individual publicity of each department, local government, and public institution, promotion of comprehensive public-data opening and utilization through inter-agency cooperation was strengthened. It established a strategy to cooperate with private portals and mobile communication companies to execute online campaigns for promoting the use of public data. In addition, it promoted development of educational content using public data and reflecting it in curriculums.

In the second master plan, in order to expand the participation of people, open data aimed to create a basis for citizen participation and decision-making so that people themselves could exercise the right to open data. Figure 4 highlights the steps in achieving public participation in the open-data initiative.



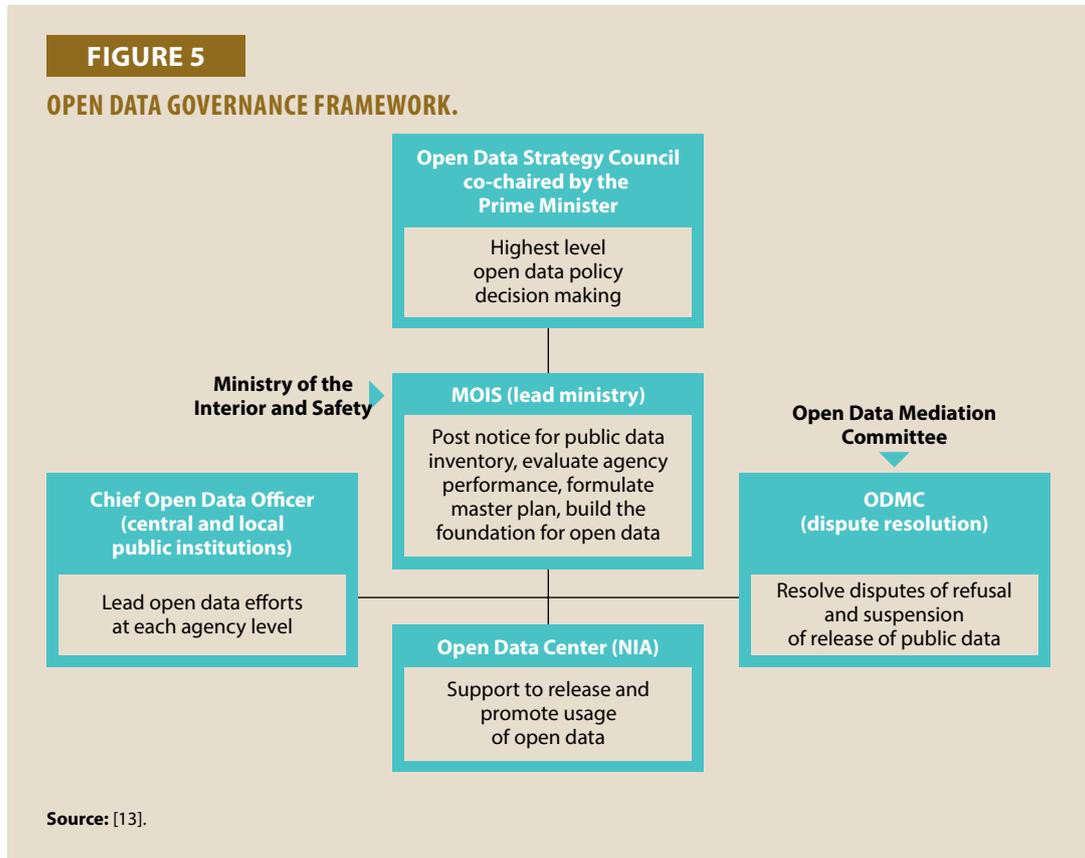
#### From Data-provisioning Framework to Data-driven Platform

In the first master plan, considering the private demand and the opening effect, organizations established and promoted the opening plan itself, but public institutions selected core public data with a high ripple effect to promote the opening. Also, in order to improve the reliability and ease of use of public data, a strategy was established to provide data to the public by converting it into an open-standard type, and to provide real-time data with high private demand in the form of an open API. In addition, for efficient opening of public data, a data-provisioning officer was designated for each institution. A system was established to build and operate a collaborative network with other ministries.

In the second master plan, for the purpose of establishing unified governance for integrated public data at the national level, the reorganization of public-data governance, which had been established through existing institutional collaboration, was brought together at the national level as an integrating system. The three areas of integrated management were (1) data creation; (2) cloud-based management; and (3) single-window provisioning.

In order to establish a public-private partnership through joint use of private data and services, a foundation was established. In this foundation, various institutions can jointly purchase and use large amounts of data collected, accumulated, and analyzed by private companies, including

financial, communication, and sales information. In addition, it sought to introduce and utilize excellent private services, technologies, and human resources in the public domain, such as consolidating public-private data, creating an industrial ecosystem, and establishing a formal organization to strengthen public-private partnerships such as purchasing excellent private resources.



### Governance

Figure 5 illustrates the open-data governance framework. The components of this governance are

1. Open Data Strategy Council (cochaired by the Prime Minister)
  - Comprehensive deliberation, coordination, and inspection of public-data openness and utilization
  - Coordination of policies and disagreements between public data open organizations
2. Ministry of the Interior and Safety (lead ministry)
  - Main public data opening department
  - Establishment and promotion of open public-data policy
  - Legal system maintenance
  - Establishment of master plans

3. Open Data Center (NIA)
  - Supports efficient provisioning and usage activation of public data
4. Chief Open Data Officer (central and local public institutions)
  - As the head of each institution, the chief open data officer oversees public data provisioning and usage activation
5. Open Data Mediation Committee (dispute resolution)
  - Resolves public data denial or disruption

### Resources

**Funding:** Since it is difficult to examine all government budgets and investments related to public data openness, this report seeks to summarize the budgets spent on major national projects related to public data openness. This is highlighted in Table 4.

As shown in Table 4, the government has invested more than KRW23 billion (USD19 million) over 10 years during 2010–19 to build open data portal and infrastructure. Through this, shared services for public data were developed. It serves as a basis for efficiently managing and releasing public data, and has made it possible to promote various public institutions, local governments, and the public.

**Human resources:** In order to estimate the exact human-resource input, it is necessary to investigate the human-resource input to all the projects mentioned in Table 4. However, since this is undisclosed data, this section is dedicated to the personnel input from the government’s point of view, especially the dedicated institution of Open Data Center, as mentioned in the ‘Governance’ section, rather than as the private-personnel input into the project.

The Open Data Center is a working organization dedicated to supporting public institutions to open data and promote its private use. It was established to expand the opening of high-quality public data at the point of contact between the public and the private sector, based on the expertise and competence in creating, opening, and using public data. This Open Data Center establishment also played a role in comprehensively supporting the creative use of the private sector. These roles are highlighted in Figure 6.

The organization is divided into planning, opening, utilization, and quality, and performs multiple roles. The organization chart is as given in Figure 7, while the main activities are listed in Figure 8.

### Activities

1. **Creating a legal basis:** Enactment, promulgation, implementation, and expansion of open-data law; public data management guidelines; open data publishing standards; etc.
2. **Creating a policy basis:** Establishment and implementation of 1st and 2nd open-data master plans, plan for promoting private information for public use, plan to activate private provisioning of public information, national core data plan, strategy for releasing key national data, open-data analysis model, quality evaluation plan, public-data implementation plan, plan for the maintenance of private similar duplicate services, and open-data innovation strategy.

**TABLE 4**

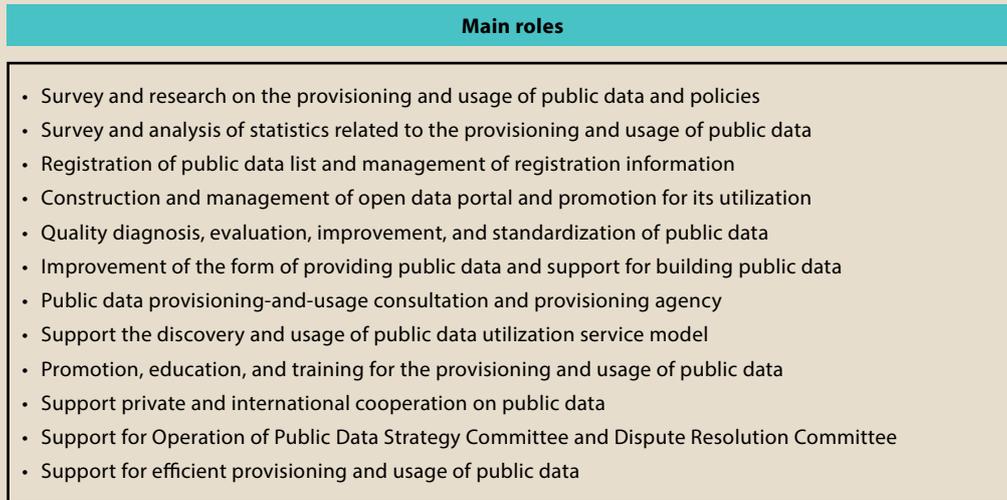
**LIST OF MAJOR PUBLIC DATA OPEN PROJECTS.**

Project	Year	Project Scope	Budget (KRW)
National Information Resource Open Sharing System (1st)	2010	<ul style="list-style-type: none"> <li>• Development of national resource sharing service that can be converged (three types)</li> <li>• Establishment of national shared resource management system</li> <li>• Establishment of national shared resource registered storage</li> <li>• Establishment of government service relay base</li> <li>• Establishment of integrated government information portal management portal</li> <li>• Establishment of data linkage and integration</li> </ul>	7,258,000,000
National Information Resource Open Sharing System (2nd)	2012	<ul style="list-style-type: none"> <li>• Development of 10 kinds of shared services</li> <li>• Enhancement of the National Shared Resources Portal, including expansion and integration of national shared resources</li> </ul>	4,073,000,000
National Information Resource Open Sharing System (3rd)	2013	<ul style="list-style-type: none"> <li>• Development of 25 kinds of real-time public data and registration of shared resource portal</li> <li>• Open platform service for standardized public data provision</li> <li>• Establishment of public data open API standard system and development direction</li> </ul>	4,390,000,000
Public Data Opening, Sharing and Utilization System Development Project	2014	<ul style="list-style-type: none"> <li>• Development of 25 kinds of real-time public data open API</li> <li>• (Common infrastructure expansion) list maintenance, operation, and portal service improvement</li> </ul>	4,240,000,000
Development of public data opening, utilization, and management system	2015	<ul style="list-style-type: none"> <li>• Public data open API development (nine types) and linkage system improvement</li> <li>• (Common infrastructure expansion) list management system and portal service expansion</li> </ul>	2,692,000,000
Open data portal (data.go.kr) service operation improvement project	2015	<ul style="list-style-type: none"> <li>• Open data portal service operation support</li> <li>• Improvement of open data portal service function</li> <li>• Promotion and technical support</li> </ul>	1,031,000,000
2016 public data open API development and linkage system establishment project	2016	<ul style="list-style-type: none"> <li>• Public data open API development and linkage system improvement</li> <li>• (API service common infrastructure) open data portal and list management improvement</li> </ul>	2,441,000,000
Open data portal consignment operation and service operation improvement business (2016~2017)	2016	<ul style="list-style-type: none"> <li>• Open data portal service operation support</li> <li>• Improvement of open data portal service function</li> <li>• Promotion and technical support</li> </ul>	2,270,000,000
Open data portal consignment operation and service operation improvement project (2018)	2018	<ul style="list-style-type: none"> <li>• Open data portal service operation support</li> <li>• Improvement of open data portal service function</li> </ul>	1,332,000,000
Open data portal consignment operation and service operation improvement project (2019)	2019	<ul style="list-style-type: none"> <li>• Service operation management such as open data portal</li> <li>• Open data operation management for open data portal</li> <li>• Open data portal complaint response and technical support</li> <li>• Open data portal content management</li> <li>• Strengthening open data portal services</li> </ul>	1,332,000,000
<b>Total</b>			<b>23,801,000,000</b>

Source: [14].

**FIGURE 6**

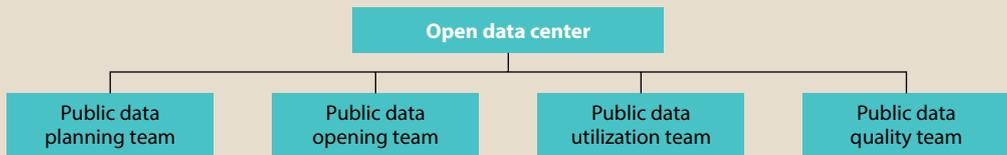
**THE ROLE OF OPEN DATA CENTER.**



Source: Open Data Portal, ROK [3].

**FIGURE 7**

**OPEN DATA CENTER ORGANIZATION CHART.**



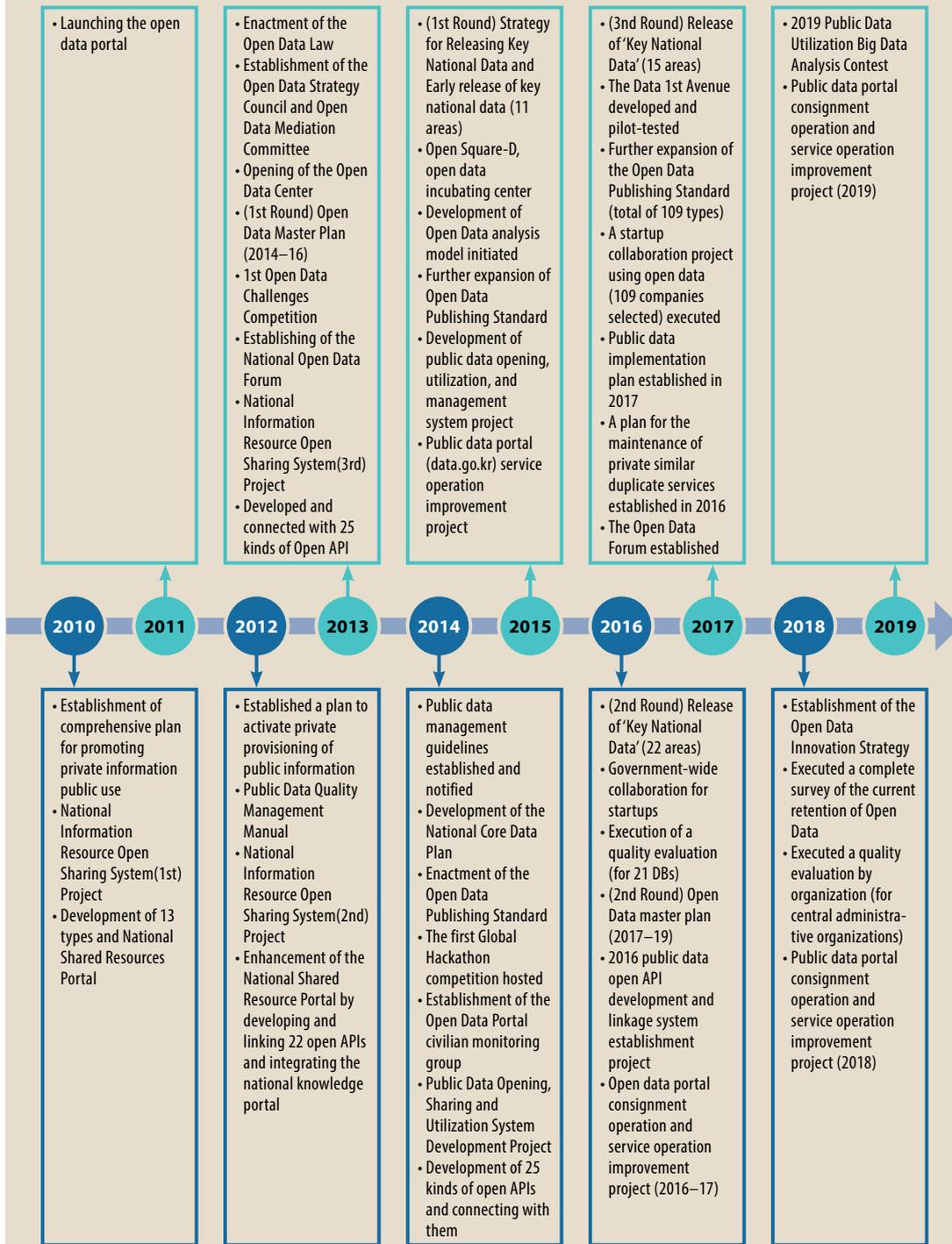
Source: Open Data Portal, ROK [3].

3. **Creating a promotion basis:** (Please refer to the ‘Governance’ section.)
4. **Expansion of public data opening:** Since 2010, Open Data Portal has been established through various projects. Through these projects, public data has been opened and expanded, and quality has been continuously improved.

In addition, in order to enable easy and diverse use of public data in the private sector, high-value and high-demand data with high industrial ripple effects were designated as national key data through national and corporate demand surveys. They were also continuously opened and expanded.

5. **Activation of public data utilization:** This involves the following activities:
  - Provide comprehensive support for public-private innovation startups across all stages of public data usage has been provided through Open Square-D, Pan-government Public Data Utilization Start-up Competition, and Public Data Utilization Start-up Support Collaboration Project.

**FIGURE 8**  
**MAIN ACTIVITIES RELATED TO OPEN DATA.**



Source: [13].

- Discover new big-data-analysis models that can actively respond to social issues and have a high level of public sentiment. Develop a public big-data-standard analysis model that can be used in various fields and institutions and has a large ripple effect.

- Promote public awareness through public big-data education program development and progress, institution-specific consulting promotion, public big data competition, and best practice contest.
6. **Civil society cooperation:** Promote civil-society cooperation and improve user-oriented portal services through the establishment of the National Open Data Forum, Open Data Portal Private Monitoring Group, and Public Data Utilization Forum Group.

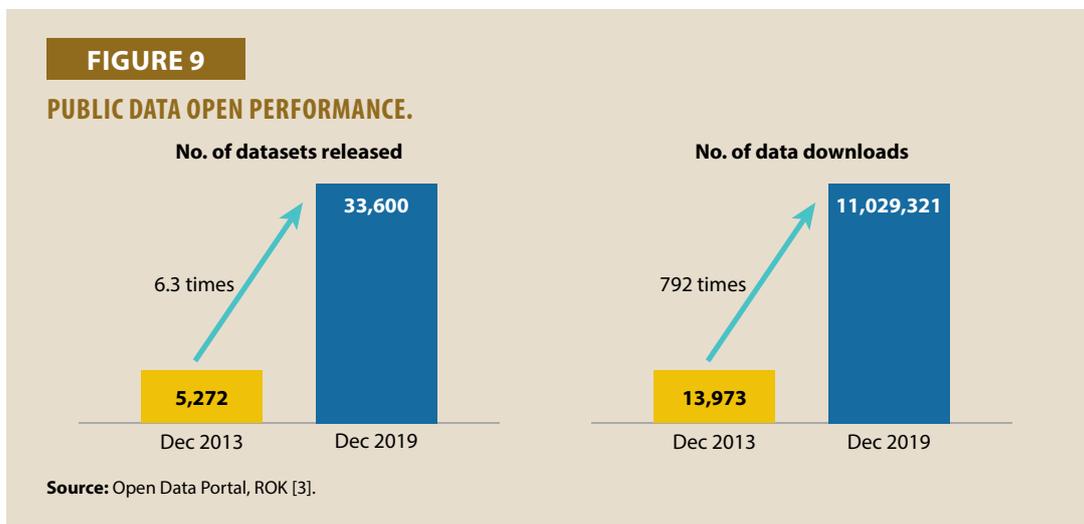
## Outputs

1. Integrated single portal
  - **Data.go.kr:** Open Data Portal was established by integrating resources and services of the existing national knowledge portal. It integrated civil complaint handling functions of the public information utilization support-center site, user utilization guides, and personalization functions.
2. Legal outputs
  - **Open Data Law:** The law guarantees the public's right to use public data by stipulating matters related to the provisioning and management of data provided and managed by public institutions. It also aims to improve the quality of life and contribute to the development of the national economy through the private use of public data.
  - **Open Data Publishing Standard:** It defines common open standards to be applied when opening public data; open standards for each dataset field (provided items, attribute information, type of provision, etc.); and other open-data standards to promote the provisioning and use of public data.
  - **Public data management guidelines:** These provide the management principles and standards to be followed by each institution and business managers for effective implementation of the provisioning policy according to the Public Data Act.
  - **Public Data Quality Management Manual:** A manual is provided for the purpose of presenting ways for public institutions to perform data quality management activities more efficiently.
  - **Public Data Quality Management Level Evaluation Guide:** The guide establishes a quality-management system for each lifecycle through overall evaluation of institutional-quality management activities related to public data collection, creation, operation, and provisioning.
  - **Guidelines for developing and providing public data utilization services by public institutions:** The guidelines have been created to prevent public institutions from using public data to develop services overlapping or similar to those provided by the private sector to prevent the growth of the private market. It includes detailed procedures and judgment criteria related to the review and maintenance of private duplication and similar services.

- **Data Big Bang Project Methodology:** It provides standard procedures and management templates for each stage to prevent work-related confusion among stakeholders in advance when performing large-scale projects and to achieve more results with limited resources.
- **Standard Analysis Model Manual:** Among the established analysis models, models with high demand from ministries and local governments and commonly applied are selected as standard analysis models.

**Outcomes**

1. **Disclosure:** By the end of December 2019, the number of public-data openings provided through portals increased 6.3 times compared to 5,272 at the end of 2013. Private-data utilization (downloads and open API applications) increased a massive 792 times. This is illustrated in Figure 9.

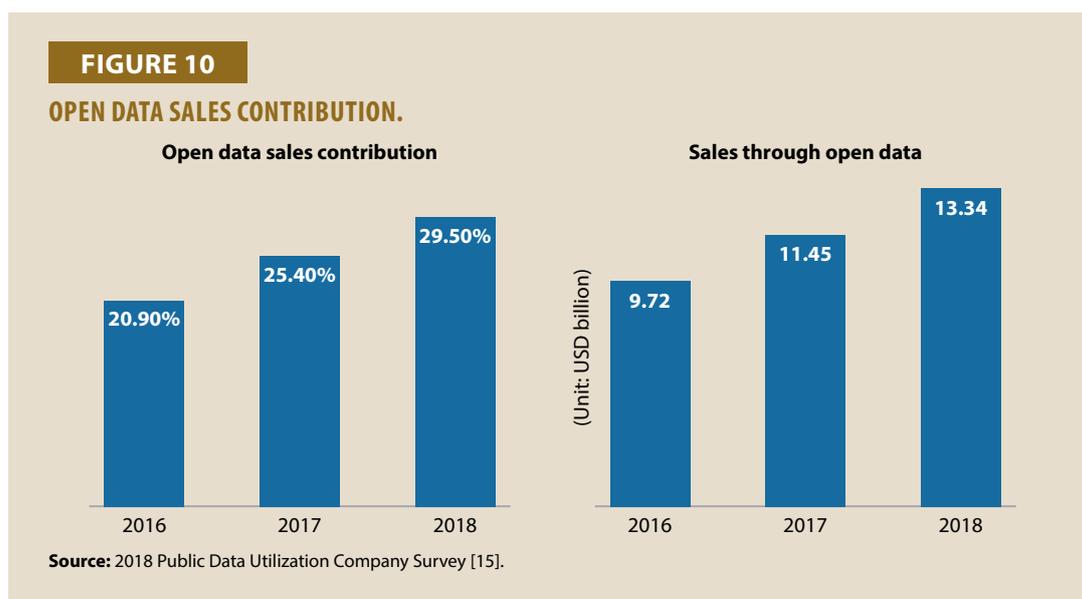


2. **Application:** Disclosed national core data are used in a number of ways. Examples include development of new business models, planning of new products, and improvement of productivity.

Sales contribution of services and products using public data had increased annually to 20.9% (2016), 25.4% (2017), and 29.5% (2018), indicating that public data continues to contribute to business sales. Also, sales of services and products using public data had grown steadily to USD9.72 billion (2016), USD11.45 billion (2017), and USD13.34 billion (2018) [15], as shown in Figure 10.

3. **Startups:** Through ‘Open Square-D,’ various programs such as training for each business startup; customized consulting; investment attraction; and networking were provided (Open Square-D is a space that provides comprehensive support for people with creative ideas for public data to exchange experiences and technologies and grow to commercialization and startup levels.)

Through the start-up competition using public data held every year since 2013, support is provided for discovering excellent start-up ideas.



Through the start-up collaboration project launched in 2017, the public and private sector have collaborated to systematically support start-ups from idea discovery to commercialization.

### Beneficiaries

1. **Public institutions:** Compared with the private sector or corporations, the emphasis was placed on promoting openness and managing data quality rather than on its utilization. Nevertheless, the use of public institutions was promoted by providing appropriate prizes and awards through public big-data best practice contests. Other organizations were encouraged to obtain ideas through promotion of best practices. Table 5 lists these best practices on big-data utilization.
2. **Private companies:** As mentioned in the ‘Activities’ section earlier, public data use happens through Open Square-D, entrepreneurship competitions, and startup support collaboration projects, among others. Public data could contribute to private companies’ entrepreneurship and corporate activities in many ways.

According to a survey of public-data-utilization companies conducted in 2018, 803 companies, or 53.1% of the total 1,511 participating companies, were using public data. It was surveyed that public data were being used for various business purposes including service or product development and improvement, as well as internal usage such as internal management or marketing. [15]

3. **Citizens:** Through the national and corporate demand survey, high-value and high-demand data with high industrial ripple effects were selected as national key data and opened.

Data 1st Avenue, a data communication window through which the public can freely request public data, was operated through the open data portal.

Also, as mentioned in the ‘Activities’ section earlier, by promoting public awareness and awareness-raising activities, including educational programs, consulting, and competitions, everyone could easily access and use public data.

**TABLE 5**

**BEST PRACTICES ON BIG-DATA UTILIZATION (UTILIZATION BY THE GOVERNMENT).**

Classification	Field	Model name
Public safety	Disaster safety	Model to optimize the allocation and operation of ambulances to ensure a response within the 'golden time' (Jeollabuk-do)
	Public safety	Analysis of CCTV zones and model upgrades (Gyeonggi-do)
	National security	Reinforcement of public security using scientific measures, e.g., artificial intelligence (National Police Agency, National Information Resources Service)
Improvement in the living of people	Healthcare, medical treatment	National health alert service (National Health Insurance Service)
	Land transportation	Efficient operation of intracity buses based on analysis of big data (Gwangju Metropolitan City)
	Urban environment	Selection of installation sites for electric vehicle charging infrastructure (Daegu Metropolitan City)
Economic stimulation	Healthcare, welfare	Job creation and self-reliance support for potentially vulnerable social groups (Namyangju-si, National Pension Service)
	Culture tourism	Economic stimulation through tourism sector analysis of the Jeonju Hanok village area (Jeonju-si)
	Weather, environment, agriculture	Analysis of culture/tourism festivals using big data (Korea Tourism Organization)
Smart administration	Employment Labor	Scientific approach to selecting places of business for labor inspections (Ministry of Employment and Labor)
	Land Housing	Analysis of big data on management expenses of multi-family housing (Gyeonggi-do, Ministry of Land, Infrastructure and Transport)
	Urban Safety	Development and application of a real-time detection system for road pavement damages using artificial intelligence (deep learning) technology (Korea Expressway Corporation ICT Center)
	Public Administration	Conflict resolution through analysis of civil complaints (Pohang-si)

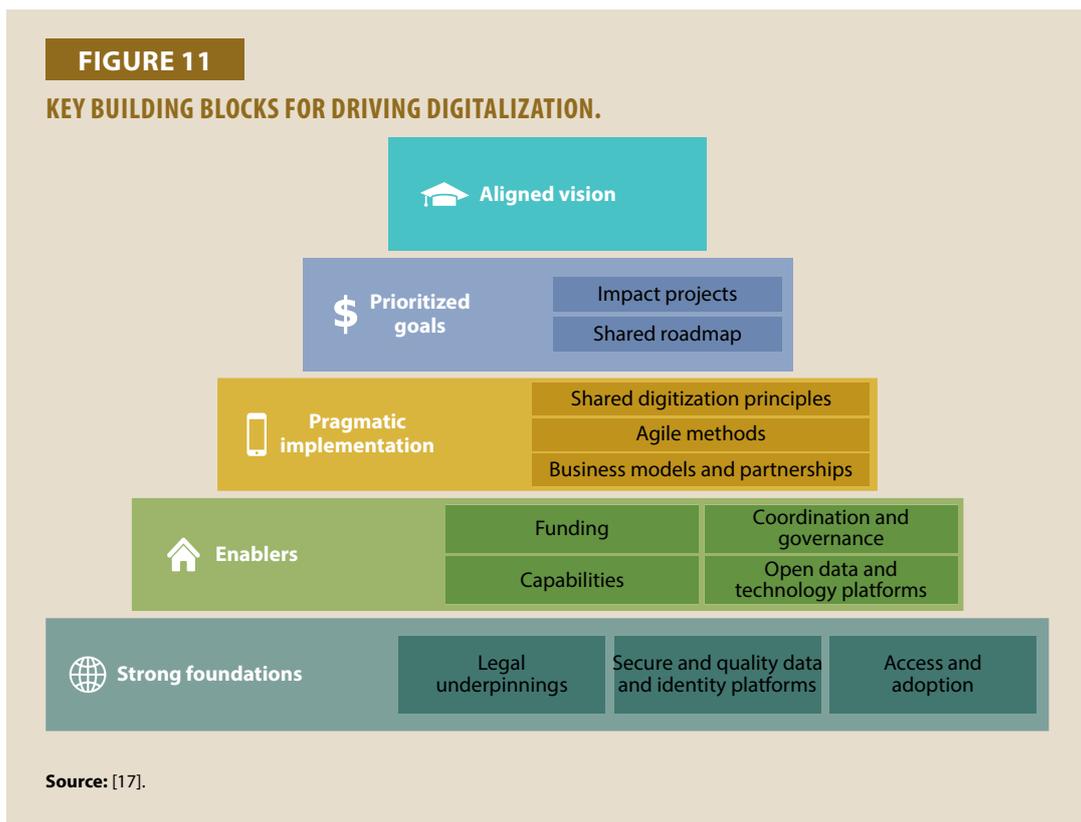
Source: Public Data Policy 5 Years Progress Leaflet [16].

### Case Analysis of Success Factors

The case analysis of the critical success factors for digitalization of government service follows the Arthur D. Little model in Figure 11.

#### Aligned Vision

The opening of public data has not been envisioned as a simple individual project. It has been promoted as a part of “opening and sharing national resources with creative soft power and strengthening the foundation for sustainable informatization,” which is the main implementation task of the National Informatization Master Plan since 2010. Looking at the contents reflected in the basic plan for national informatization, it can be seen that it not only includes specific contents such as opening, sharing, and collaborative initiatives of national information resources; establishing a service-oriented opening, sharing, and collaboration foundation; and activating private use of public information; but also promoting complex areas rather than single tasks. As



such, it can be seen that the opening of public data has been promoted as an important axis of national informatization and has been continuously pursued with strong policy support.

**Prioritized Goals**

As previously mentioned in the ‘Strategies’ and ‘Activities’ sections, the ROK government has developed various plans to establish a clear vision and strategy for opening public data.

Based on the Open Data Master Plan, which has been refreshed every three years, a public-data implementation plan has been established every year. In addition, open-public-data development strategies and quality-management promotion plans have been established. What is important here is that each strategy or plan was not established individually. Rather, each proceeded in a manner that deals with details within the framework of the master plan and the implementation plan.

In particular, the Open Data Master Plan provides a clear direction to related stakeholders because the vision, goals, strategies, and tasks are systematically aligned. This alignment can be observed in Table 6.

**Pragmatic Implementation**

**Shared Digitalization Principles**

As discussed in the ‘Output’ section, basic guidelines such as open data publishing standard, public data management guidelines, public data quality management manual, public data quality management level evaluation guide, public institution’s public data utilization service development and provision guidelines, and data big bang project methodology were developed and shared. In particular, the guidelines, for the development and provisioning of public data utilization services by public institutions, advocate the principle that public institutions should not hinder the growth

**TABLE 6**

**OPEN DATA VISION, GOAL, STRATEGIES, AND TASKS.**

Classification	1st Open Data Master Plan	2nd Open Data Master Plan
Vision	Build government 3.0 and data-driven creative economy	Digital society where citizens and businesses prosper with data
Goal	<ul style="list-style-type: none"> <li>• Spread personalized services using public data</li> <li>• Create new creative industries and jobs based on public data</li> </ul>	<ul style="list-style-type: none"> <li>• Create new added value through expansion of data-focused industrial ecosystem</li> <li>• Make citizens better off through increased use of data in everyday life</li> </ul>
Strategy	<ul style="list-style-type: none"> <li>• Quantitative expansion and individual business support</li> <li>• Raising citizen awareness on data release and use</li> <li>• Establishment of a data provisioning service framework for each institution</li> </ul>	<ul style="list-style-type: none"> <li>• Qualitative improvement and supporting industrial ecosystem growth</li> <li>• Expansion of citizen engagement and data use in everyday life</li> <li>• Establishment of data-driven platform for government and public-private governance</li> </ul>
Task	<ul style="list-style-type: none"> <li>• Increase public data centered on consumer                             <ul style="list-style-type: none"> <li>– Open the data in entirety in stages at the government level</li> <li>– Open the primary 15 selected open strategic areas</li> <li>– Promote opening by institution</li> <li>– Customized opening focused on real users</li> <li>– Open around the national agenda</li> </ul> </li> <li>• Expand the foundation for public data opening and utilization                             <ul style="list-style-type: none"> <li>– Establish public data management system</li> <li>– Expand public data production and improve quality</li> <li>– Expand public data open infrastructure</li> <li>– Standardize public data and develop skills</li> <li>– Support big data analysis using public data</li> </ul> </li> <li>• Create a public data industry ecosystem                             <ul style="list-style-type: none"> <li>– Establish and operate a nationwide support system</li> <li>– Create initial public data market</li> <li>– Customize support by company lifecycle</li> <li>– Establish foundation for revitalization of public data industry</li> </ul> </li> <li>• Continuously secure the capability to drive enhancement                             <ul style="list-style-type: none"> <li>– Establish the foundation of public data opening law and system</li> <li>– Strengthen public data public relations</li> <li>– Promote international cooperation on public data</li> <li>– Strengthen the capacity of the Open Data Center</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>1-1 Expand release of converged and intelligent high-quality data</li> <li>1-2 Establish an ecosystem for data use to nurture new industries</li> <li>1-3 Build foundation for data distribution and transaction</li> <li>1-4 Increase support for businesses using open data to enter overseas markets</li> <li>2-1 Establish foundation for citizen engagement in open data provisioning and usage</li> <li>2-2 Reinforce data use for solving social issues</li> <li>2-3 Improve capabilities of all citizens to use open data</li> <li>3-1 Develop an open data management framework based on ‘One Gov’ approach</li> <li>3-2 Establish public-private collaboration framework for expanded sharing of private data and services</li> <li>3-3 Improve lifecycle-based quality management of open data</li> <li>3-4 Reinforce performance management of government-wide open data</li> <li>3-5 Expand global open data partnership</li> </ul>

Source: Public Data Policy 5 Years Progress Leaflet [16].

of the private market by using public data to develop services that overlap or are similar to those provided by the private sector. In addition, the Data Big Bang project methodology, which systematically promotes the project, establishes a system for opening consumer-centered public

data at the national level by providing practitioners with basic knowledge and practical guides to promote the project.

### Enablers

No matter how clear the vision and goals are, or how well a good organization can carry out a well-crafted strategy, without a budget to build and continue to operate the system, it does not matter how good the system is, because it will be outdated or fail to meet user needs.

As discussed in the earlier ‘Funding’ section, the government was able to continuously adapt the state-of-the-art system to meet the needs of users and develop the latest technology by continuously injecting funds for operation, promotion, and technological support as well as construction since the beginning of 2010 till date.

### Coordination and Governance

As described in the ‘Governance’ section, public-data-opening policies and strategies have been established and implemented from a government-wide perspective by the Open Data Strategy Council, Ministry of the Interior and Safety (MOIS), and Open Data Center. The roles and responsibilities of each institution are clearly specified in the ‘Act on Providing and Utilizing Public Data,’ which is the basis for actively carrying out open public data.

The Open Data Strategy Council is an organization created by the Prime Minister to deliberate upon and coordinate the government’s major policies and plans for public data and to examine and evaluate its progress. The Prime Minister and a person designated by the President are appointed as cochair. Any person prescribed by Presidential Decree, from among the heads of the central administrative agencies, the heads of local governments, and the heads of public institutions, will be appointed as a member. In addition, the Prime Minister can appoint a person with expertise and experience in the provisioning and usage of public data. Through these functions, it could be said that both the driving force and the ability to work to open public data are fulfilled.

MOIS, the government agency responsible for opening public data, is a central administrative agency that oversees the affairs related to government functions and local autonomy. It is leading not only the opening of public data, but also e-government and national informatization. For this reason, it is an institution that can faithfully fulfill the role of establishing and promoting public-data policies by effectively fulfilling the role of coordinating and mediating disagreements with each institution and local government.

Lastly, the Open Data Center, established to support the efficient provisioning and use of public data, is conducted by the National Information Society Agency (NIA), which is an institution that serves as a support tower for e-government and national informatization. Therefore, like MOIS, it is a suitable institution to efficiently build and operate a significant national agenda called public-data openness.

### Strong Foundations

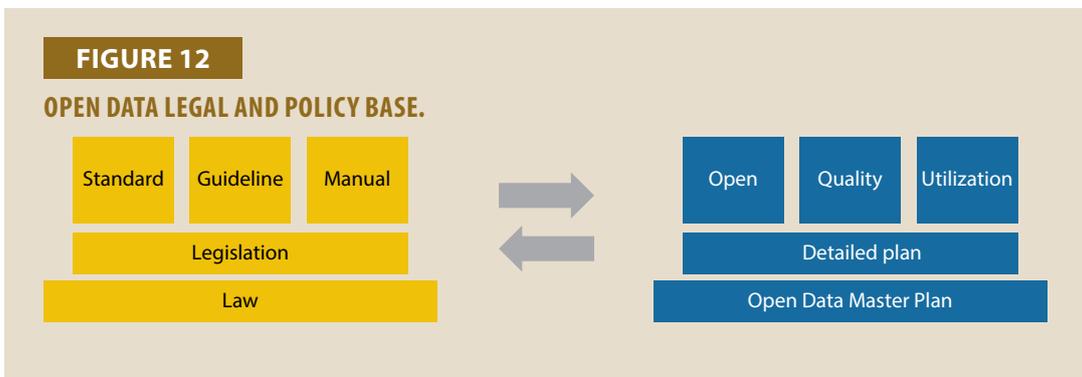
#### Legal Underpinnings

All government tasks and services are the same, but all government-level services such as the Open Data Portal must have a strong legal and institutional foundation. This is because without this foundation, it is difficult to cooperate and collaborate with stakeholders and to secure the justification of service provision, so there are many restrictions that the supervising ministries proceed with.

Accordingly, it is clearly stated in the Act on Provision and Utilization of Public Data that the head of a public institution must provide public data held and managed by the public institution. The Act also states that through the registration of public data lists and the publication of catalog information, the opening of public data is clearly defined to be mandatory, not optional.

In addition, as discussed in the previous section, the law enforcement ordinances, standards, guidelines, and manuals are well equipped for the Open Data Portal so that not only the ministries in charge but also agencies at each level can use the necessary matters when performing the relevant tasks.

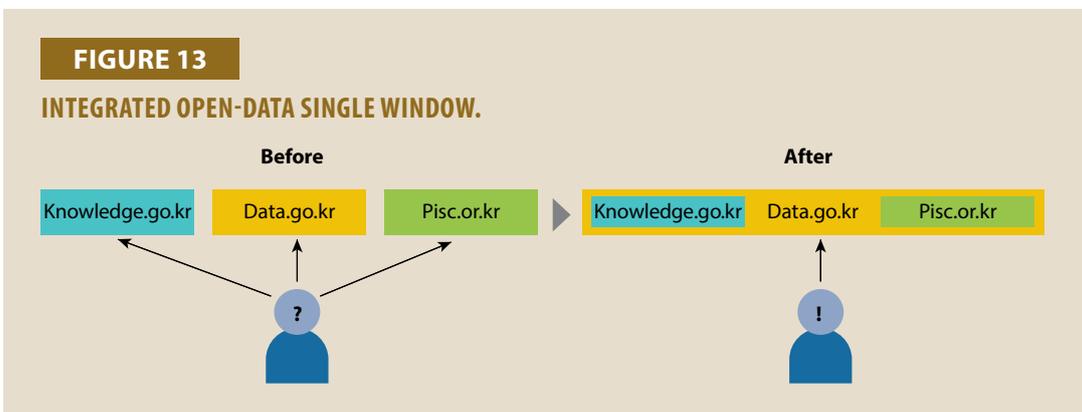
Also, under this legal basis, Master Plan and detailed plans were established in fields of openness, quality management, utilization, and innovation, so that not only providers but also consumers can be aware of the government’s direction and plans in advance and utilize them in business. Figure 12 explains the relationship between laws and policies on open data.



**Access and Adoption**

In case of public portals, there are many portals that provide similar services depending on their functions and purposes. From the perspective of users who do not frequently use public services, the reality is that there is a hassle of finding the services they want. From this point of view, integrating similar sites is essential, and the Open Data Portal can be evaluated as having successfully addressed this part from the initial stage of service.

The existing national knowledge portal and the resources and services of the Open Data Center were integrated into the portal data.go.kr. The integrated single window system improves accessibility and internal operational efficiency of various institutions, companies, and people. Figure 13 demonstrates this integrated single window for open data.



## Lessons Learned and Insights from the Case Analysis

Opening public data is an important national agenda that not only improves the efficiency of internal affairs of the government and increases the quality and quantity of public services, but also ensures transparency. In order to become a truly smart government, the question of “which service to deliver?” should be given priority over “how to deliver the service?” This way, it is possible to understand what the people and businesses really want from the government and why they want it, as the first step to success.

From this point of view, opening public data can be said to return data, which is the new crude oil in the era of the fourth industrial revolution. Open public data can create tremendous added value for the people and businesses and can therefore be said to be an essential area for efficient service delivery.

If one finds the answer to the question “which service to deliver?” then one also needs to find the answer to the question “how to deliver such an important service well?” As with anything, it is a way to increase the chances of success by setting high priorities and persisting in the right direction for important things.

The government has set the opening up of public data as one of its most important national policies and has steadily developed this agenda for more than a decade. Efforts have been made to establish the right vision and strategy on a legal footing, and the agency and implementation staff have been clearly identified to ensure that these plans are implemented. Under such a basis, a proper budget has been allocated to establish and continuously manage the service-delivery system so that users can use it conveniently. Through active publicity, consulting, and collaboration, there has been no shortage in terms of activation. In addition, the government seeks to objectively examine where the service-delivery system is located and whether it is going in the right direction, by studying the evaluation findings of reputable external organizations such as OECD and ODB. The government also scrutinizes how other countries are delivering similar services and attempts to get a better rating for its efforts. The continuous development of services aimed at making the ROK the best in the world in terms of open data will be a good benchmark for countries that plan to build a similar service.

## Acknowledgement

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## CASE STUDY 4

# DIGITALIZING PUBLIC SERVICE DELIVERY, MALAYSIA

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### Abstract

This case study takes its inspiration from The World Bank's recommendation that digitalization should be a whole-of-government approach. It cannot be done in silos [19, 22]. This chapter therefore sketches Malaysia's journey in digitalizing the delivery of public services across the government. It offers a macro perspective of the motivation and processes involved in a digital transformation that has enabled about 90% of public services to be delivered online. Such digitalization has not only kept pace with global trends in the era of fourth industrial revolution, it has also equipped the public service to help Malaysia achieve its vision of becoming a rich and developed nation by 2020.

The study highlights the goals, objectives, strategies, and outcomes of a government-wide digital transformation. It also features the challenges faced in wiring the public service and the initiatives taken to overcome them. From these efforts, the critical success factors required for a successful digital transformation have been documented. One of these factors is a governance structure for executing policies. The study aims to offer deep insights to any government in this gargantuan task of digitalizing the public service.

### Introduction

It was the establishment of the Multimedia Super-corridor (MSC) that gave the government the impetus to adopt electronic government (EG) across the public service. A brainchild of the then prime minister Dr. Mahathir Mohamad, the MSC is a free-trade zone that stretches from Kuala Lumpur, the capital city, to Cyberjaya, the newly built cyber city. Created in 1996 with world-class infrastructure facilities, the MSC seeks to accelerate the pursuit of a digital economy.

Multinational IT companies were first targeted with a host of incentives to locate in the MSC. Their operations there would enhance business opportunities and digital capacities of local companies. Today, the bulk of the information and communications technology (ICT)- and IT-related businesses, both local and foreign, are located in that corridor.

Other events helped accelerate the development of EG. One was the avowed policy to migrate to a 'knowledge economy' to reduce the reliance on a production-based economy. This policy naturally followed the unveiling of the Vision 2020 in 1991, which envisaged the country achieving a developed-nation status by 2020.

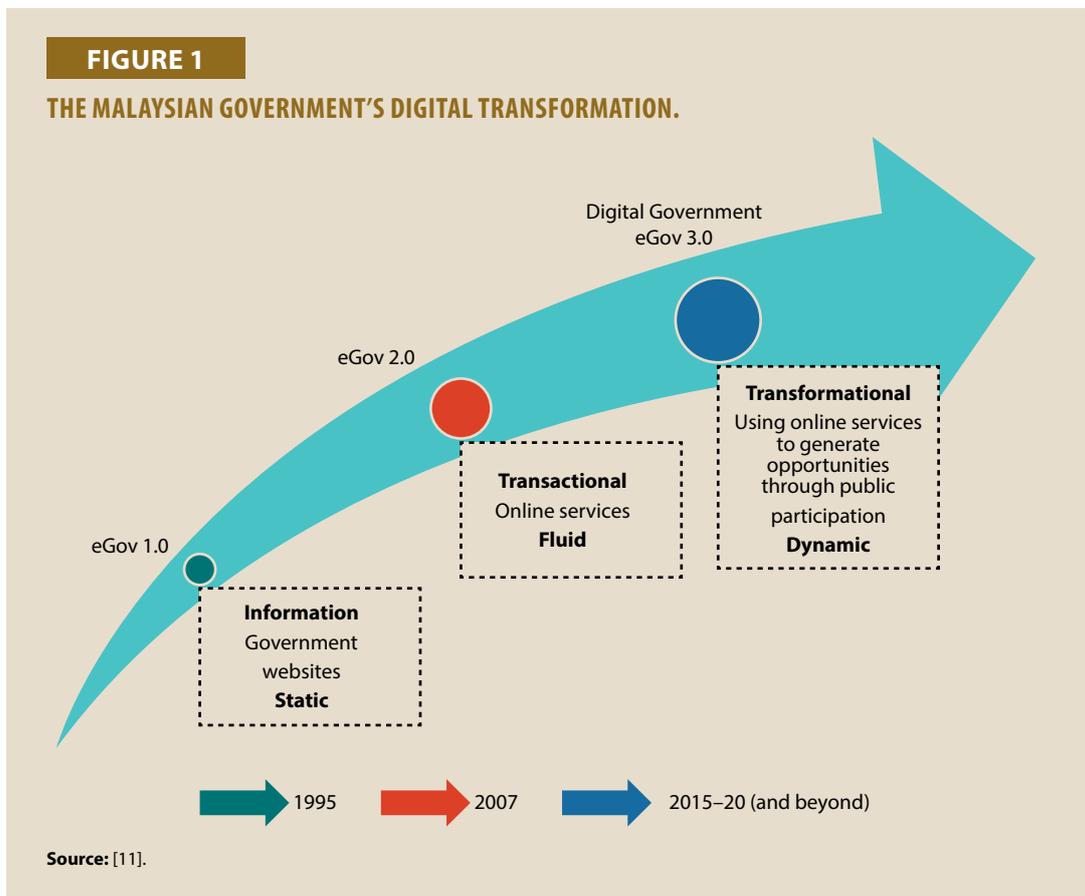
Another set of events comprised the global trends in EG. These inexorable trends inspired the government to increasingly assimilate elements of EG to improve governance and public services and foster national development. The heightened expectation of an increasingly consumerist population for citizen-centric public services undoubtedly precipitated EG [1].

The Malaysian Administrative Modernization and Management Planning Unit (MAMPU) is the prime mover of digital government (DG). Since the launch of DG, MAMPU has developed two formal five-year ICT strategic plans. These plans covered the five-year periods of 2003–10 and 2016–20, respectively. The 10th Malaysia Development Plan (2011–15) highlighted digital strategies in between the two digital strategic plans. Combined, these plans set out the strategies to power public-sector digital transformation.

Additionally, MAMPU also came out with the Digital Government Transformation Action Plan, 2017–18, focusing on three key elements: online services and ICT; big data and open data; and information-sharing services [10].

As part of good governance, MAMPU periodically monitors the development of DG. The performance-evaluation findings are reported in the five-year development plans and their mid-term reviews. The feedback enables the fine-tuning of the implementation of the ICT strategic plan.

Figure 1 illustrates the government’s digital-transformation journey. The government has come a long way from EG to DG, i.e., from the early days of using government websites for providing information to transforming public services through online delivery and public engagement.



## Background

Digital transformation is designed to make the government work better so that it can offer timely and quality public services in a transparent and accountable manner. It promotes the speed and efficiency with which the government works. It determines private-sector productivity, global competitiveness, and its contribution to national prosperity.

Initially, EG initiatives were aimed at improving internal processes and operational efficiencies of public agencies. The bureaucracy gradually became paperless. Online services enabled citizens to access government services anytime, anywhere. EG also sought to improve the flow of information within the government. Increased information flow enhanced evidence-based decision-making. EG also improved the quality and convenience of interactions between the government and businesses and the government and consumers.

EG started off with five pilot projects. These were, generic office environment, e-services, e-procurement, human resource management information system, and project monitoring system [1, 13]. Since then, EG has made the government more transparent and data centric. Increased allocations under successive five-year national development plans have helped build the necessary IT infrastructure in the public sector. This had the salutary effect of accelerating collaboration in information exchange and integration of databases across agencies. Such collaboration enabled faster and more responsive public services. As a result, among other things, it now takes only an hour or so to issue passports [2].

With data sharing, digital platforms, and online services, EG has morphed into DG. This transformation started at the turn of this century. DG eventually plans to integrate the operations of 24 ministries, 722 agencies, and 1,700 licensing bodies. Together, they deliver 13,500 public services [3, 6].

With a number of electronic channels of communication under its belt, DG offers integrated services to citizens, businesses, and other stakeholders. It has fostered increasing productivity in public services, thereby, enhancing national competitiveness and forging new levels of engagement and trust in government [6].

Under DG, the government has pushed for a more inclusive and integrated delivery of public services. For example, the integrated Government Online Services Gateway (also known as the MyGovernment Portal), which was launched in 2017, allows the government to offer 90% of its services online. The other key initiatives in digital delivery of public services include

- E-Procurement (an online procurement system for government agencies, as detailed in the box);
- Jobs Malaysia (an automated labor exchange that links a job applicant with the jobs available);
- E-Services (to make available public services online);
- E-Tanah (or E-land is to ensure convenient and efficient services to citizens on matters relating to land administration);
- E-Courts (to expedite the registration and processing of court cases for speedier dispensation of justice);

- E-Syariah (to upgrade the quality of services offered by Syariah courts);
- E-Sila (to manage the federal-government scholarship program including the progress of federal scholars);
- Human Resource Management Information System (an online portal for personnel management in the public service); and
- UPU (to manage online applications to public universities, polytechnics, community colleges, and public skills-training institutes).

#### **MALAYSIA'S EFFORTS AT E-PROCUREMENT.**

*E-perolehan*, or eP, represents one of the flagship projects of electronic (now digital) government in Malaysia. It refers to “the use of electronic methods in every stage of the purchasing process from identification of requirements through payment, and potentially to contract management.” Aligned with the national agenda of improving public services and promoting increased accountability and transparency, eP aims to improve the public service efficiency and effectiveness in procurement. EP overcomes the problems that beset the traditional and manual procurement process. These issues include inefficient buying, redundant and disconnected processes, nonstrategic sourcing, and maverick purchases. Switching to the electronic model has improved the coordination and management for all purchasing activities.

EP automates procurement processes and makes them faster and easier for businesses to avail government procurement opportunities. The electronic system also enables direct electronic funds transfer for purchases made by the government. All this enables modernization of the procurement system to a more dynamic and strategic one.

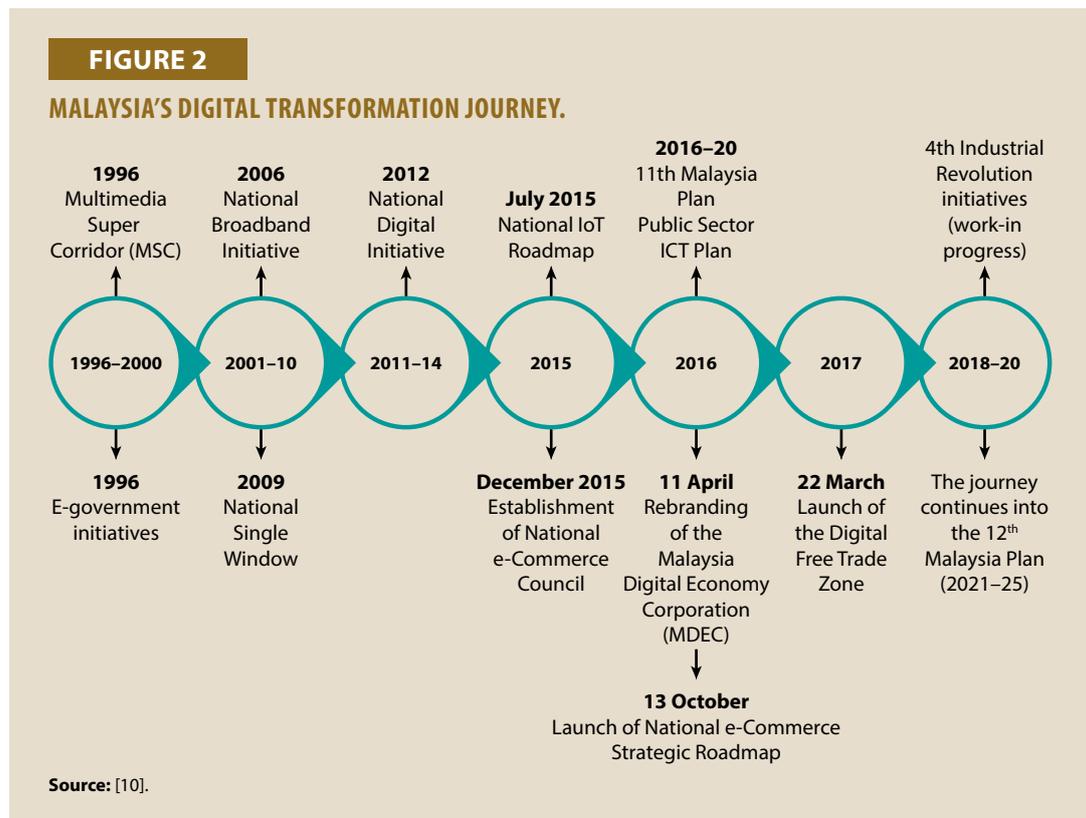
While eP has enabled government agencies to become smart buyers, the benefits derived by businesses are also enormous. Businesses have benefited from an increased level of transparency in the new system as well as from faster and accurate payment through electronic fund transfers. Since its introduction in 1999, the program has seen steady progress. In 2017, the system was used by all ministries. It has over 116,000 registered suppliers, in sharp contrast with the initial tally of 30,000. In 2017, close to 1.4 million e-transactions were conducted over the system.

To ensure that the system functions well, the government has improved its overall digital infrastructure. It has also established an extensive database of some 116,000 suppliers including their respective products and services (e-catalogs). The government has also fostered competencies among suppliers through educational programs and dialogue with suppliers. This has promoted trust and confidence.

Undeniably, eP has increased transparency, communication, and convenience to businesses. Information on purchase tenders and quotations are available to all potential suppliers online, and that has promoted a level-playing field. This has also improved competitiveness among businesses. Given the electronic mode, the system has considerably reduced face-to-face interaction between procurement officers and suppliers, which could otherwise leave give room for unethical and corrupt behavior.

Still, in 2017, only one-fifth of the online services were end-to-end [7]. Steps are therefore afoot to allow more end-to-end online services. Indeed, this is one of the key strategies of the second Public Sector ICT Strategic Plan (2016–20). Initiatives are also targeted at the development of a data-driven government. One initiative in this regard is data.gov.my. This portal enables citizens to publish data and benefit from data-sharing by others. The portal also augurs well for evidence-based decision-making. The platform will go a long way in ensuring accountability and transparency in public services [6].

Figure 2 summarizes Malaysia's overall digital transformation from 1996 to 2018. It provides a timeline of evolution from the days of establishing the MSC in 1996 to the development of a number of infrastructure-related initiatives for a digital economy. This figure also offers a context to the latest ICT strategic plan (2016–20). The progress to a full-fledged DG continues to buttress the development of Malaysia's digital economy.



## Scope and Focus

This case analysis takes a holistic approach in understanding the evolution of the government-wide efforts at DG. Malaysia's experience at DG across the public sector will be especially useful for countries in the Asia-Pacific region who want to benchmark their efforts against a more progressive developing country, more so, as Malaysia has made commendable progress in DG.

Public service in Malaysia has come a long way in its digital journey, from EG in the 1990s to the second ICT plan spanning 2016–20 that spearheads DG. The success has been due to the persistent implementation of the digital-government agenda over the last two decades. Digital planning in Malaysia's five-year development plans has also ensured that the implementation of DG is well-structured and aligned to the needs of the nation. The digital policies implemented over the last 20 years are being built upon, but the journey is not over yet. It continues.

To offer insights to the factors that have determined its progress, the case dissects Malaysia's development in DG on the basis of

- rationale and motivation for DG;
- goals, objectives, and strategies of DG;
- activities undertaken for the implementation of the strategies;
- resources dedicated to the effort;
- factors that have been critical in putting DG on a sustained growth path; and
- lessons that other countries can draw from Malaysia's experience.

### Case Analysis through the Policy Modeling Canvas

The concept of DG in Malaysia encompasses the broad spectrum of initiatives, from EG to a data-centric public service. This section highlights the rationale and progress of DG using the Policy Modeling Canvas. Additionally, the section sketches the goals and objectives, strategies, and outputs and outcomes of the DG implementation.

#### Issues/Problems

The public service has been constantly bombarded with one reform initiative after another since Malaysia's Independence. It has ranged from financial management to performance and human resource management. DG represents another cog, and a significant one, in the wheel of transformation of the public service. It encompasses the full range of digitalization efforts ranging from core digitalization of public services to digital infrastructure, governance, and processes needed to deliver online public services.

Global trends have much to do with this process as well. As IT trends washed ashore, the public service capitalized on them to overcome the cumbersome manual processes of the traditional bureaucracy and improving service delivery.

Big data and analytics too have aided this digital transformation. These enable the prediction of future trends and preferences of citizens. They also offer opportunities for evidence-based policy development and decision-making. Social media has also offered the government a means to diversify access to its services and be agile to citizen needs [5]. The rise of email, search engines, and online forums further empowered citizens to demand better services from the government in terms of speed, affordability, and quality.

Technology was not new to the public sector. Under EG, the public sector had largely exploited IT to automate some of its backroom processes, especially those that related to license and permit issuance. Amidst added societal pressure demanding responsive governance, EG offered a medium to respond to those pressures. EG enhanced government capacity to serve the public better and offer value at an affordable cost [1, 3, 13].

The MSC created a sense of urgency for the adoption of DG. This is because a modern administration is a prerequisite for the success of the MSC in attracting top IT companies [7].

The government too wanted to engage the public and the business community. Many governments across the globe are opening up their data for public information and scrutiny. Making data available online for free allows the government to build social capital with the public. Combining transparency of information with big data and analytics can lead to service efficiency and customization of public services. Such transparency will also provide the public with the requisite information to make an informed assessment of government accountability for the services rendered.

Internally, the public service has the strength to embark on the digital journey. It has competent ICT personnel and good digital governance in terms of the institutional infrastructure and the technology systems and processes.

One-stop access to government services, multiple digital channels to optimize citizen engagement, and data sharing among related agencies are considered as important means to build an effective digital governance. This governance has since been bolstered by the components of the fourth industrial revolution comprising artificial intelligence (AI), robotics, augmented reality (AR), cloud computing, data analytics, digital networks, and the internet of things (IoT).

### Goals and Objectives

Foreseeing the immense potential of DG in improving public services, the government crafted in 1996 a bold long-term goal to effect radical and rapid execution of DG. This contrasted with the previous evolutionary or incremental approach to implementation. The private sector was brought on board to propose innovative solutions in pursuit of the DG vision.

The vision for DG is aligned with the larger national vision. That vision envisages Malaysia becoming a developed nation by 2020. Additionally, the vision for DG is aligned to the five-year development plans that seek to achieve the larger national vision. DG envisions the government, businesses, and citizenry working together to promote the larger good of the community. It also envisages the government becoming ever more citizen-centric and efficient through innovation. As such, the DG's vision is aligned with the larger modernization effort of the public service. Such alignments offer synergies in the execution of DG [1].

The vision of DG has remained essentially the same since its inception. Its alignment with the larger vision and plans of the nation remains unaltered. However, the vision statement has been updated to reflect the growing significance of new technologies, demographic changes, and the high expectations of state-of-the-art service delivery, especially from the younger generation. As such, the latest 2016–20 DG plan envisions an inclusive government that meets the needs of all segments of the population.

Migrating to DG has the beneficial effect of addressing the shortfalls in EG. Accordingly, the first strategic ICT plan (2003–10) sought to achieve the following:

- Improve service delivery through increased customer-interface on the digital platform, data-sharing, and community and agency-specific applications. To enhance data-sharing, a common knowledge-bank would be created.
- Facilitate information sharing and experience by capturing information across agencies.
- Strengthen the ICT governance framework to improve the implementation of ICT programs. This framework was to include leadership and policy development to encourage

the use of digital transactions. The governance structure would also include standards enhancement, and the development of ICT skills and culture in the public service.

- Increase cohesiveness among back-office functions through greater integration of internal processes by enterprise-wide applications.

These objectives were furthered in the second DG plan (2016–20). Specifically, the second plan seeks to achieve the following:

- Support government efforts in realizing Vision 2020.
- Make MAMPU an effective overall planner, coordinator, developer, and promoter of DG.
- Ensure high impact from investments in DG through a structured and well-crafted implementation.
- Transform administrative and service-delivery processes through innovation, cutting-edge technologies, and process reengineering to promote quality and affordable public services.
- Enhance good governance in public services and a whole-of-government approach for the better provision of value to citizens and businesses through integration of end-to-end services and enhance trust in the government. This will involve aligning the implementation strategies of agencies with the public-sector ICT agenda.
- Expand information channels for greater data sharing and collaboration among government, citizens, and businesses for the people's wellbeing.
- Develop appropriate capacity in the public service, including skills enhancement and adoption of best practices for reliable, secure, and green digital services [6].

Figure 3 offers a combined snapshot of the strategic thrusts and strategies of these two digital plans. These plans have sought to strengthen digital transformation in government based on the UN's thematic areas, i.e., whole-of-government approach in service delivery, open government data, bridging the digital divide, providing multi-channels for service delivery, and e-participation. The transformation will involve setting standards in digital public service delivery to end users and the establishment of a governance mechanism to ensure its proper execution [8].

### Strategic Thrusts and Strategies

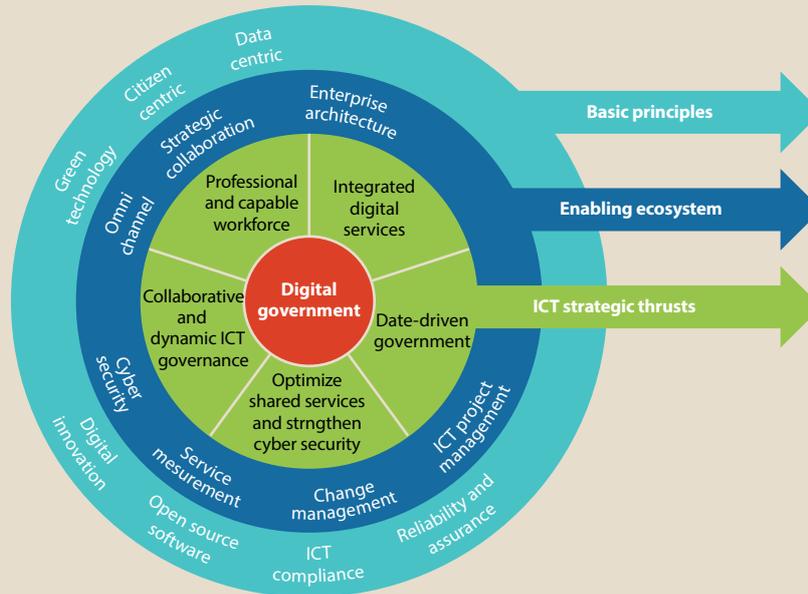
This section highlights the key strategic thrusts that have been crafted to achieve the goals and objectives of the Second Public Sector Strategic Plan (2016–20). Encompassing five strategic thrusts, 12 strategies, and 30 programs within an enabling ecosystem, the plan is a key document to ensure the migration of the public service to an all-inclusive digital government.

As Figure 3 highlights, the five strategic thrusts and their respective strategies to achieve the goals and objectives of DG are as follows:

1. **Integrated citizen-centric digital services to provide inclusive and quality end-to-end digital services.** The strategies to realize this strategic thrust are

FIGURE 3

## STRATEGIC THRUSTS AND STRATEGIES OF DIGITAL GOVERNMENT.



Source: [6].

- strengthening the one-stop digital-services gateway as a single-entry point by incorporating citizen-centric and feature-rich designs, such as life events of citizens;
  - expanding the access to digital services including cashless digital services; and
  - conducting campaigns to encourage greater citizen engagement and participation.
2. **Data-driven government for a holistic and efficient management of data and strengthening inter-agency data sharing.** Among the strategies are
    - accelerating the implementation of the open-data and big-data initiatives through good-data governance; and
    - establishing a hub for sharing and managing data.
  3. **Optimized shared services and strengthened cybersecurity.** The objective of this strategic thrust is to increase the sharing of ICT resources through a centralized structure. At the same time, this thrust seeks to enhance the security and trust in digital services. Strategies to realize this thrust include
    - strengthening of the public service ICT infrastructure through increased cloud services and data centers (additionally, 1Gov\*Net network services will be expanded even as public-agency networks are strengthened); and
    - strengthening public-sector cybersecurity as per the security guidelines.

(1Gov\*Net is a single, integrated, secured, and centrally managed telecommunications network service for the government. 1Gov\*Net is the expansion of the Electronic

Government Network (EG\*Net), which was initiated in 1997 as Malaysia was establishing the MSC in line with Vision 2020. 1Gov\*Net continues as the single telecommunications network enabler for the public sector. The exemplary shared services recorded a notable 85% savings in cost as compared to single implementation. It has continued to show an annual increase in customer satisfaction.

4. **Collaborative and dynamic ICT governance.** The objective of this strategic thrust is to strengthen leadership, ICT management, and governance for the efficient and effective development of digital initiatives. Among the strategies to enhance ICT governance are
  - enhancing digital-government leadership and collaborative networks, and particularly, boosting the leadership capacity of MAMPU and the ICT capacity of the rest of the public service; and
  - strengthening the ICT governance structure, including policies and regulations.
5. **Professional and capable workforce by enhancing the capabilities of ICT personnel.** To operationalize this strategic thrust, the key strategies being pursued are
  - strengthening of the ICT personnel-placement process and ICT job schemes; and
  - enhancing career development and competencies to develop and retain talent [6].

### Governance

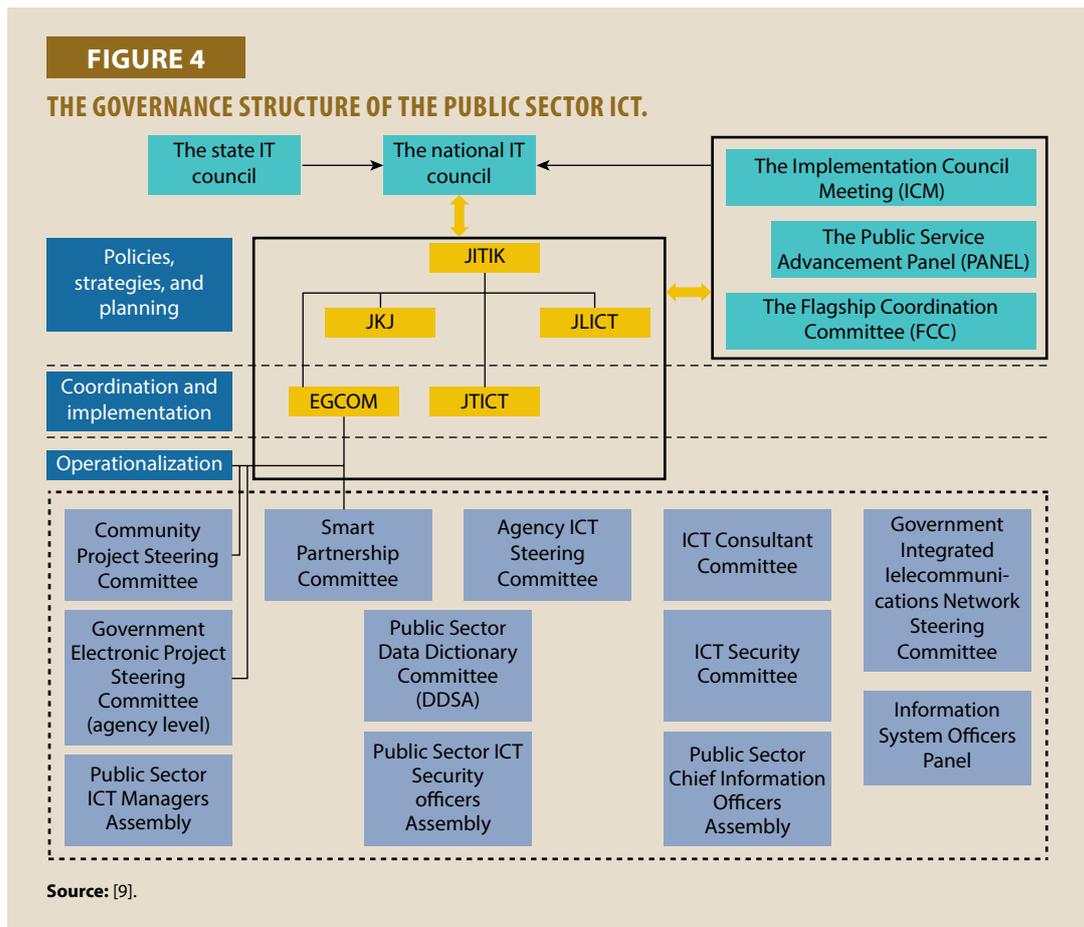
The development and usage of ICT in the public sector involves multiple agencies at all levels of government, including the states and local governments. The success of DG, therefore, is highly dependent on the smooth coordination and continuous monitoring of DG implementation across the three levels of government. This is undertaken through a well-structured governance mechanism. Figure 4 highlights the government's ICT governance structure.

At the helm of this digital governance machinery is the National IT Council. Chaired by the Prime Minister, the national IT council's role is to set the overall direction and policies relating to ICT in the country.

Below the council is the Government IT and Internet Committee (JITIK). The JITIK was established on 6 February 1998 with MAMPU as its secretariat. The top bureaucrat, the chief secretary to the government, chairs the JITIK. Its members comprise the Secretary-General of the Treasury, Auditor-General, Chief Government Security Officer, Director-General of the Economic Planning Unit, Director-General of Education, CEO of the Malaysian Digital Economy Corporation (MDEC), and secretaries-general of relevant ministries.

For its work, JITIK takes inspiration from the policies of the National IT Council. It directs and formulates policy proposals and monitors all ICT programs in the public sector. JITIK also ensures that DG initiatives are aligned with the national vision and mission. In addition, it oversees the development of comprehensive guidelines and policies including those relating to standards, security, human resource development, and acquisition. JITIK too serves as the patron for research, development, and acculturation of ICT among public service personnel.

JITIK also takes input from other committees. These include the Implementation Council Meeting (ICM), Flagship Coordination Committee (FCC), State IT Council, and Public Service Advancement Panel.



To discharge its duties, JITIK brings in experts from the private sector as consultants when needed. JITIK also fosters collaborative governance between the government, the industry, and institutions of higher learning. This is to accelerate industry-related research and development and innovation. JITIK is also empowered to establish other committees deemed necessary. These include

- IT Implementation Committee (JTPIT);
- Technical Committee on ICT (JTICT);
- Committee on Training and Development (JLICT);
- JITIK Working Committee (JKJ); and
- Coordinating Committee on Electronic Government (EGCOM).

Additionally, there are a number of committees involved in implementing the various directives of JITIK at the agency level such as the Agency ICT Steering Committee. These are represented in the governance structure as illustrated in Figure 4 [9].

### Beneficiaries

The beneficiaries that profit from DG range from policymakers through service providers to citizens and businesses.

Policymakers benefit greatly as they are now able to make evidence-based decisions and policies. Integration of data across agencies allows them to access data for such decision-making. Agencies too are able to offer services quickly and transparently. The central databases enable the public service to offer services seamlessly without the need for citizens and businesses having to provide information through applications.

Online applications for permits, licenses, and approvals from a public agency allow for greater transparency and accountability, thereby securing integrity in service provisioning. E-procurement, for example, has cut middlemen from the procurement process and introduced greater transparency, thereby enhancing integrity. The wiring up of the public service has brought greater efficiency and has relatively lowered the cost of service delivery. More important, DG has promoted collaborative governance. The integrated databases now enable faster service delivery, resulting in higher citizen satisfaction [15, 18].

The public is able to access varied online services speedily. It can engage with public service providers through various media. Services such as online tax assessments and collection ensure greater convenience. DG offers the public a wealth of data for their decision making. The public receives quick online services such as e-filing of tax returns and payment, and online registration of land and property transfers. DG has given the public a platform to resolve complaints expeditiously.

The third category of beneficiaries is the business community. Greater transparency and efficiency of the public sector engendered by DG have brought down the cost of doing business by reducing transaction costs. This has enhanced business competitiveness. ICT vendors have been able to secure contracts in developing and maintaining the various components of DG. Investors too have been greatly assisted by the ease of doing business.

Overall, DG has strengthened public institutions through various digital platforms such as population and voter registers, land registration, court-cases management, payment platforms, and information delivery mechanisms [20].

### Resources

To ensure that DG is supported with the necessary ICT infrastructure, the government spends heavily on technology products and services. These include the purchase of IT devices, computer equipment and peripherals, development of data centers, software, and IT and communications services. Over the last 10 years (2011–20), the average annual public-sector ICT expenditure has been USD560 million [13, 16, 17].

Additionally, the government constantly upgrades the skills of its ICT personnel. There are currently over 50 ICT experts who manage DG both at the MAMPU and in the ministries [6]. The government also assists in skills development of suppliers through its e-procurement module.

Policies and laws to promote digital government as well as cybersecurity have been promulgated while cybersecurity systems are regularly updated. The Digital Signature Act 1997 allows for the development of e-commerce, among others. It provides an avenue for secure online transactions. The Computer Crimes Act 1997 and the Communications and Multi-media Act 1998 are the other main laws to regulate DG and e-commerce.

### Activities

This section highlights the key transformational initiatives that have been executed to realize the strategies. These include government open data, government online services or GOS gateway, government information-exchange hub, and big-data analytics [8]. The principles that guide the implementation of these activities are citizen- and data centricity, reliability and quality assurance, compliance with ICT laws, sourcing of open software, digital innovation, and green technology [6].

### Integrated Digital Services

The key initiatives and the parties (in parenthesis) responsible for executing them are

- identifying expectations and needs of citizens based on life events (MAMPU);
- developing government digital-services gateway as a one-stop portal for end-to-end digital services based on life events (MAMPU);
- consolidating agency applications for increased interoperability and accessibility of services, including data integration, and sharing (MAMPU and agencies);
- establishing digital ID for use of government digital services (MAMPU);
- developing customer-centric digital services in consultation with the public (MAMPU);
- designing e-participation platforms that will feed citizen comments into policy formulation and public service delivery (MAMPU);
- formulating policies, guidelines, and standard operating procedures for better usage of digital services (MAMPU); and
- strengthening the infrastructure for cashless digital services (MAMPU).

### Data-driven Government

The activities and the agencies involved in implementing this strategic thrust are

- crafting an action plan for implementing the open-data initiative (MAMPU);
- establishing a mechanism to publish open datasets in agencies (MAMPU);
- implementing big data by leveraging IoT (agencies);
- developing data lakes and oceans across public agencies (MAMPU and agencies);
- forging strategic collaboration in using private-sector data lakes (MAMPU and agencies);
- providing data-analytic services (MAMPU); and
- establishing a governance mechanism for data sharing and policy implementation (MAMPU and Attorney General's Chambers).

#### Optimizing Services and Strengthening Cybersecurity

Among the key activities undertaken by MAMPU to achieve this strategic thrust are

- formulating an action plan for strengthening and extending the public-sector data center;
- developing a standard operating procedure and infrastructure for government cloud services;
- strengthening agencies' local area network and communication services, and the usage of 1Govt\*Net through better policies;
- establishing a public-sector messaging service;
- developing a framework of policies and guidelines on cybersecurity;
- securing ISO certification for ICT equipment, business continuity management systems, and information security management systems; and
- developing a digital forensic laboratory.

#### Collaborative and Dynamic ICT Governance

The key activities to be largely carried out by MAMPU under this strategic thrust are

- strengthening appointment criteria and the role and accountability of digital-government leaders;
- consolidating existing policies and drafting new ICT policies that are relevant to the implementation of DG;
- intensifying enforcement of ICT regulations;
- establishing collaborative governance between DG leaders, industry, and institutions of higher learning to accelerate innovation;
- rationalizing the structure and functions of MAMPU as the digital-governance reference center. This is to ensure a better provisioning of ICT consulting and shared services and enterprise applications;
- establishing a new and nimble operating model for ICT units in ministries (by the Public Service Department, Public Administration Ministry);
- streamlining existing rules and developing new ones for the better implementation of digital governance; and
- consolidating ICT committees across the government for leaner governance.

#### Professional and Capable Workforce

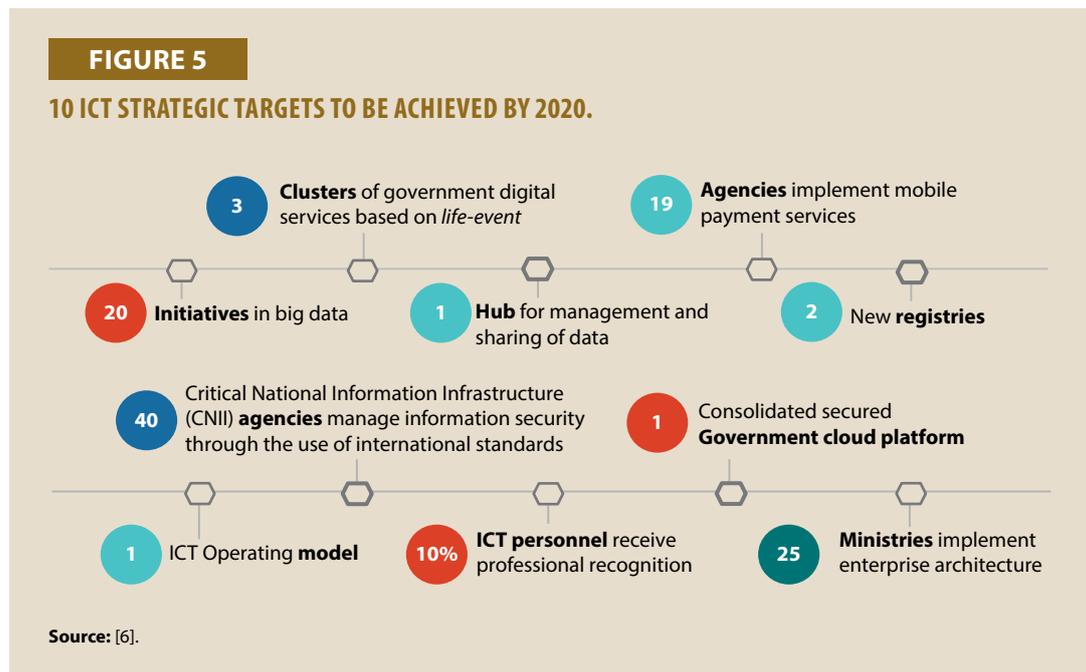
Together with the Public Service Department, MAMPU will undertake the following key activities:

- develop an ICT placement mechanism and competency profiles;
- draw up a career-advancement and succession plan for strategic ICT posts;

- develop and implement a digital-competency roadmap;
- engage in strategic collaboration with institutions of higher learning and industry;
- strengthen ICT governance for the recognition of ICT expertise; and
- provide incentives for reskilling and upskilling in ICT.

### Outputs

This section (see Figure 5) identifies the performance targets established under the ICT strategic plan (2016–20) and the outputs achieved till date. These include the implementation of big data, cloud services, hub for managing and sharing data, mobile payment services, and the critical national information infrastructure.



Much has been achieved under these targets. Among the key outputs are

- 90% of public services have been made accessible online;
- 31 agencies are using the DDMS, a debugging service;
- 200 agencies are using the MyMesyuarat, a meeting application for convening and recording minutes of meetings;
- four pilot projects on big-data analytics have been introduced;
- 1Gov\*Net has been introduced in 206 agencies;
- over 50 ICT experts have been trained;
- 132 agencies have started to use the PDSA, or public service data centers;

- the number of MyGovUC users is close to 300,000; and
- over 1,340 datasets have already been published in the public-sector Open Data Portal with a target of 7,000 datasets by the year 2020 [3].

MyGovUC is an integrated communications and collaboration service that is centrally managed by MAMPU. The service integrates email communication channels, video and audio conferencing, instant messaging, and identity management system. In addition, the service also provides information sharing through the collaborative portal.

### Outcomes

The ICT strategic plan spells out six policy outcomes. These are

1. zero face-to-face service delivery;
2. paperless government;
3. culture of information sharing;
4. enhanced interagency collaboration towards a seamless and interoperable service;
5. establishment of government-shared services, and
6. enrichment of skills and expertise of public-sector ICT personnel [6].

There has been a significant migration to online services (90% of services are online) and internet access (91% of citizens have access). They, especially the younger tech-savvy generation, access online services largely through mobile phones. A mindset change, greater broadband connection, and the narrowing of the digital divide will see DG approaching zero face-to-face delivery.

Many online government services are integrated. They aim to provide inclusive and citizen-centric digital services. In the process, leadership and governance have been enhanced to better plan and coordinate digital initiatives so that the public service can become more dynamic and efficient [21].

The increased investments in digital infrastructure have enabled access to e-services for households in the bottom 40% of Malaysian income pyramid. That helps reduce the digital divide [21]. DG has also increased transparency in public services. Digital transactions have an electronic trail that promote accountability. Although there is little evidence to suggest that DG has lowered the cost of service delivery, as the cost of digital equipment and ICT infrastructure has been increasing, DG has surely increased the operational efficiency, thereby improving public services in terms of speed and quality. This has promoted greater convenience for citizens and businesses.

Additionally, the public sector has partnered with the private sector to undertake a nationwide initiative to educate and integrate women into the online community. This partnership uses community internet centers to conduct basic ICT training and to introduce women to safe usage of smart devices and the internet.

The international rankings for Malaysia attest to the good progress Malaysia has made in its migration to DG. For example, Malaysia occupied the 27th spot among 193 countries in the 2018 Online Service Index (OSI). It has also been ranked among the top 50 countries in the UN E-Government Development Surveys. Malaysia's innovative initiatives have enabled it to climb the rankings, propelling it upward by 12 ranks from 60 in 2017 to 48 in 2018 [18]. Its E-participation Index, involving the three stages of e-information, e-consultation, and e-decision-making, has shown significant improvement as well. In 2018, Malaysia's rank was 32 out of 193 countries compared to 47 in 2016 [15, 21].

Due to the government strengthening its cybersecurity, Malaysia was ranked third in cybersecurity in 2018 [21]. In October 2020, the government launched the five-year Malaysia Cyber-Security Strategy 2020–24 with an allocation close to USD0.5 billion. National cyber security is a priority in national defense and security agenda, given the increasing number of cybercrimes during the COVID-19 pandemic. Elements of cyber security are well-established in all government-led digital initiatives, to ease investors' worries regarding safety.

The Cyber-Security Strategy was drafted based on five pillars encompassing 12 strategies, 35 action plans, and 113 programs to fortify national cybersecurity preparedness against any form of cyberattacks. The five pillars are

1. enhancing the management of national governance and cybersecurity by improving the country's ICT infrastructure as well as raising the ability to deal with cybersecurity issues effectively;
2. strengthening the enforcement of existing cybersecurity laws by reviewing related legislation as well as formulating laws on cybersecurity;
3. empowering innovation and world-standard technology in cybersecurity;
4. improving development capacity as well as cybersecurity skilled manpower; and
5. enhancing international cooperation by activating regional and international cooperation to protect the national cyberspace.

International cooperation is crucial in overcoming cybersecurity issues as no country can deal with these issues alone. Malaysia has been supportive of cyber-safety initiatives in regional and international platforms. These initiatives have led to norm-setting for cybersecurity, aligned with the norms of the Association of South-East Asian Nations (ASEAN) Regional Forum, UN, Asia-Pacific Economic Cooperation, and the Commonwealth. Further bilateral and multilateral relationships will be explored.

The National Cyber Security Committee, headed by a senior minister, has been established to steer the development and implementation of this strategy. Both the Ministry of Communications and Multimedia and the National Cyber Security Agency will jointly formulate, implement, monitor, and coordinate the implementation of this security strategy.

The Policy Modeling Canvas in Appendix neatly summarizes the issues, goals, strategies, resources, outputs, and outcomes of DG in Malaysia.

## Analysis of Critical Success Factors

This section sketches the key factors that have contributed to the success of Malaysia's DG efforts. Table 1 distils the following key success factors:

- **Aligned vision:** The public service plays a key role in national competitiveness and prosperity. The speed and efficiency of the public service, as a result of DG, promotes the efficiency and effectiveness of the private sector. The resulting competitiveness of the private sector gives rise to increasing wealth and prosperity of the nation. As such, one of the key factors contributing to the success of DG is the alignment of its vision with the larger national vision of becoming a developed and rich nation by 2020. DG is also aligned with the five-year development plans, government transformation plans, and public service modernization efforts. It is this alignment that has provided its implementation the requisite synergy and laser-sharp focus.
- **Prioritized goals:** The aligned vision was cascaded to a more concrete set of goals or objectives. These objectives include the transformation of administrative and service-delivery processes through DG to ensure high-impact public services. DG has also enhanced the governance, including accountability and transparency.
- **Pragmatic implementation:** Implementation is not about seeking to achieve idealistic goals. Rather, it takes into consideration what could be achieved, given the resources available. More importantly, the government realized that digital services and databases should be shared for cost savings as well as for seamless services. Citizen engagement and participation are crucial if DG is to be sustained. This is because citizens are primary stakeholders. Without their involvement, DG will not be customer centric. Also, collaborations between the government and the industry and among government agencies are important to ensure better outcomes. One such strategic collaboration is the government's use of private-sector data lakes. Strategic partnership between government and industry also extends to conducting training programs, especially for lower-income groups as a means to narrow the digital divide. Significant strides are being made to forge collaboration among agencies, particularly in integrating their databases and sharing these with the private sector. This has enabled the latter to develop apps for the benefit of the public.
- **Enablers:** While leadership and goals drive the implementation, public funding, ICT personnel, and digital infrastructure enable the institutionalization of DG. Cloud services, data exchange, open data, and omni-channels for service delivery represent parts of that ICT infrastructure. The digital-governance structure provides an effective framework for the formulation and execution of digital policies.

To help spearhead the open-data initiative, the government collaborates with international bodies, namely, the Open Data Institute and The World Bank. Jointly with The World Bank, the public service conducted an open-data readiness assessment in 2016. The purpose was to provide a comprehensive view of the required open-data ecosystem. This enabled the government to fully harness the power of open data to improve the quality of lives of citizens and the sustainability of businesses [7].

- **Strong foundations:** Rules, regulations, and procedures on DG offer the strong foundations to anchor DG. Apart from the laws and guidelines, the Cabinet approved the implementation

of the National Digital Identity (national digital ID) initiative in August 2019. This national digital identification will help foster confidence in the digital economy and in online businesses and services.

TABLE 1

### CRITICAL SUCCESS FACTORS OF DG IMPLEMENTATION IN MALAYSIA.

Success factor category	Related success factors in DG
Aligned vision	DG vision is aligned with the larger national vision of Malaysia becoming a developed nation by 2020, five-year development plans, government transformation plans, and public service modernization efforts.
Prioritized goals	<ul style="list-style-type: none"> <li>• To transform administrative and service-delivery processes</li> <li>• To ensure high impact of public services through a structured and well-crafted implementation</li> <li>• To enhance governance, accountability, and transparency in public services</li> </ul>
Pragmatic implementation	<ul style="list-style-type: none"> <li>• Shared digital services and databases</li> <li>• Citizen engagement and participation</li> <li>• Strategic collaboration to use private-sector data lakes and promote the narrowing of the digital divide</li> </ul>
Enablers	<ul style="list-style-type: none"> <li>• Public funding and personnel</li> <li>• Structured institutional implementation framework</li> <li>• Data exchange, open data, cloud services, and omni channels for service delivery</li> </ul>
Strong foundations	<ul style="list-style-type: none"> <li>• Rules, regulations, and procedures on DG</li> <li>• Central management secretariat</li> <li>• Integrated citizen-centric digital services to provide quality end-to-end digital services</li> <li>• Digital platforms with 90% of services accessible online by 91% of citizens through internet connectivity</li> </ul>

The MAMPU runs a central management secretariat to ensure the effective implementation of DG. Integrated citizen-centric digital services and digital platforms provide quality end-to-end digital services.

### Lessons Learned and Insights from the Case Analysis

The direction is clear. DG is the way to go to improve public services and ensure public service responsiveness as the imperatives of the fourth industrial revolution. Malaysia registers a commendable progress in DG. Notwithstanding, the journey has not always been smooth, given the challenges along the way. However, Malaysia remains optimistic in taking DG to greater heights in meeting citizen and business needs.

Malaysia's experience in DG offers key lessons and insights to other emerging countries. One is the need for a strong rationale for DG. Such a purpose will enable DG to take root. DG in Malaysia was instituted to initially serve industries in the Multimedia Super-corridor (MSC). The success of the MSC depends on the success of DG. More broadly, DG is meant to support businesses, improve public services, and enhance public- and private-sector productivity. In Malaysia, DG has evolved to become the anchor for a digital economy. Countries therefore must have a burning *raison d'être* for the introduction of DG. Merely introducing DG to have a comfortable feeling that the public service is modernizing will not do to sustain the initial fervor.

Once that burning rationale is determined, DG then needs a strong and committed political and bureaucratic leadership to fan the flames of enthusiasm in DG throughout the public service. This digital leadership is crucial in sustaining the implementation effort. This is because DG will require constant budgetary allocations to update the system in line with evolving technology trends. In Malaysia, the prime minister was directly involved in setting up the MSC. DG is one of the flagship applications. Subsequent prime ministers kept the tradition of being directly involved in DG. Such leadership has ensured that DG is aligned with the overall national vision.

Efficacy in DG implementation requires a mindset change among public service employees to ensure DG's smoothing functioning. That 90% of public services are online attests to the cultural change in the Malaysian public service, though there is still a distance to go. Data analytics and data mining should be pursued with alacrity to predict services that fit the needs of the populace. Data analysis is also needed to make informed decisions. As such, DG will see a greater use of big data.

A central project office that reports to the political and bureaucratic leadership must be set up to direct the implementation effort. Malaysia has a dedicated institution in MAMPU to spearhead DG. A centralized governing body ensures alignment of DG efforts with the national vision. It can regularly monitor its implementation. Additionally, a well-structured governance mechanism helps coordinate activities across the tiers of government. Collaboration will allow for the integration and sharing of data.

Among the problems impeding the full implementation of DG in Malaysia is citizen readiness. The success of any DG effort ultimately depends on the extent of citizens' digital literacy and their usage of DG services. Lack of tech-savviness on the part of citizens can impede the development of DG. Therefore, it is important that citizens are literate in the use of DG, especially in the rural areas. This calls for the narrowing of the digital divide across the country and an affordable high-speed broadband internet connectivity. In Malaysia's case, close to 90% of Malaysians had access to the internet in 2018, which marked a 17% jump from 77% in 2016. This translated into about 29 million internet users in 2018 (in a population of 32 million users), which was an increase from 25 million users in 2016. However, most of the access is through mobile devices with limited coverage.

Citizen readiness is a function of citizen trust. Public trust needs to be fostered by ensuring security and privacy in digital transactions. As Malaysia's online data breaches are growing significantly, there is an ever-urgent need for public awareness on cybersecurity. For example, there were over 200 data breaches involving internet users in 2019, compared with 63 breaches in 2018 and 19 breaches 2017. Over 11,000 cybercrime reports were lodged with the police in 2018 involving a total loss of over RM400 million. Worse, Malaysia was ranked fifth among countries most vulnerable to cybercrime by the Sophos Security Threat Report 2013 [4]. As such, security threats will need to be addressed to promote citizen confidence if a government is to make headway in DG. In Malaysia, the Public Service Cybersecurity Framework and the National Cryptography Policy are especially useful in this regard.

Greater trust and confidence in DG can also be generated by providing citizens multiple channels to access public services, i.e., email, websites, mobile apps, and social media. For example, smartphones have become a popular medium for internet users. In Malaysia, nine out of 10 internet users used smartphones to go online in 2018. The smartphone's increasing computing power enables the growth of new applications. This has led to a decline in the divide between the digital citizen and the nondigital citizen.

It is also important for the public service to sort out legacy systems at the outset. Prior to service-wide implementations, agencies had introduced electronic systems in silos. These are now not amenable to integration. Incompatibility between systems hinders electronic linkages between agencies, which is compounded by the differences in the types of data formats used. Therefore, interoperability must be fostered early in the game so that it does not become more expensive later. Once these legacy systems are written off, common systems and processes across ministries need to be established [12].

Governments should also optimize resources by creating shared platforms. These shared platforms can be created by centralizing, consolidating, and standardizing common applications and infrastructure such as data centers, networks, and security surveillance. Standards provide the means for interoperability, thus enabling more systems, including hardware and software, to communicate with each other. Further, interoperability also ensures easy and efficient transfer of data. To address this need, MAMPU introduced the EG Information Technology Policy and Standards in 1997. This policy document offers a platform on which innovations can be developed [14].

Infrastructure needs to be put in place before DG can be rolled out fully. Malaysia established the Government Online Services (GOS) gateway to spur DG. The GOS gateway seeks to cater to an individual's needs from cradle to grave. Malaysia has shown gradual improvement in the E-Government Development Index and the Online Service Index (see the discussion under the Outcomes section). Notwithstanding, it has a lot of catching up to do with other advanced countries in terms of digital infrastructure. For example, 5G technology has already arrived. Yet most of Malaysia's 4G coverage is concentrated around major cities. Most rural areas lack the infrastructure to support 4G [8].

MAMPU has successfully introduced and managed various shared services for the public sector centrally. These include the 1Gov\*Net for wide-area network connectivity, government data centers for data-center hosting and disaster-recovery services, and 1GovUC for unified communication services. With the pervasiveness of cloud computing and its ability to enable the delivery of information and services to a wide range of users, an even greater level of sharing of resources will be possible in future.

To ensure all this, proper governance for open data and data sharing is needed. The official secrets legislation may need to be amended to enable more extensive data sharing across agencies. This governance framework should encompass laws related to DG, and ensure open data, integration of data, data management and protection, identity management and privacy, quality of datasets, as well as cybersecurity.

In Malaysia, the government also embarked on the myIDENTITY project across the public services to spare the citizens of the requirement to provide their identity information every time they interact with different agencies. The project has since morphed into the Government Data Exchange which helps citizens to transact with the government seamlessly.

Big data without analytics is of little value. A big-data analytics program in the public service can lead to, among others, better evidence-based planning, and decision-making. It can also lead to better service delivery through improved identification of citizen needs and improved operational efficiency [7].

Talent is another issue. DG requires highly skilled employees. Without that, the government cannot design and operate digital projects. Key workers will sometimes need to be drawn from the global and private-sector talent pools. The government will also have to intensify its training and development to expand digital talent in the public service, more so to manage the technologies of the fourth industrial revolution.

DG will increasingly draw the public and businesses into the realm of decision making. Indeed, this is an explicit aim of DG. The public service must engage them to make policies and regulations that cater to their needs. Citizens expect governments to provide public services that are user-driven and adaptable to different users' needs. For example, demographic changes cultivate new needs. The challenge for the government is to meet the new expectations, especially those of sophisticated consumers and the younger generation. The ultimate aim is to have a DG that is inclusive and customer centric.

The implementation of a citizen-centric DG requires that online services be readily available at all times. Government data centers must provide appropriate service levels as required by client agencies, citizens, and businesses. Digital technologies require to be upgraded so that the government can offer state-of-the-art public services. Finally, governments need to ensure that digital technologies and data are exploited to attain customer-centricity and inclusive growth.

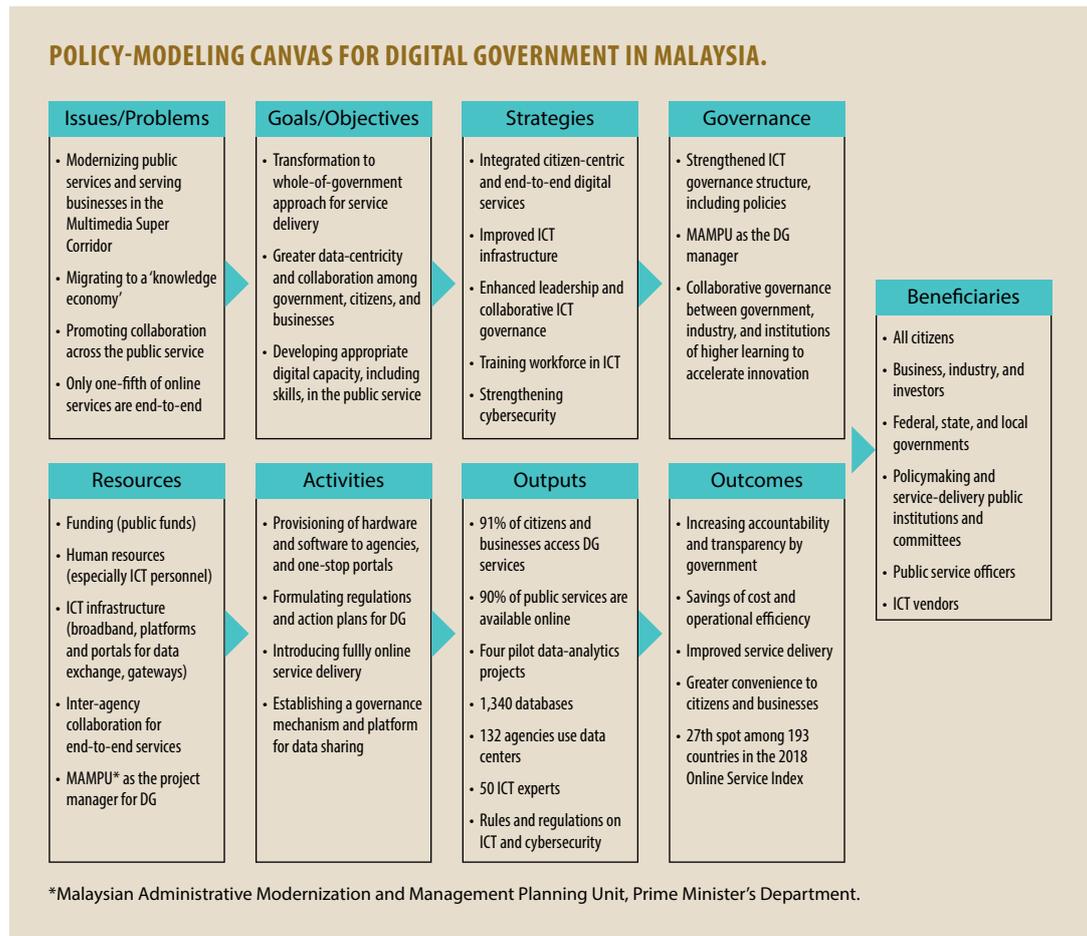
There are tremendous opportunities in DG. It just has to be managed well so that the government can obtain value for money from the investments made toward development.

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## Appendix



## CASE STUDY 5

# BIG DATA FOR A CLIMATE DISASTER-RESILIENT COUNTRY, PHILIPPINES

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### Abstract

This case study focuses on the application of ‘big data’ in the Nationwide Operational Assessment of Hazards (NOAH) for disaster risk reduction and management (DRRM) and climate actions (CAs) through the production of hazard and risk maps for vulnerability assessment and early warning. For having introduced innovative solutions using the latest technology in DRRM/CA for hazard and risk mapping, vulnerability assessment, and early warning, which led to marked decrease in fatalities, NOAH received several international and local awards mostly in the areas of information and communication technology (ICT). The primary emphasis of this study is on the present setup, functions, services, and performance of the University of the Philippines-NOAH (UP-NOAH) Center from 2017 till present. However, since it was a creation of the Department of Science and Technology, inevitably, its historical foundation and performance during 2012–17 as Project NOAH is also included in the study. (When NOAH is mentioned in this chapter, it refers to both Project NOAH and UP-NOAH Center. It is used in a generic sense to refer to the whole concept.)

### Introduction and Background

The Philippines is prone to weather-related and other natural geological events, mainly due to its location. The country experiences typhoons, earthquakes, tsunamis, storm surges, landslides, floods, and volcanic eruptions [1, 2]. Thus, it ranks high in the *Global Climate Risk Index* (among the top 10 since 2011) and the *World Risk Index* (among the top 3 since 2011) [3]. Every year, there are hundreds of casualties and injuries aside from billions of pesos lost due to insufficient preparations for natural disasters [3–5]. According to local disaster risk reduction (DRR) experts, there is a lack of awareness on extreme natural-hazard events like flooding, typhoon, and earthquake to make intelligent decisions to save lives and properties [6–8].

The inability to make faster decisions due to insufficient real-time information in times of disasters is now a thing of the past. Big Data Analytics (BDA) is now widely utilized in many countries for climate change adaptation (CCA) and DRR [9–14]. All rights reserved. Decision making in natural disaster management has its own challenge that needs to be tackled. In times of disaster, government as a response organization must conduct timely and accurate decisions to ensure rapid assistance

and effective recovery for the victim involved can be conducted. The aim of this paper is to embark strategic decision making in government concerning to disaster management through Big Data Analytics (BDA). In the Philippines, BDA served as the backbone of hazard mapping and early warning for disasters when the Project NOAH was established in 2012. This case study focuses on the application of BDA in the NOAH for DRRM and CAs through the production of hazard and risk maps and offering of IT- and non-IT-based DRR/CCA-related services. Using the Policy Modeling Canvas as a framework, the paper discusses the institutionalization of digitized risk-hazard maps that serve as big data for early warning purposes towards building disaster-resilient communities. The success factors and lessons learned are also enumerated to better understand the travails of NOAH's institutionalization.

### **Digitization, Digital Government, BDA, and DRR**

Before proceeding, it must be cleared why NOAH is a poster project of 'digitization' and an example of an agency of a 'digital government.' Moreover, it is also imperative to discuss the relevance of BDA in disaster risk reduction (DRR).

According to Choi [15], digitization "involves the greater use by governments of digital technologies to improve government activities and data/information management." NOAH's primary tool for DRR are digitized risk-hazard maps generated by the latest available digital technologies. Examples include, satellite imagery, unmanned aerial vehicles (UAV)-based aerial imagery, wireless sensor, light detector and ranging (LiDAR), simulation numerical data, vector-based spatial data or geographic information system (GIS), mobile GPS, call data records, data from the internet of things (IoT), social media, and crowdsourcing.

Digital government, on the other hand, involves "enabling governments to create public value and undertake broad sector modernization (with greater openness, transparency, engagement with and trust in government) through the integration of digital technologies and user preferences in service design and delivery of direct personal services and in shaping public policy outcomes, while also achieving efficiency and productivity gains" [15]. Simply put, this involves, among other things, using digital technology in creating new models of public service delivery and providing inputs to public policymaking for more efficient, effective, and productive government services. NOAH transformed what used to be a map-less and 'generalized early warning or forecasting of possible disasters' into one that is hazard-focused, area-specific, and timebound with the use of the latest data and maps generated by digital technologies mentioned above.

BDA is "the technological paradigm that allows researchers to conduct an efficient analysis of vast quantities of data that are made available through the current practices. It is the collection of scientific and engineering methods and tools that help in making the best of massive amounts of available data" [14]. It is briefly characterized by 5 Vs, which are, volume, velocity or speed of data generation, variety of sources and nature of data, veracity of the data, and value or usefulness of data. BDA is useful in DRRM because data are needed before (mitigation/prevention, and preparation) and after (response and recovery) the disaster event. In mitigation/prevention, BDA is needed for a long-term risk assessment and reduction, and forecasting. In preparation, it is useful for monitoring and detection, and early warning. In response, damage assessment and post-disaster coordination and response can be conducted faster with BDA. Finally, in recovery, big data is useful for reconstruction and infrastructure and services restoration. In a literature review conducted by Yu, et al. [14], the sources of big data were identified, and it was ascertained in which particular disasters they were generally utilized. Table 1 lists these down by each phase of DRR.

TABLE 1

## SOURCES OF BIG DATA FOR DISASTER RISK REDUCTION.

Disaster management phase	Data source	Disasters
<b>1. Mitigation/Prevention</b>		
Long-term risk assessment and reduction	Satellite, crowdsourcing, sensors/ internet of things (IoT), GPS, call data recorder (CDR), simulations, etc.	General natural disaster, earthquake, oil spill, flood
Forecasting	Simulation, satellite, sensor web and IoT, social media, etc.	Hurricane, flood
<b>2. Preparedness</b>		
Monitoring and detection	Social media, sensor web and IoT, satellite, combination of various data types, spatial data, light detector and ranging (LiDAR) Mobile GPS, CDR, crowdsourcing	Wildfire, flood, earthquake, landslide, volcano
Early warning	Social media, sensor web and IoT, simulation, crowdsourcing	Flood, tsunami
<b>3. Response</b>		
Damage assessment	Satellite, unmanned aerial vehicle (UAV), social media, sensor web and IoT, crowdsourcing	Earthquake, flood, typhoon, hurricane
Post-disaster coordination and response	Social media, satellite, sensor web and IoT, crowdsourcing, UAV, simulation, spatial data, LiDAR, mobile GPS and CDR, and combination of various types	General natural disaster, flood, earthquake
<b>4. Recovery</b>		
	Crowdsourcing, satellite, and combination of various data types.	Earthquake, hurricane, typhoon

Source: Public Data Policy 5 Years Progress Leaflet [16].

## Case Analysis through Policy Modeling Canvas

In this case study, the Policy Modeling Canvas (see Figure 1) is employed to describe how the digital services of NOAH have helped to avert disasters and the accompanying casualties and loss and damages.

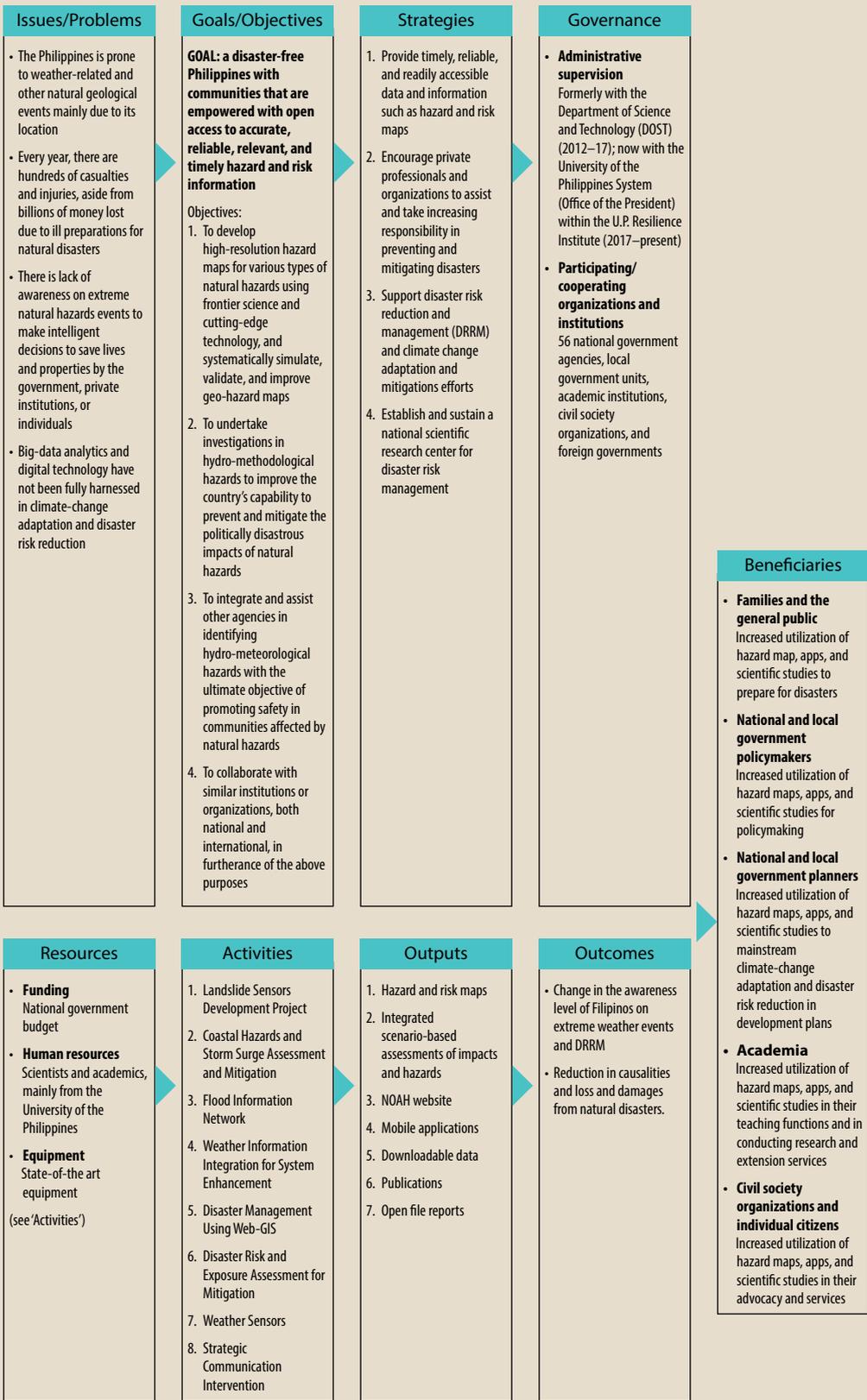
### Issues and Problems in Early Warning and DRRM Forecasting

Years before the establishment of Project NOAH in 2012, several natural disasters hit many areas in the country. These were the Cherry Hills landslide in Antipolo (1999) that resulted in 60 deaths; Dingalan landslides (2004) with 135 deaths; Infanta landslides (2004) with 390 deaths; Guinsaugon landslide (2006) with 1,126 deaths; Durian landslide (2006) with 1,399 deaths; Ondoy flood (2009) in Metro Manila with 465 deaths; Pepeng flood (2009) in Pangasinan, La Union, and Ilocos Sur; landslide in the Cordillera Administrative Region (CAR) (2009) with 465 deaths; Pedring and Quiel floods (2011) in Central Luzon; and Sendong flood (2011) in Cagayan de Oro and Iligan with 1,268 deaths [1].

The government had not been remiss in its job of warning the people of possible natural hazards. In fact, it has several major agencies involved in the surveillance of natural hazards, namely, the Philippine Atmospheric, Geophysical, Astronomical Services Administration (PAGASA) for hydro-meteorological hazards like typhoon; and the Philippine Institute of Volcanology and Seismology (PHIVOLCS) and the Mines and Geosciences Bureau (MGB) of the Department of the

**FIGURE 1**

**POLICY MODELING CANVAS.**



Environment and Natural Resources (DENR) for geophysical hazards like earthquake and landslide. However, it has been observed that the early-warning system and forecasting were not hazard- and area-specific, and timebound. Hence, more often than not, when the forecasted occurrence of hazard on an area failed to happen, future warnings or forecasts were perceived to be unreliable and people started to distrust them. This resulted in disastrous results because people did not prepare for what they thought to be unreliable forecasts or warnings of impending disasters. In response to the problems mentioned above, Project NOAH was created in 2012 as a grant-in-aid project of the Department of Science and Technology (DOST).

In February 2017, its operation was terminated, and its resources were transferred to the country's weather bureau, i.e., PAGASA, and other relevant agencies. However, in the same month that Project NOAH was terminated by the DOST, the University of the Philippines (UP), home of the project for the last five years, adopted and converted it to UP-NOAH Center in recognition of its vast technological capabilities to assist the university in providing public service in DRRM. It is now under the supervision of the UP System's Office of the University President [16, 17].

It is useful to discuss the inception of NOAH from a project of the national government to its transition to a university-based academic unit to highlight lessons about its sustainability which could be useful for similar undertakings in other countries.

### Goals and Objectives

Originally, the mission of Project NOAH was “to undertake disaster science research and development, advance the use of cutting-edge technologies and recommend innovative information services in government's disaster prevention and mitigation efforts” [17]. At present, the UP-NOAH Center envisions “a disaster-free Philippines with communities that are empowered with open access to accurate, reliable, relevant and timely hazard and risk information” [18]. To realize this vision, it is the goal of UP-NOAH Center to provide the public access to accurate, reliable, relevant, and timely hazard and risk information. Its specific objectives are to do the following:

- Develop high-resolution hazard maps for various types of natural hazards using frontier science and cutting-edge technology; and systematically simulate, validate, and improve geo-hazard maps.
- Undertake investigations in hydro-meteorological hazards to improve the country's capability to prevent and mitigate the potentially disastrous impacts of natural hazards.
- Integrate and assist other agencies in identifying hydro-meteorological hazards with the ultimate objective of promoting safety in communities affected by natural hazards.
- Collaborate with similar institutions or organizations, both national and international, in furtherance of the above purposes [18].

### Strategies

At present, the UP-NOAH Center pursues the following strategies to accomplish the goal and objectives stated above:

- Provide timely, reliable, and readily accessible data and information such as hazard and risk maps.

- Encourage private professionals and organizations to assist and take increasing responsibility in preventing and mitigating disasters.
- Support disaster risk reduction and management and climate change adaptation and mitigation efforts.
- Establish and sustain a national scientific research center for disaster risk [18].

### Governance

From 2012 to 2016, Project NOAH was under the supervision of the DOST. When it was about to be closed and its resources to be transferred to other government agencies starting early 2017, its head, Dr. Alfredo Mahar Francisco Amante Lagmay, expressed his concern about losing more than 200 personnel that the project had trained or developed. A month before its dissolution in February 2017, NOAH was absorbed by the University of the Philippines through Executive Order PDLC-17 issued by University President Danilo L. Concepcion following the decision of the UP Board of Regents' approval for the creation of the UP-NOAH Center on 23 February 2017. Now known as the UP-NOAH Center, it is housed in the newly created UP Resilience Institute (UP-RI) which was established to serve as "a proactive hub of benchmark innovative information vital to the nation's efforts in climate change mitigation and adaptation." The mission of UP-RI is "to empower local communities through multidisciplinary actions toward resilience." The center assists the institute in hazard and risk mapping [19].

### Resources

Project NOAH was a grant-in-aid project of the DOST with a budget of PHP6.4 billion provided in 2012. As a project, it had starting and completion dates. All deliverables were to be turned over to the DOST in 2015 but the deadline was extended to early 2017 [17].

The project benefitted from the technologies and management services for DRRM at PAGASA, PHIVOLCS, and the DOST-Advanced Science and Technology Institute (DOST-ASTI). DOST partnered with the UP National Institute of Geological Sciences and UP College of Engineering [20]. At one point between 2012 and 2017, Project NOAH had more than 200 personnel.

As of March 2020, the UP-NOAH Center has 34 out of the 65 staff of UP-RI. These 34 people are mostly geologists, geographers, IT specialists, and urban planners. They are distributed into four teams, which are (1) hazard, (2) planning, (3) flood modelling, and (4) web-GIS. Its budget comes from that of the UP-RI. In 2018, the latter received PHP150 million (USD3 million) from the national government. In 2019, it was reduced to PHP30 million (USD600,000) [21, 22].

### Activities

Project NOAH had eight components that were undertaken in 2012–17. These were:

- **Landslide Sensors Development Project:** It involved the development and deployment of landslide sensors and data communication systems that comprise early warning systems for deep-seated landslide hazards.
- **Coastal Hazards and Storm Surge Assessment and Mitigation (CHASSAM):** This enabled PAGASA to deliver accurate and timely forecast through the updated storm-surge models and generation of storm-surge inundation maps of all the coastal provinces in the country.

- **Flood Information Network (FloodNet):** This network was aimed at providing an upgraded version of ClimateX computer models for critical river basins and fully automated data gathering. This has produced accurate radar calibration and a 94.16% accurate ClimateX percent chance of rain calculation.
- **Weather Information Integration for System Enhancement (WISE):** This component provided a seven-day forecast at 12 km resolution and four-day forecast at 4 km resolution by enhancing the numerical weather prediction and development of forecast accuracy validation protocols.
- **Disaster Management Using Web-GIS:** This created various featured layers in the NOAH website for easier access to users. These layers are weather, sensors, flood, landslides, storm surge, WebSAFE and MOSES.
- **Strategic Communication Intervention:** This component conducted information, education, and communications (IEC) for the different audiences of Project NOAH. Through information dissemination, it aims to prevent massive casualties and minimize loss of properties.
- **Disaster Risk and Exposure Assessment for Mitigation (DREAM):** Science and technology and social science were integrated to produce a proactive disaster preparedness planning and response. It used cutting-edge technologies such as LiDAR and airborne radar interferometry to produce topographic datasets to assist in disaster forecasting.
- **Weather Sensors:** These sensors were aimed at providing accurate early warning forecasts. Different weather sensors were developed, e.g., Hybrid Weather Monitoring System and Production of Weather and Rain Automated Stations (HYBRID); Hydro-meteorological Devices (HYDROMET); and Deployment of Early-Warning Systems (DEWS) [23].

These project components produced high-resolution flood, landslide, and storm-surge hazard maps used in early warning with a six-hour lead time on an impending disaster (e.g., floods) to vulnerable communities. It is also used to give real-time weather data.

When Project NOAH was dissolved, these components and the technologies that were developed were farmed out to PAGASA, PHIVOLCS, MGB, and the National Mapping and Resource Information Authority (NAMRIA), which are the key government agencies in weather forecasting, disaster mitigation, and geo-hazard maps production [23].

All relevant agencies under DOST, in cooperation with the DENR, Department of National Defense-Office of Civil Defense, and the Department of Education, created ‘Geospatial Information Management and Analysis Project for Hazards and Risk Assessment of the Philippines (GeoRiskPH).’ It aims to “provide protocols and platforms to share hazards, exposure, and risk information to help people, communities, local governments, and national agencies prepare and plan how to reduce the risks for natural hazards.” One of its components is the HazardHunterPH tool.

At present, the UP-NOAH Center has taken a step forward from hazard mapping to risk mapping to visualize the impacts of hazard events. These are useful in the Integrated Scenario-based Assessments of Impacts and Hazards (ISIAAH), which aims to assist local communities in determining the possible disaster risks and impacts through the use of multi-hazard maps [24]. It

also partnered with OpenStreetMap (OSM) to identify points of interest, critical facilities, buildings, and other infrastructure in the communities to determine the vulnerable areas and calculate the risk and exposure details. These are useful to local governments because they could be used as strategic guides for emergency response and disaster mitigation planning [24].

### Outputs

According to Lagmay [1], there are two things that can avert disasters:

- **Highly detailed hazard maps:** Policymakers can use these for identification of safe areas for resettlement, establishment of evacuation centers, and planning for disaster and climate change resilient communities. These hazard maps are necessary to elicit appropriate public response to government warnings on imminent danger from floods, landslides, and storm surges.
- **Early warning systems:** These will help stakeholders, at vertical and horizontal levels, to detect incoming severe weather threats. It is important that information provided by these systems must be accurate, reliable, understandable, and more importantly, timely.

By the time Project NOAH folded up, it was able to generate the following number of hazard maps: enhanced landslide hazard maps for 81 provinces, Metro Manila, and Zamboanga City; multi-hazard maps for 28 disaster-prone provinces; 1:10,000 scale geo-hazard maps for all 1,634 cities and municipalities; LiDAR maps of the 18 major river systems and four critical areas; storm surge maps for all 66 vulnerable provinces and Metro Manila; and multi-hazard maps for the Greater Manila Area [3, 25]. Most of these were made available on the Project NOAH website housed by DOST. The smartphone apps of Project NOAH were also made available to public. At present, the UP System hosts the NOAH website, which also contains app sites, downloadable data, publications, open file reports, and instructional videos.

### Outcomes

The *raison d'être* for the creation of NOAH is to reduce mass casualties from natural disasters and increase the level of awareness of Filipinos about them. Thus, it is appropriate to measure their outcomes on these bases.

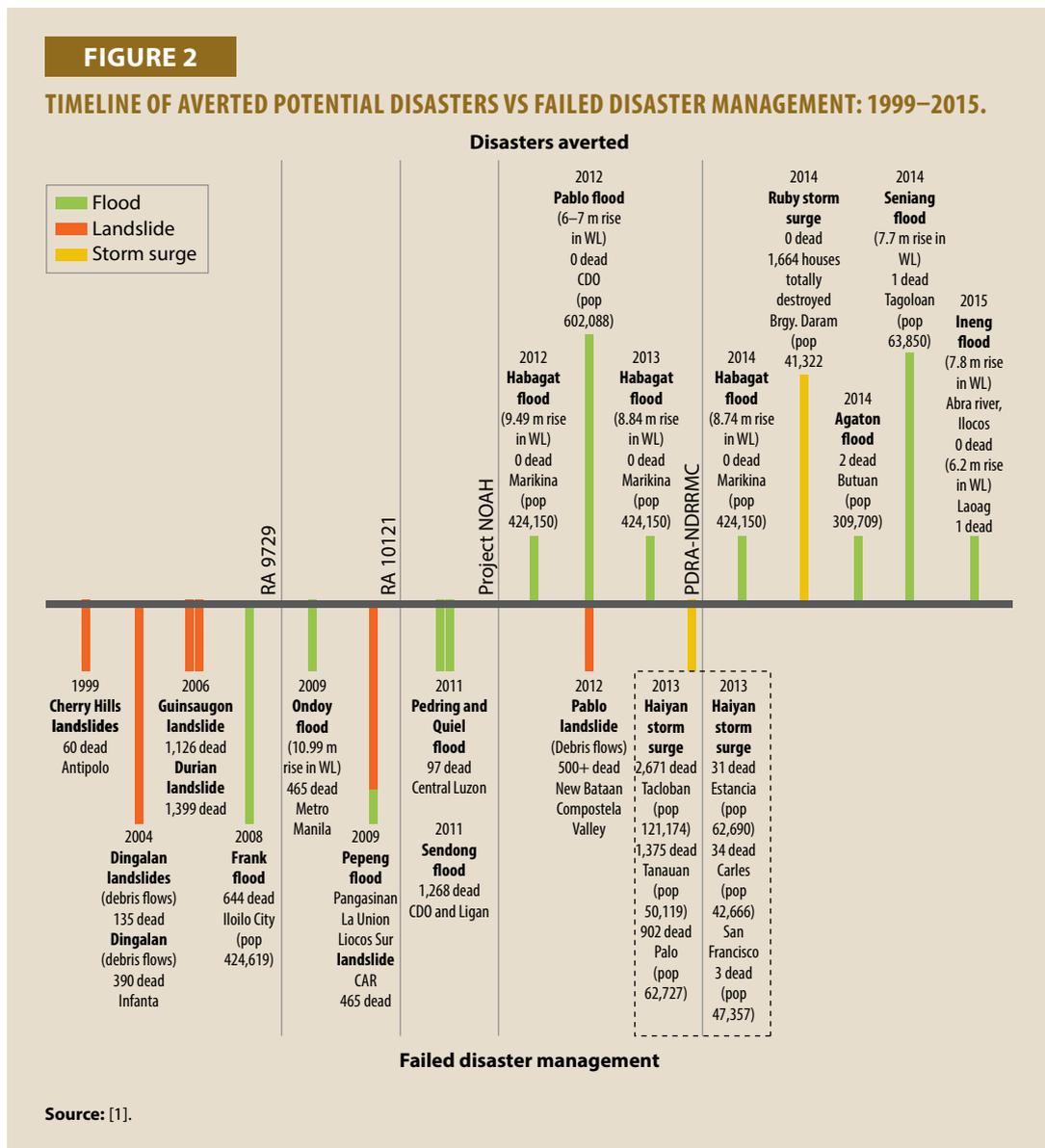
Based on the timeline created by Lagmay [1] (see Figure 2), before Project NOAH was created in 2012, ten major disaster-management efforts failed during 1999–2011, thus resulting in 6,014 fatalities. These included five floods, and five landslide occurrences, mostly in Luzon. From 2012 to 2013, out of the five disasters that took place, three of them (flooding) were successfully managed with zero casualty. Unfortunately, one landslide event in Mindanao in 2012 and the storm surge caused by Super Typhoon Yolanda in the central Visayas region in 2013, which were not managed successfully, caused over 500 and 4,948 deaths, respectively.

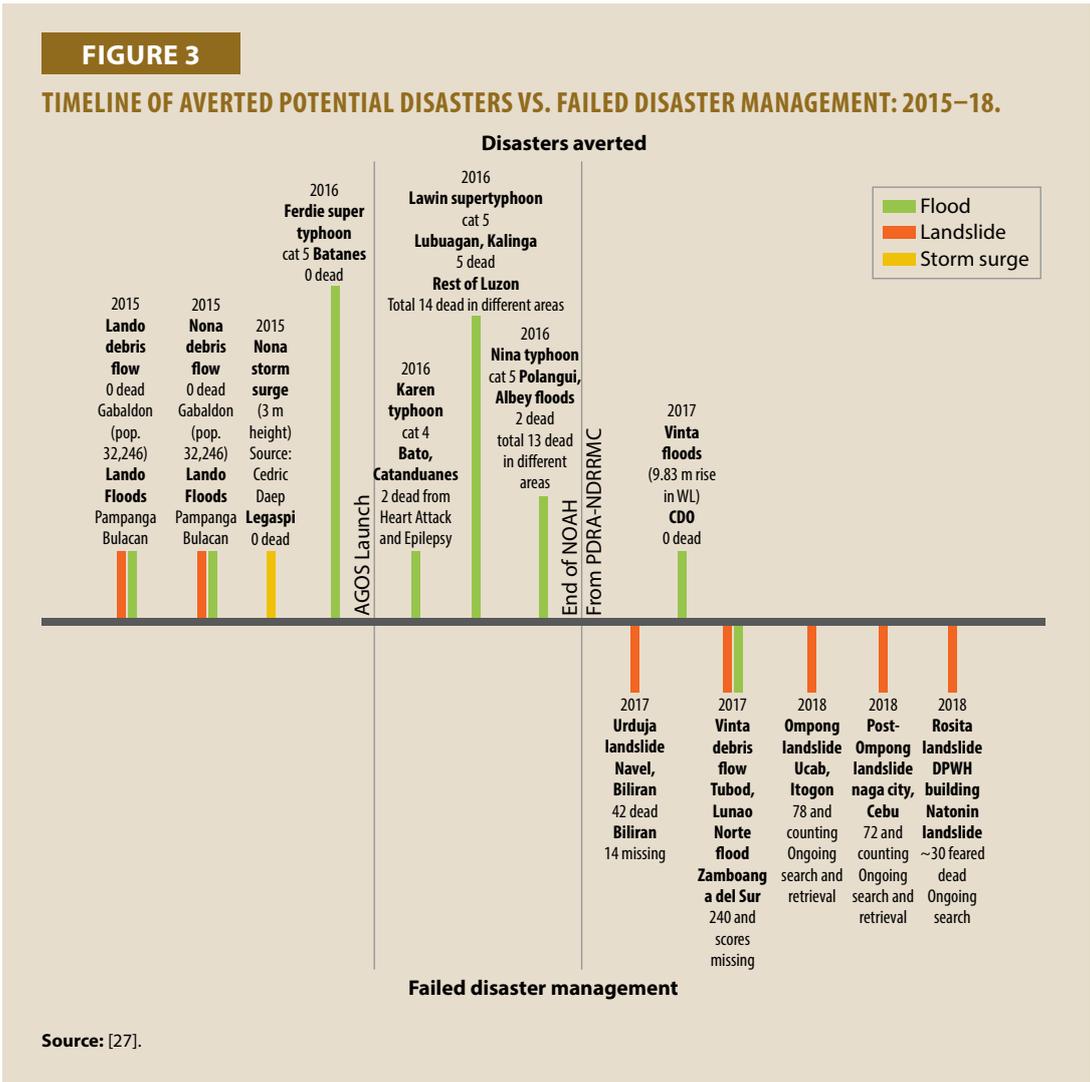
Beginning with 2014, NOAH was included in the Pre-Disaster Risk Assessment (PDRA) system of the National Disaster Risk Reduction and Management Council (NDRRMC). PDRA is a principle, which states that warnings should be ‘hazard-specific, area-focused, and timebound.’ Thus, NOAH’s online hazard maps were used to determine which hazards would hit specific areas at particular times [26]. As a result of this, all 14 disasters from 2014 and 2016, mostly in Luzon, were averted (see Figures 2 and 3) with only 40 fatalities. Unfortunately, 1,664 houses in Barangay Daram, Samar Province were totally destroyed when the storm surge caused by Typhoon Ruby hit the Visayas region. Compared to 1999–2011, there was a 99% decrease in fatalities in 2014–16.

Due to the contribution of Project NOAH in disaster risk reduction and management (DRRM), it received numerous awards from national and international organizations in the areas of ICT, geo-spatial management, resilience, mobile application, etc. [18] (see Annexure 1 for the list of awards).

Beginning in 2017, Project NOAH was terminated by the government and subsequently adopted by UP. At this time, the PDRA’s principle (hazard-specific, area-focused, and timebound) was no longer followed. The government forecasting agencies, once again, resorted to ‘general warning.’ Thus, according to Lagmay [27] (see Figure 3), six out of the seven disaster management efforts failed, resulting in 432 deaths, apart from more than 44 missing and/or presumed dead. The fatality rate spiked 10 times between the time periods 2014–16 and 2017–18.

When it comes to increasing the awareness of the Filipinos about the risks of disasters, according to Lagmay [27], it is manifested by the number of casualties. Thus, a disaster with few or zero casualty could mean that all or majority of the affected population had been adequately informed of the impending disaster.





**Beneficiaries**

In general, the whole country benefits from the services of NOAH. The general public is the primary beneficiary of the hazard and risk maps available on the internet and accessible through their smartphones so that they could prepare for disasters on their own. The secondary beneficiaries are local governments, which could utilize the maps, apps, and scientific studies to undertake all phases of DRRM and to mainstream these together with climate change actions in formulating local development plans. The next set of beneficiaries are national- and local-government policymakers who could utilize the maps to formulate policies that would build a resilient country. Civil society organizations could also use them in their advocacy and to assist the government in DRR. And finally, the academia could utilize the outputs of NOAH in their teaching functions and conducting DRR research and extension services.

**Case Analysis of Success Factors**

**Aligned Vision**

It can be argued that NOAH came into existence because the government could no longer ignore the havoc of disasters, most notably the typhoons that hit the Philippines on a yearly basis and have intensified in strength in recent years. Before 2012, the previous governments responded by enacting

the *Climate Change (CC) Act of 2009* (Republic Act No. 9729), and the *National Disaster Risk Reduction and Management (NDRRM) Act of 2010* (Republic Act No. 10121). However, it was only the government of President Benigno S. Aquino III that made Project NOAH its flagship DRRM program in response to the destructive Tropical Storm Sendong (international name Washi) in December 2011 [3, 28]. The resolve to put an end to the destructions of disasters got firmer when Typhoon Yolanda (international name Haiyan) devastated the central Visayas region in November 2013.

### Prioritized Goals

Building a disaster-resilient country was a high-priority project of the government of President Aquino III so much so that strategies to accomplish it were spelled out in the country's development plan, that is, the *Updated 2011-2016 Mid-Term Philippine Development Plan*. In the environment chapter of that plan (Chapter 9), the favored sectoral outcome was “sustainable and climate resilient environment and natural resources achieved,” followed by the sub-sectoral outcome “adaptive capacities of human communities improved.” Its three cross-cutting strategies were, (1) fast-track the production of updated higher-scale topographic and other thematic base maps and completion of geo-hazard maps with 1:10,000 scale; (2) update and further downscale climate projections; and (c) fast-track vulnerability assessment, mapping of highly vulnerable areas, communities and priority sectors and integration of climate change adaptation and mitigation (CCAM) and DRRM in development plans and programs [29].

### Pragmatic Implementation

NOAH started off as a project by DOST, with a definite beginning and ending period. As a project, it was not attached to any government agency, which enabled it to avoid the dysfunctions of regular bureaucracies. It was nestled in UP, which also enabled it to network with academics and experts of the university, and tap human resources from among them. Furthermore, NOAH benefitted from the billions of pesos allocated to it by the government. It also obtained the support, resources, and cooperation of relevant government agencies (for example, DOST, PHIVOLCS, and PAGASA). In return, it was subjected to a lot of pressure to produce the intended outputs and release them immediately to avert future disasters.

The dissolution of Project NOAH in 2017 encountered a bumpy road. The DOST requested the project executive director, Lagmay, to turn over the deliverables, outputs, and all components to the agency but had no plans of absorbing the over 200 project personnel to the disappointment of the latter. Realizing NOAH's potential in fulfilling its mandate of serving the people through academic extension activities, UP, which has been NOAH's domicile since its inception, decided to ‘adopt’ it through an executive order of the University President in 2017, which was later approved by the university's Board of Regents [17].

### Enablers

Project NOAH received tremendous support from all sectors in the Philippines. Fifty-six national government agencies, local government units, academic institutions, civil society organizations, and foreign governments provided various forms of support. The governments of Japan, the ROK, the UK, Germany, Australia, and the USA provided financial assistance through their aid agencies. Philippine government agencies like the National Disaster Risk Reduction and Management Council-Office of Civil Defense, Climate Change Commission, DOST-ASTI, DENR, Department of the Interior and Local Government, Department of Social Work and Development, and Department of Health, among others, cooperated through data exchange and other forms of technical assistance. Big television networks lent their communication knowhow while leading

ICT companies assisted in software and application developments. Several academics and researchers of some units of UP were tapped by the government to implement the project led by Lagmay [18]. (For the complete list of agencies and organizations that support/supported NOAH, see Annexure 2.)

### **Strong Foundational Elements**

Since its inception, NOAH had strong political and legal backings. Two national laws, i.e., *CC Act of 2009*, and the *NDRRM Act of 2010*, call for risk and hazard mapping as starting points in identifying the vulnerable areas of the country. However, it took several devastating disasters up until 2012 for these to be realized. This time, hazard and risk mapping were included in the national development plan as a strategy to build a resilient Philippines. Its inclusion as part of the blueprint for national development aided in securing funds from Congress.

### **Lessons Learned and Insights from the Case Analysis**

It is said the disasters bring out the best in people. In the Philippines, it took several catastrophic natural disasters before the government decisively created real-time weather updating and advanced early warning system by systematically collecting big data, digitizing, and digitalizing them into risk and hazard maps. As one saying goes, “Better late than never.”

The story of NOAH offers so many lessons, which could be useful for those who might want to follow its path:

- Start with an independent project-based undertaking. This would insulate it from bureaucratic dysfunctions normally associated with regular government offices as, for example, red tape, and procurement problems.
- As a project, it must have a ‘sunset provision,’ i.e., a definite beginning and an end, to avoid poor performance or poor productivity of the personnel. However, the latter should be informed about this before they are recruited into the project.
- The project must receive political backing from the national leader. This will ensure continuous support, especially in terms of funds.
- It must be supported by a law or laws so that legal questions about its existence could be avoided.
- It should be made part of the national development plan as a strategy towards resilience building.
- Recruit the best and the brightest staff preferably fresh from the university.
- Locate the project office in a university, which produces the fresh graduates and employs the academics that the project needs.
- Secure the support from relevant government agencies, local governments, DRRM and climate-change champions, academic institutes, telecommunication companies, IT professionals and organizations, civil society organizations, and funding agencies.

Understandably, NOAH hit a snag when it was time to fold up in 2017. The project’s executive director expressed disappointment that there was no plan on the part of DOST to absorb its staff, who had produced the risk and hazard maps and invented the associated technologies and gadgets. It would be a real loss to the government if they were not hired on a continuous basis. The DOST, however, was right in saying that it had no obligation to recruit them in permanent capacities as this was a project, which hired them as casuals or nonpermanent personnel. Also, the agencies, which received the deliverables and outputs of the project, have equally competent staff of their own to continue what the project had finished. Both had good arguments. Luckily, a few of the project staff were hired by UP when it adopted NOAH in the same year.

If the casualty numbers in Figures 2 and 3 are to be believed, something is amiss with the turnover of the project’s outputs to regular government agencies. If it is true that the latter were providing early warnings just like before (which were not hazard- and area-specific, and timebound) that resulted to fatalities in disaster-stricken areas, then it is time to examine the operations of those agencies. For what good are the modern technologies if there is no accompanying reform in the bureaucracy to fully utilize them? As British science novelist John Brunner once said, “It’s supposed to be automatic, but actually, you have to push the button.” These agencies must reach out to local communities and local governments in advance or in a timely manner to avert disasters using the information they have. There is no more excuse to be late. Technology alone will not solve mankind’s problems.

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## Annexure 1

### List of Awards Received by NOAH and Its Components

#### International

1. Top Smart City Initiative in Public Safety at the Smart City Asia Pacific Awards, 2016, from the International Data Corporation Asia Pacific

2. Harnessing Data for Resilience Recognition Award, 2016, from the Harnessing the Data Revolution for Resilience Summit
3. Silver Prize in the Corporate Social Responsibility category, 2015, from the 2015 ASEAN ICT Awards
4. UN World Summit Awards Mobile Content, 2014
5. Geospatial World Excellence in Policy Implementation Award, 2014
6. Asia Geospatial Excellence Award, 2013, from Asia Geospatial Forum 2013

#### Local

1. Special Award, 2016, from the University of the Philippines
2. Best Telecom Project, 2016, from the 16th Telecom Asia Awards
3. Best Philippine-made Mobile Application of the Year, 2015, from the International ICT Awards Manila
4. 2015 *Gawad Parangal* Awards from the Quezon City government
5. Best Mobile App, 2013, from the FutureGov Awards
6. Anvil Award of Excellence, 2013, from the 48th Anvil Awards
7. IT Product of the Year, 2012, from the Cyberpress Awards
8. Digital Heroes Awards, 2012, from the Media Digital Heroes Awards

Source: [18].

## Annexure 2

### Collaborating Agencies, Institutions, and Organizations

1. National government agencies
  1. Climate Change Commission
  2. National Disaster Risk Reduction and Management Council-Office of Civil Defense
  3. Department of Social Work and Development
  4. Department of the Interior and Local Government
  5. Department of Agriculture
  6. Department of Health

7. Department of Environment and Natural Resources
  8. Department of Public Works and Highways
  9. Department of Science and Technology-Advanced Science and Technology Institute
  10. Department of Science and Technology-Science and Technology Information Institute
  11. Department of Science and Technology – Philippine Council for Health Research and Development
  12. Department of Science and Technology - Philippine Institute of Volcanology and Seismology
  13. Department of Science and Technology - Philippine Atmospheric, Geophysical, and Astronomical Services Administration
  14. Philippine Information Agency
  15. Metropolitan Manila Development Administration
2. Local governments
    1. 2nd District of Albay
    2. City of Legaspi
    3. Ligao City
    4. League of Municipalities of the Philippines
    5. League of Cities of the Philippines
3. Foreign governments, international organizations, and financial institutions
    1. The World Bank
    2. US Agency for International Development
    3. British Council
    4. British Embassy
    5. UK Environmental Agency
    6. *Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH*
    7. International Organization for Migration

4. Academic organizations and scientific organizations
  1. Volcano Tectonics (VTEC) Laboratory, National Institute of Geological Sciences, University of the Philippines
  2. Earth Material Science (EMS) Laboratory, National Institute of Geological Sciences, University of the Philippines
  3. Training Center for Applied Geodesy and Photogrammetry, Department of Geodetic Engineering, University of the Philippines
  4. Marine Science Institute, University of the Philippines
  5. Computer Center, University of the Philippines
  6. Manila Observatory
  7. Cabot Institute, Bristol University
  8. Institute of Earth and Environmental Sciences, University of Potsdam
  9. Environmental Science for Social Change
5. Telecommunication and television networks
  1. ABS-CBN Corporation
  2. MediaQuest Holdings, Inc.
  3. Smart Communications, Inc.
  4. SUN Cellular
6. ICT-related organizations
  1. OpenStreetMap Philippines
  2. nababaha.com
  3. DRRNet
  4. ClimateX Project
  5. Google Crisis Response
  6. Team 48

7. Business corporations
  1. Petron
  2. Energy Development Corporation
  3. Silverworks
  4. Open Garden
  5. Safe Steps
  
8. Civil society organizations and professional organizations
  1. Local Climate Change Adaptation for Development
  2. Consuelo Foundation
  3. Volunteer Services Overseas
  4. Rotary Club of Pinamalayan Central
  5. *Pambansang Samahan sa Linggwistika at Literaturang Filipino, Ink.*

Source: [18].

## CASE STUDY 6

# THE NEW FUNDS TRANSFER SERVICE AND PAYMENT PROMPTPAY, THAILAND

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### **Abstract**

Nowadays, we cannot deny that information technology (IT) has been creating changes in all aspects of our borderless world, including our daily life. It also has an impact on national development. One of the applications of IT in government is the financial payment system or PromptPay in Thailand. This is a crucial electronic financial transaction system that requires the participation of the public sector, the private sector, and people to promote economic and social activities together in a flexible and effective way. Moreover, PromptPay supports innovation and competition in the financial and banking industry, relying on the management ecosystem and national infrastructure. In addition, the project has also resulted in the advocacy of policies and programs that have been designed and integrated to benefit the public.

This study highlights the key success factors of the implementation, the lessons learned, and the mechanisms that drive the PromptPay project, including the major results of the project towards the security, prosperity, and sustainability of the country. A key success of PromptPay is the enhancement of the project on the national agenda under the National E-Payment Master Plan. It has also created a new ecosystem for the relevant parties and developed a single integrated infrastructure that provides flexibility in applying the system in a secure manner. The project is continuously being developed through prototypes or quick-win projects, and management and use experience is considered in the design of PromptPay applications.

### **Introduction and Background**

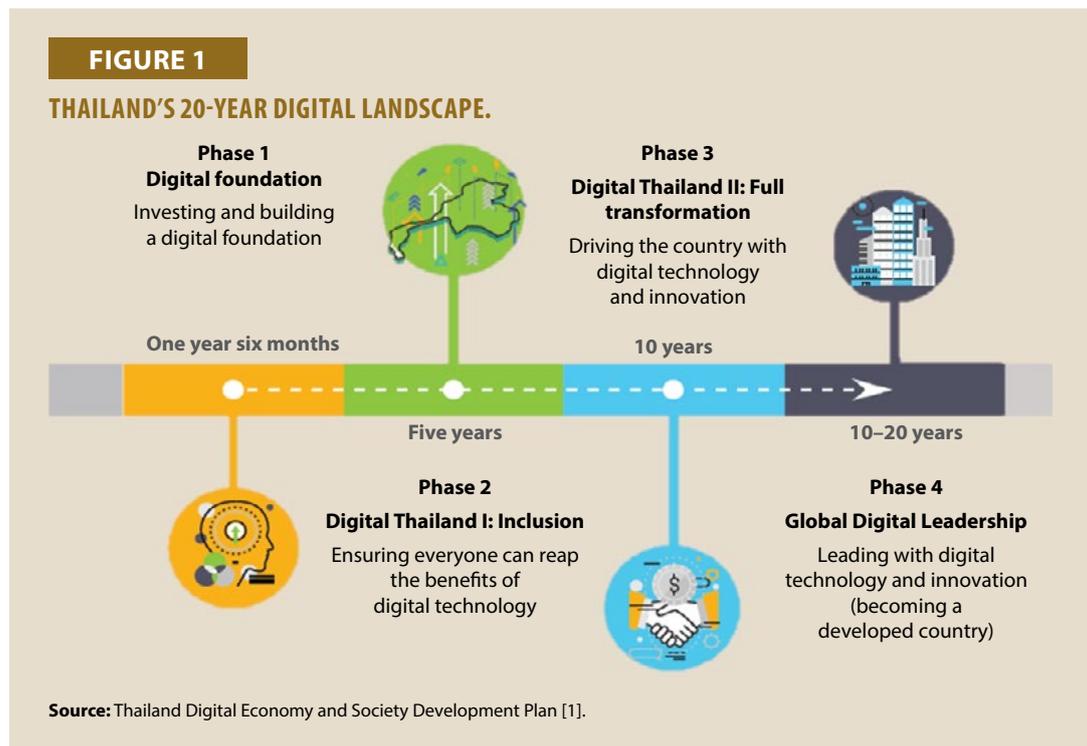
The rapid and worldwide developments in IT, especially in digital technology, have created fundamental changes that affect the daily activities of people as well as the operations of the public and private sectors. There has been a paradigm shift and structural transformation in response to the opportunities and threats generated by digital technologies. To get the most benefit for the country, new management principles and tools are integrated and applied together.

For Thailand, in accordance with the principles of ‘leave no one behind’ and ‘security, prosperity, and sustainability,’ the Cabinet approved the Digital Economy and Society Plan on 5 April 2016 (see Figure 1). This plan is to serve as a framework to apply digital technology as a key mechanism for economic and social development, including the development of state administration. The Digital Economy and Society Plan and Thailand 4.0 Model, an economic model that aims to transform the economy through value-added services and innovation, reflect the government’s awareness of the importance of digital technology. Digital technology can be both an opportunity

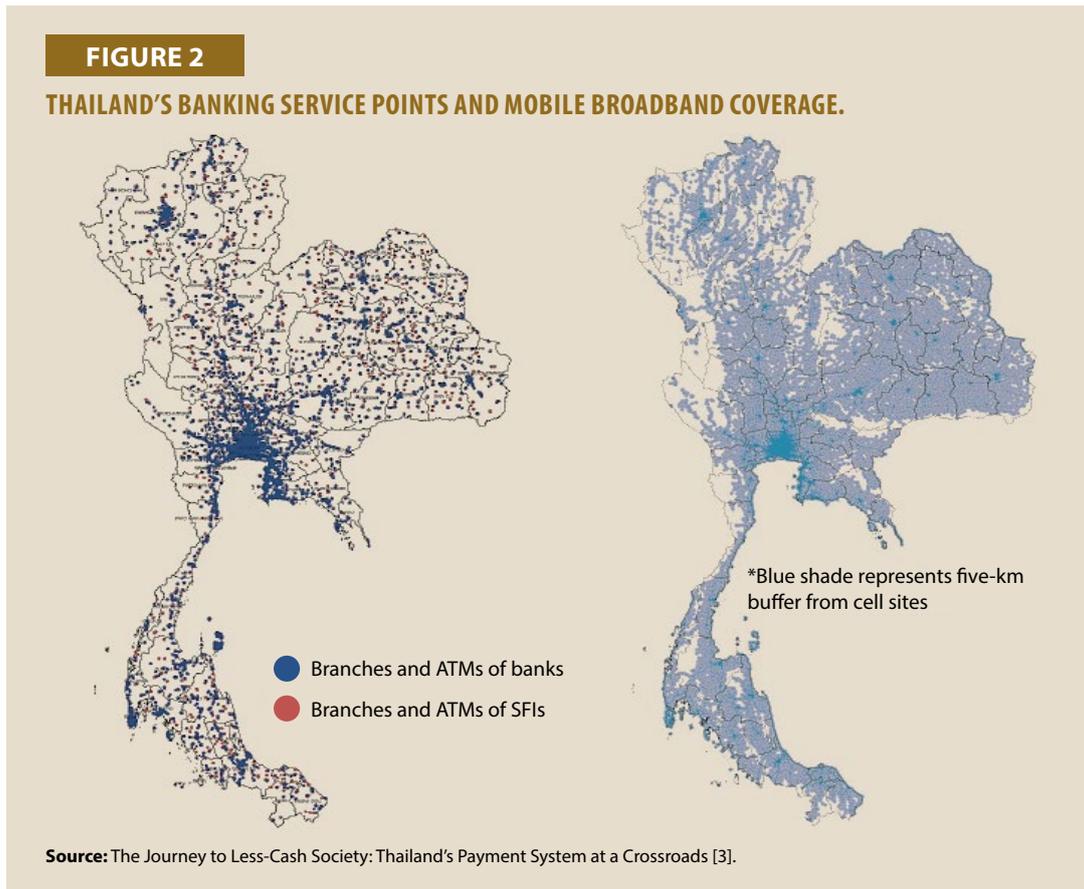
and a challenge for Thailand in developing its economy and society. One of the government efforts in promoting socioeconomic development is the National E-Payment Master Plan. This plan aims to increase financial accessibility and financial services, in addition to reducing the risk of fraud in the economic system. It results in a saving of THB75,000 million [2] or USD2,490 million per year in terms of the national cost of cash management.

As a new option for financial transactions, PromptPay is made possible by advanced digital technology, telecommunications, and financial innovation (see Figure 2). A PromptPay service goes beyond internet banking, mobile banking, ATM, and services at the bank counters. It allows individuals to transfer money between banks with an account or any ID such as mobile number, ID number, bank account number, e-wallet ID, or an e-mail address. In the first phase, the system required the user to use the mobile number and ID number to access basic operations. The PromptPay service focuses on payments based on international standards. The cost of the service is reasonable, and it is safe and reliable. PromptPay also provides other types of transactions as requested by users (people, the public sector, and the private sector).

This project was created through the cooperation of the relevant sectors, namely, the Ministry of Finance, Bank of Thailand, public-sector agencies, financial institutions, and business sectors. The project aims to help the business sector and the public so that they are able to access its financial services easily. The project will be the basis for other financial services in the future.



PromptPay was officially launched on 15 July 2016. It came into service on 31 October 2016. As of 31 December 2018, there were 46.5 million registered users with the system. More than 50% of Thai bank accounts have already registered with PromptPay, and on average 4.5 million use the system daily. Besides, in 2017, more than 2 million or more than 70% of Thai taxpayers obtained their tax refunds through this system. Similarly, during 2016–18, the number of financial transfers via digital payment increased by 83%. [4]



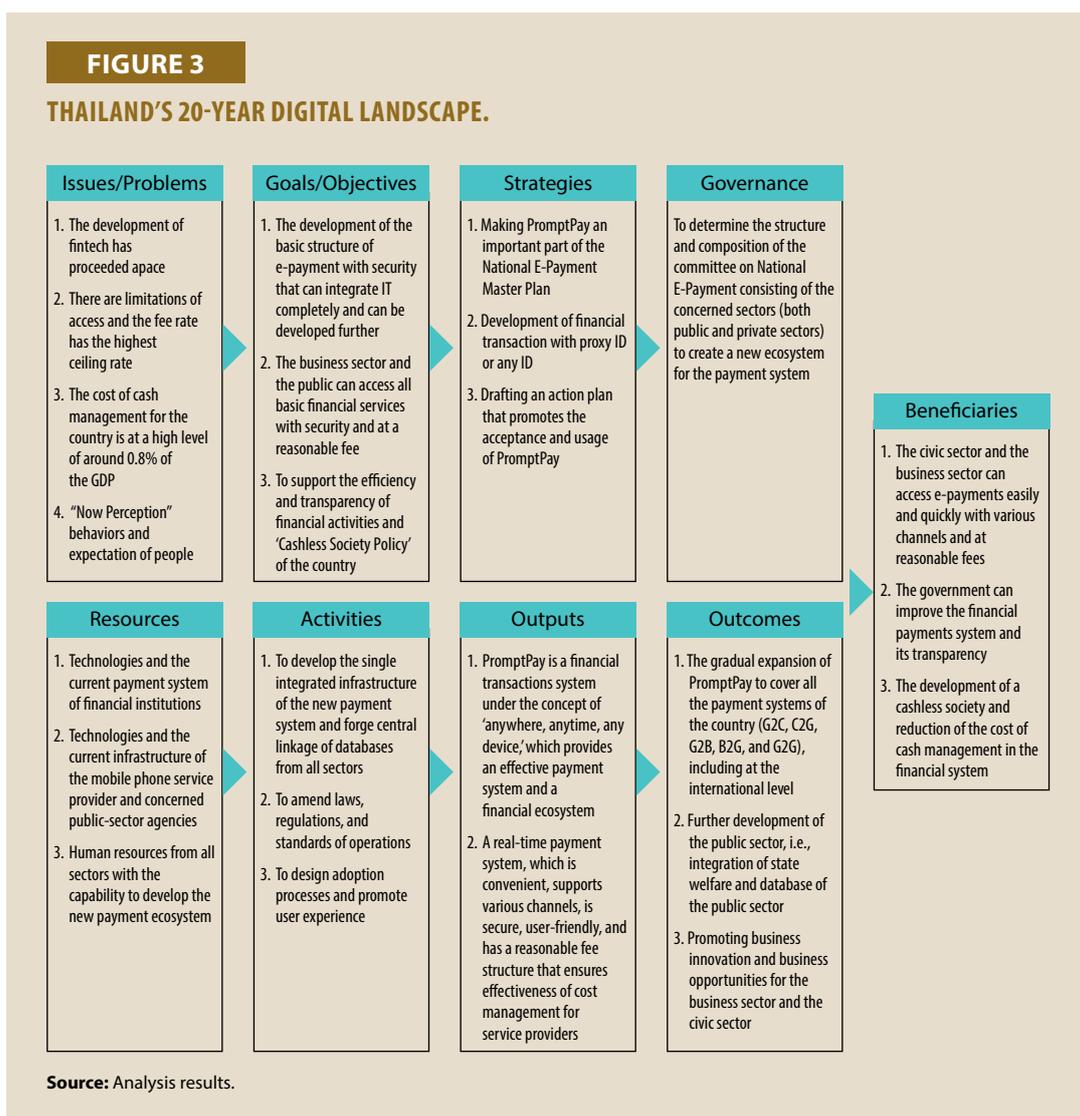
### Focus and Scope of Case Analysis

The case study seeks to analyze the new remittance and payment service of Thailand, namely, PromptPay. The service has created a new ecosystem for digital payments that promotes effectiveness and safety at a reasonable fee. It is aligned with the transformation of the government sector. This study highlights the key success factors and the good practices of the project since its inception. The Policy Modeling Canvas is applied to analyze and identify the success elements of the PromptPay project (see Figure 3). The case study hopes to be a model for emulation by other countries. It also highlights the opportunities and threats for Thailand as a result of the introduction of this new technology that has been pioneered jointly by the public sector, the private sector, and the civil society. The project is a combination of many technologies, which, with the modern management and other important strategies, will help implement the ‘Thailand Digital Economy and Society Development Plan.’

To undertake this research, we collected secondary data on quantitative results and statistical models. The study also embarked on qualitative research, interviewing the relevant parties from public and private sectors. We also interviewed the representative of the National ITMX Company. This company was assigned by the Bank of Thailand to develop PromptPay. Based on the quantitative and qualitative data, the study identifies the progress of the project and specifies the key lessons learnt from the project’s implementation.

### Case Analysis through the Policy Modeling Canvas

The Thailand 4.0 Model is an economic model that aims to transform the economy through value-added services and innovation by applying digital technology to all sectors and to the daily life of



citizens with the purpose of creating economic prosperity and sustainable employment through moving up the value chain of the country. One of the projects under the National E-Payment Master Plan is the PromptPay Project. This project and each of its elements can be visualized with the Policy Modeling Canvas as follows:

### Issues/Problems

Funds transfer is a basic payment function. It is very important for capital movements in the country's economic system across all sectors such as money transfers between persons; financial transfers for business activities including remuneration transfers; expenses; and budgets of the public sector. Having a financial transfer system that is more convenient, rapid, flexible, transparent, and safe is crucial to support people in their daily lives and economic operations. The system also enhances the competitive capacity of businesses in the country.

However, the civic sector still faced significant problems in accessing financial services, even basic financial services, in terms of branch accessibility, inadequate branches, fee charges at the maximum rate of the ceiling, and service quality. Since 1983, Thailand has been using the automatic teller machine (ATM) to apply technology to the financial sector. In 2016, Thailand's cash to GDP

ratio stood at 11.6, highest among 12 emerging countries, while non-cash transactions amounted to only 50 transactions per person in a year.

There is a cost to using cash in the economic system. This includes the cost of printing, maintenance, transportation, and elimination, which can be considered an economic burden. The cost is approximately 0.8% of the GDP annually. When comparing the cost of payment for the same value of transaction, it is found that paying cash costs about three times more than e-payment [5]. Payment with cash creates some problems in the shadow economy as well.

Furthermore, technology has advanced rapidly globally, disrupting the business model and daily lives of people. Using electronic devices to do business transactions has become more common. Also, financial transactions are changing from cash payments to going e-payments. In future, electronic devices and mobile phones will become digital wallets for business sectors and citizens because the system is capable of easy access. Aiding this adoption is a growing expectation for faster services in Thailand. In 2015, mobile subscriptions and the number of active internet users in Thailand were 122% and 56% of the population, respectively [6].

The acceptance of real-time payment is a result of product development and introduction of new services by financial institutions. Also, the business sector now has an opportunity to create a payment data system. The database created from e-payments will be useful for its strategic development. Furthermore, it is an opportunity to integrate and enhance the state administration in terms of providing effective services to the people and is indeed a step forward in digital government.

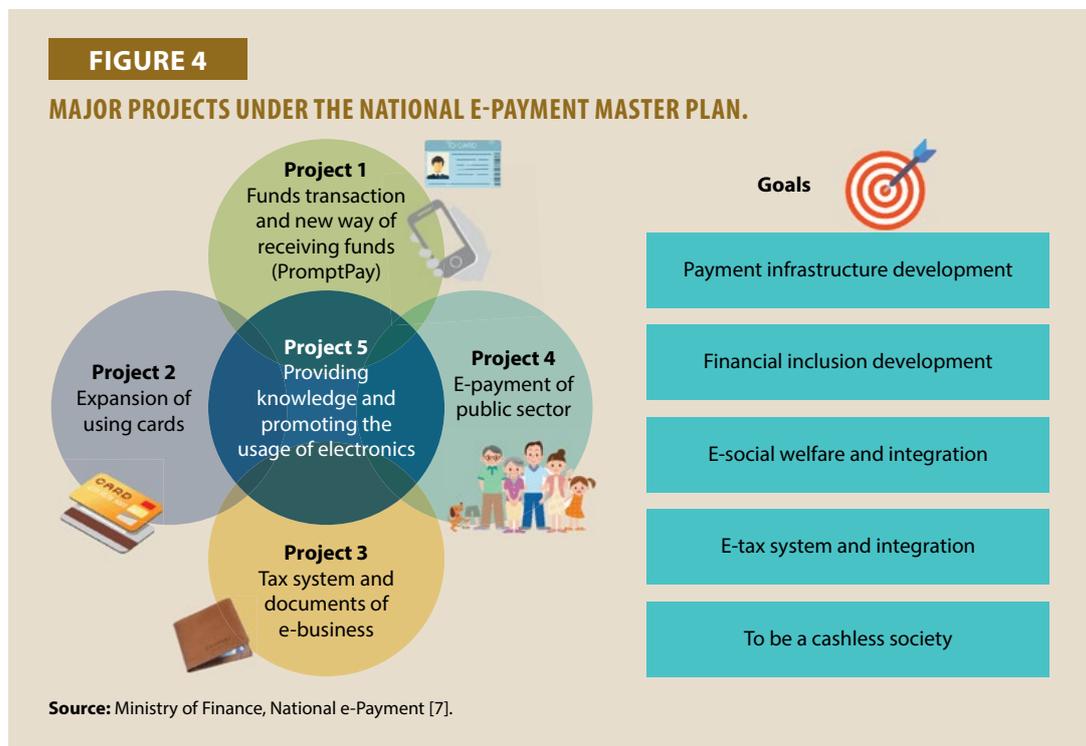
### Goals/Objectives

Advances in technology, internet coverage, and consumer behavior trends have resulted in continuous and radical developments in fintech. Financial institutions as well as nonbanks can leverage their online financial services for the benefit of citizens and businesses. This service also ensures financial accessibility for the ‘unbanked’ or those who have never received the service, and the ‘underbanked,’ i.e., those who have received insufficient service.

PromptPay, the first major project under the National e-Payment Master Plan, has focused on offering opportunities to individual, businesses, and the government to carry out remittances. It also focuses on improving the overall operational efficiency of government agencies through the development of payment systems. As one of the channels for money circulation in the economy and to sustain the stability in the financial system as well as to prepare for the adaptation of the digital economy, PromptPay has the following major objectives:

1. Develop the basic structure of e-payment to provide security and full integration of information to ensure sustainable development.
2. Enable businesses and citizens to access all the basic financial services with security and with reduced fee.
3. Support the efficiency and transparency of financial activities so that the system will reduce errors and fraud.
4. To meet the nation’s policy of a cashless society.

As a major project promoting National E-Payment system, PromptPay allows all sectors to progress further. The project is integrated through a roadmap that connects the action plans and operational objectives with other major projects under the National E-Payment Master Plan.



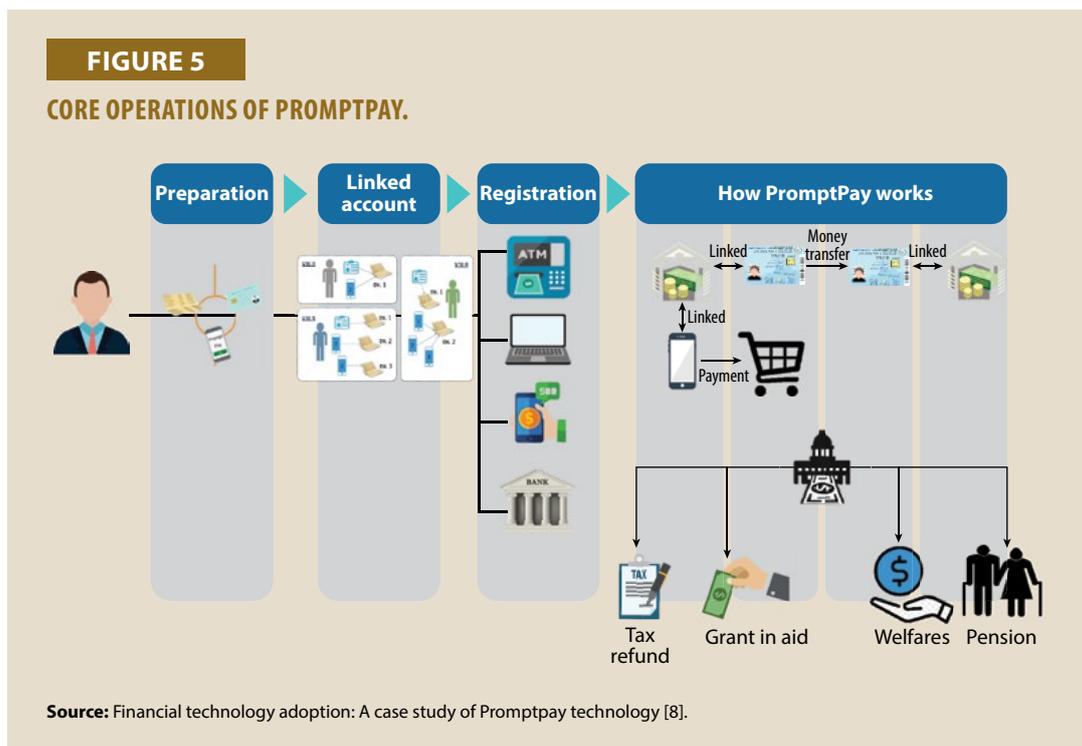
### Strategy

In mid-2011, the country was hard hit by a flood. The disaster ended in January 2012. This crisis delayed the launching of the project PromptPay, thereby causing a detrimental impact on the public sector, the business sector, and the public at large. On 21 July 2015, the Ministry of Finance proposed a concept to develop the National e-Payment system in order to manage the nationwide financial system. This system would allow all Thai people to access the services and be able to use it at an affordable cost. The official launch of PromptPay was witnessed on 27 January 2017. Bank of Thailand is the key player that has driven and supported the development of this basic payment system.

Managing the project effectively will require specific strategies for building demand for PromptPay along with the strategies for developing its management and operations. To create a new ecosystem and a value-creation network of the payment system, and to have a secure demand for economy of scale, the following major strategies were crafted:

1. Integrate and enhance the features of PromptPay as the first major project of the National e-Payment Master Plan and as part of the national digital infrastructure, to usher Thailand into a cashless era. PromptPay seeks to help contribute to the achievement of the goals of 'Thailand Digital Economy and Society Development Plan,' as well as to upgrade the guidelines and information management systems as shown in Figure 4.
2. Develop financial transactions with proxy ID or any ID by the establishment of a single integrated infrastructure (see Figure 5) that allows financial-service providers to be interconnected to the information systems (interoperability). The project also covers the

design of the operations and incorporates user experience in the design. The system seeks to be user-friendly, convenient, and interoperable with other electronic devices through a network of financial service providers and mobile phone providers who are the major stakeholders in creating value in the ecosystem. The ecosystem will be secured and guarantee privacy of information. It will also meet the needs of both existing and future users. Initially, people will be able to transfer money by using their own mobile phone numbers or their ID numbers. This is a big improvement from the previous situation where they could only transfer money through their bank account numbers.



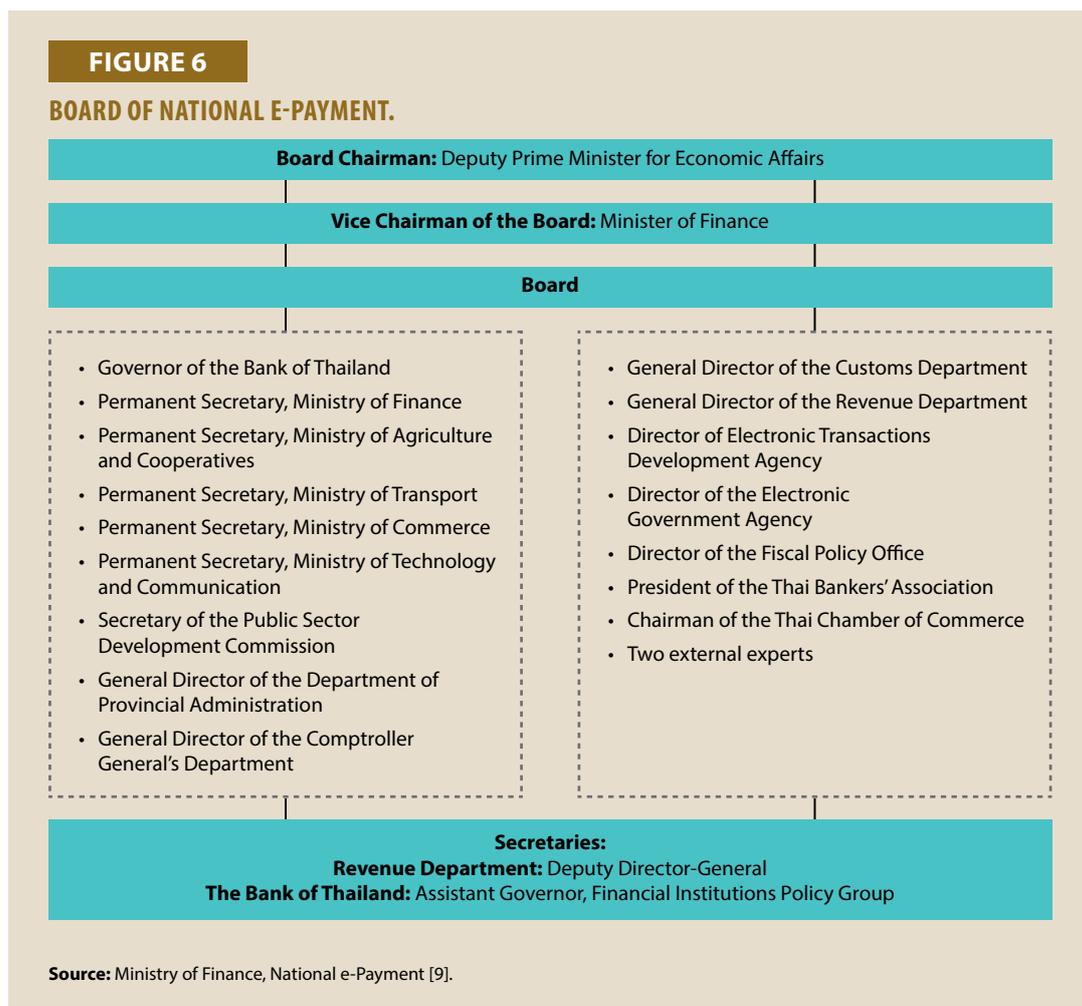
3. Craft an action plan that promotes the acceptance and usage of PromptPay by citizens and businesses. The new payment system is designed to not only link the information effectively, but also to meet the needs of users. Therefore, the structure and trend of acceptance (behavioral intention) of users will be an important influence in further improving this financial technology that eases their daily lives (actual usage). The integration of information from public and private sectors will aid in the continuous development of this new payment system, PromptPay. A specific roadmap will connect PromptPay with other major projects under the National e-Payment Master Plan.

**Governance**

A governance framework will facilitate the management of the PromptPay project. This framework will consist of the mechanics of the operation as well as the core values that will guide all parties in the new payment ecosystem during the development of the project and its operational phase. The roles and duties of the Bank of Thailand are especially important as the institution that will operate and secure the payment system, including the printing of banknotes, the management of using banknotes, and supervising the financial service providers of both banks and non-banks. The Bank of Thailand has information about the entire financial payment system and its operations. That means that the Bank of Thailand has the best and most comprehensive database of the financial

payment system of Thailand. It is for these reasons that the Bank of Thailand has been assigned to be a major player to work with the Ministry of Finance to encourage banks and telecommunications networks to drive and promote PromptPay as the new secure and sustainable payment system so as to win the confidence of users from all sectors.

The Board of National E-Payment was established on 22 December 2015 to ensure the proper implementation of the e-payment system. The Deputy Prime Minister of the economic affairs is the chairperson, and the board consists of representatives from the public sector, private sector, and relevant network providers (see Figure 6).



Specifically, the major roles of the Board of National e-Payment are as follows:

1. **Driving the development of PromptPay:** The Board's Working Committee will be responsible for operating the various projects of the Board. It will cooperate with National ITMX, a company established with the collaboration of Thai commercial banks to implement the policies of the Bank of Thailand regarding the payment system. The company takes responsibility for the operation and development of the new payment system. The project will also contain guidelines for each sector to ensure the integrity of the payment system. The Board will also ensure the development of performance metrics and the continuous update of the technology to enhance user-experience of the target groups.

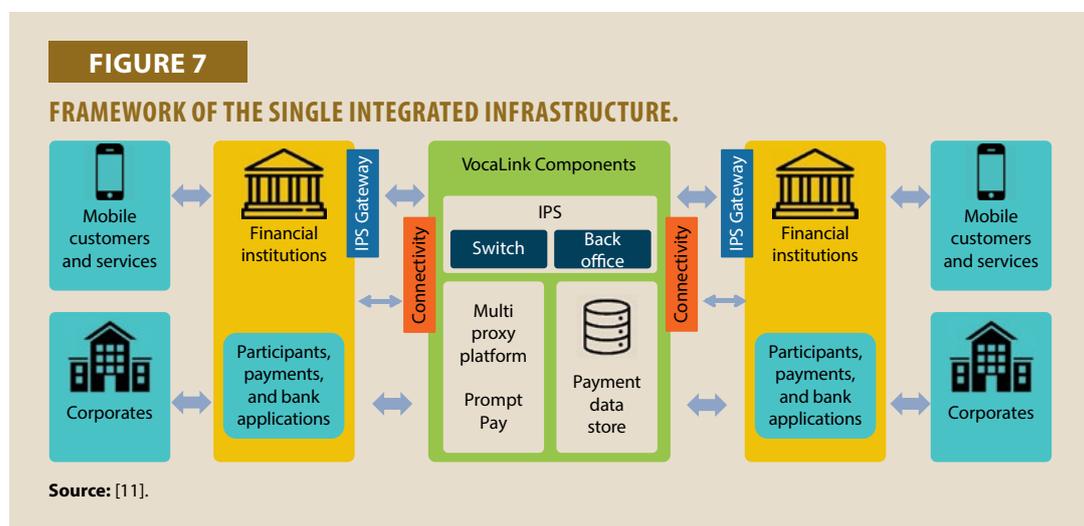
Along with infrastructure development, regulations and laws related to e-transactions have been developed and implemented to regulate this new payment ecosystem so that it operates smoothly and reliably to facilitate transactions among parties.

2. **Development and integration of related information:** The Ministry of Interior, Ministry of Information Technology and Communications, and the National Broadcasting and Telecommunication Commission are the agencies that are involved in the development and integration of related information.

Under the any ID policy, key information of target users both in government and private sectors is gradually linked through an ID number, mobile number, bank account, e-wallet, and e-mail address. The information will be adapted to a single format that can support remittance information and help reconcile purchase transactions including international transactions.

**Resources and Activities**

Resources include cost, time, personnel, technologies, and other devices that are needed to ensure the success of the project. The lack of resources will directly impact the operation of the project and the implementation of the related action plans. PromptPay will focus on the resources that help realize the value proposition of its new payment system. Banks and financial institutions have provided companies the requisite technology and basic infrastructure of the payment system to link and build a single integrated infrastructure that creates the confidence in the security and privacy of the PromptPay system. The system conforms to the international standard for submission and dispatch of financial information under ISO20022. It also complies with the e-commerce laws that have been amended and applied, including the Payment System Act B.E. 2560, Electronic Transactions Acts (No. 4) B.E. 2562, Personal Data Protection Act B.E. 2562, and Cybersecurity Act B.E. 2562. [10].



Furthermore, businesses and financial institutions have an important role of publicizing to their users the benefits of the system and the way to use it.

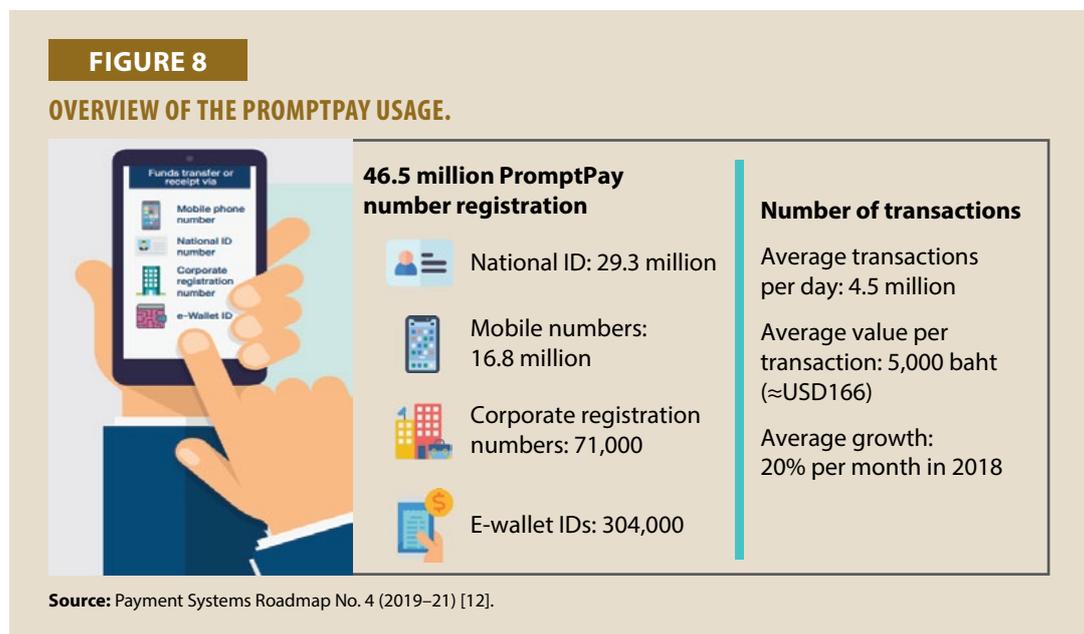
Although the implementation of the project and activities will increase operating costs to financial institutions in the short term, it is a worthy investment, given the cost savings in the long term and the opportunities for further development of financial services. The public sector, which is involved

in this PromptPay project, also develops the information technology (see Figure 7) to integrate the databases through the development of the ‘Linkage Center.’ This center is the key resource of PromptPay. It allows the integration of PromptPay with other major projects under the National E-Payment Master plan.

Human resource is another significant resource that drives the project. Human resources include personnel from all related sectors who have the ability to learn and operate the project. Personnel development in the public sector is especially important to move the project. Accordingly, state officers and state agents should have the requisite digital skills, or the capability of learning and applying digital technology to drive digital transformation in government.

**Outputs**

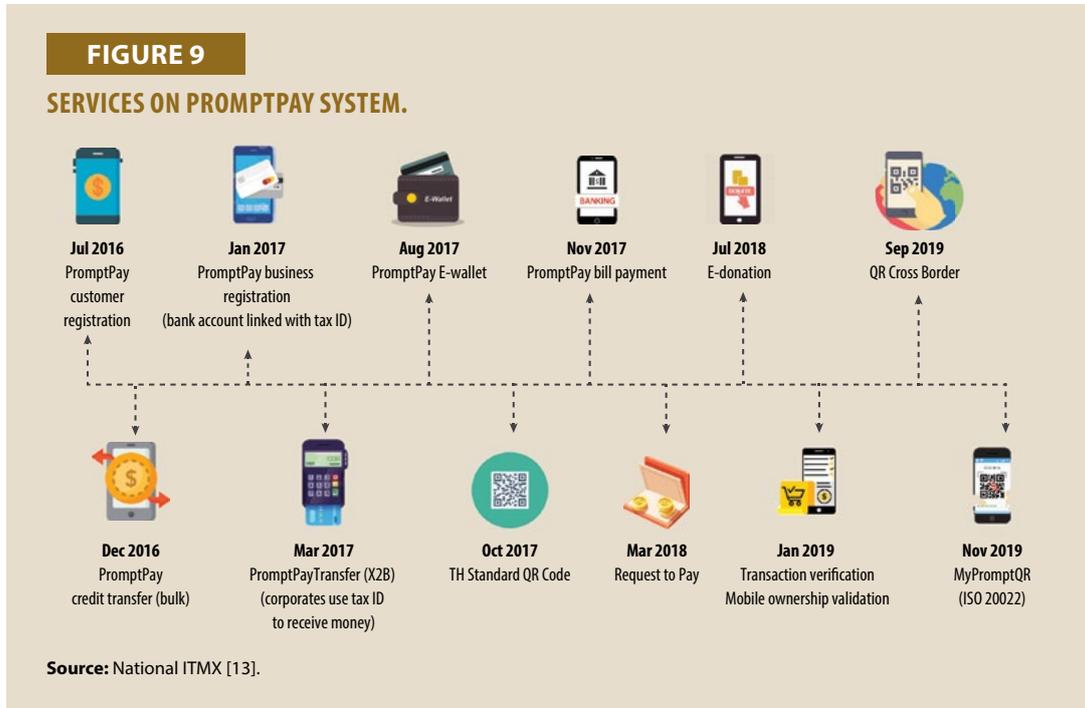
There are a number of opportunities from fintech advancement and mobile registration of citizens. Around 93 million have registered mobile phones, which means that most Thais can access a mobile network and are already familiar with the device in their daily lives. Being able to adopt developments in financial technology can lead Thailand a step closer to a cashless society quickly while also enhancing the state administration through the adoption of electronic payments. The development of the payment system on any ID model or PromptPay project will create the basic infrastructure of the national payment system that is networked with the financial-service providers and telecommunication networks. PromptPay will also be able to provide services to the business sector. Citizens too will have more opportunities to access the services (financial inclusion) in various channels, in a user-friendly, fast, and secure way under the concept of ‘anywhere, anytime, any device,’ and at a reasonable fee.



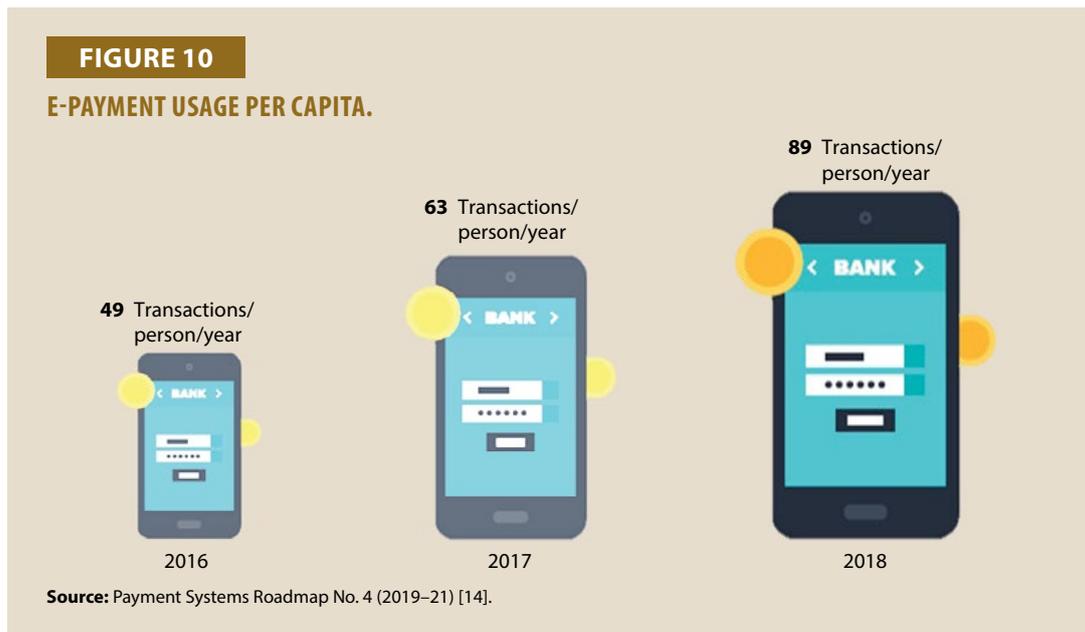
Furthermore, the money transaction and payment system via PromptPay have continuously gained popularity, especially during the COVID-19 pandemic. Its contactless payment feature can help prevent the spread of the coronavirus despite being used extensively. In April 2020, there was an increase in the number of people who registered for this system. The number of registered users is 52 million and the average transaction per month is 11 million transactions. The number of transactions per day is 16 million.

**Outcomes**

Figures 8 and 9 illustrate the progress of the project in different phases. They also reflect the outcomes and impacts of project implementation, including the series of innovations that relate to four other major projects in the National e-Payment Master Plan.



Furthermore, PromptPay has introduced continuous improvements to the Thai payment system, leading to changes in electronic payment. From 2017 to 2019, digital payment in Thailand has grown rapidly (see Figure 10). There has been a constant increase in the number of authorized payment providers while the number of Thais using e-payment has witnessed a constant average annual growth of 116%.



## Beneficiaries

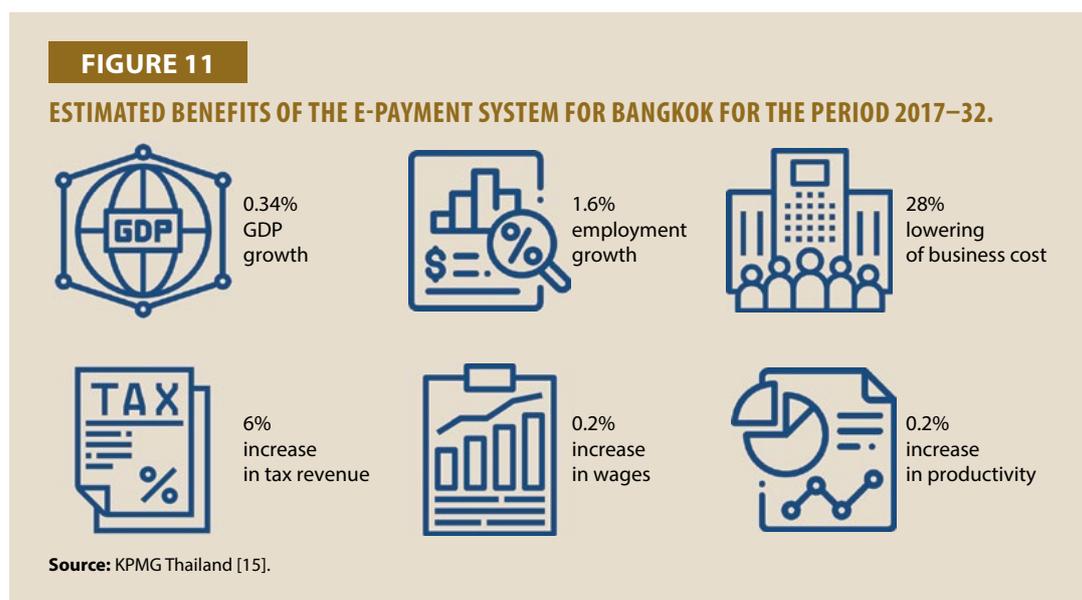
Basing PromptPay transaction on any ID has the objectives of developing the basic infrastructure of electronic payments and to increase the capability of the nation at digitalization. These will benefit all sectors as follows:

**Civic sector:** People can execute electronic payments easily and quickly at a reasonable cost. With various channels, various payment services such as money transfer, bill payments, purchase of goods, and online services, including tax and fee payments to public authorities are accessible. Moreover, people who receive remuneration, provident fund, and tax refund from the state will be able to receive the money directly through their registered accounts.

**Business sector:** Businesses obtain a convenient and fast payment channel with a registered ID instead of a bank account number. This will increase their business opportunities in terms of convenience of payment from customers at reasonable costs. Also, PromptPay enhances the competitive capacity of businesses, including SMEs, by allowing them to pay electronically. This will ensure their customers' convenience as well.

**Public sector:** The government sector can optimize money transfers or remittances with an applicable ID number. This will include transferring remuneration directly to people and paying tax refunds electronically to taxpayers. The financial payment of the state will have more transparency, reduce errors, and decrease corruption as a result of the elimination of cash and cheque payments. Furthermore, payment with any ID can capture more information for taxation through the electronic payment records. These records will constitute the database for broadening the taxation coverage.

**Economy:** The overall economy will witness less use of cash across all sectors, thereby reducing the cost of cash distribution and management in banknote operation centers. Also, PromptPay decreases the problem of shadow markets and promotes flexibility in using funds in the economy. In addition, payment records via electronic modes will be used for analysis to develop better economic plans for the country and help determine the metrics and policies to support greater usage of PromptPay among businesses and people.



## Case Analysis of Success Factors

Policies are formulated to transform various aspects of the core infrastructure, including the introduction of new values for the country in the future. The vision is to transform the country into a cashless society as well as develop national competitiveness through digital technology. Therefore, the case analyzes the project PromptPay under the National E-Payment Master Plan, based on the building blocks that are instrumental for digitalization of public services [16]. These building blocks are summarized below.

### Aligned Vision

From a macro perspective, PromptPay is designed to achieve the vision of the state. At the national level, the project is being implemented by the Ministry of Finance, which designs policies to reduce cash payments in Thailand’s economic system. The finance ministry will also develop processes that related agencies will be instructed to follow to ensure continuous development of the project. The implementation of the project is envisaged for both the public sector and the business sector.

The goals of the ‘Thailand Digital Economy and Society Development Plan’ will guide the development of the financial infrastructure and the new business model. Therefore, PromptPay is essential for the country. It has already improved and integrated the goals of all sectors and all related parties. PromptPay also incorporates the policies and tools for supervising and monitoring the progress of the project. In undertaking development, the project will meet the needs of society, economy, and politics, while advocating values and technology for the present as well as the future.

**TABLE 1**

### CRITICAL SUCCESS FACTORS IN IMPLEMENTATION OF PROMPTPAY.

Success factor category	Related success factors
Aligned vision	To raise the importance of the PromptPay project in the national agenda under the National E-Payment Master Plan
Prioritized goals	To determine the PromptPay roadmap that links it with other projects in the National E-Payment Master Plan in accordance with Thailand Digital Economy and Society Development Plan, Thailand 4.0 concept, and cashless-society policy
Pragmatic implementation	The new ecosystem and partners’ design of the payment system must be sustainable and inclusive of all commercial, nonbanking, and public banks. Along with them, there will be a single open-architecture infrastructure for the payment system that is highly resilient and secure. This infrastructure will promote mutual utilization across the value chain This will be achieved by creating a continuous and conscientious implementation mechanism through success of prototypes and quick-win projects throughout the project implementation period, including the focus on experience of PromptPay users
Enablers	The integrated and well-designed financial and nonfinancial resources of partners in the new ecosystem will provide the link and interoperability consonant with operating guidelines and standards. This is to ensure that the system always performs robustly
Strong foundational elements	Amendments of laws, regulations, and rules facilitate and support the security and protection of privacy of users in accordance with international standards

### Prioritized Goals

The vision and goals of the country will guide the related parties in devising their implementation strategies. As such, their goals and strategies are aligned with the overarching goals of PromptPay

so that the project can be advanced and integrated into the other four projects under the National e-Payment Master Plan. In addition, the action plans of all projects are arranged and prioritized. This will ensure that the framework and operational guidelines of the PromptPay project are accepted and implemented conscientiously and the project complies with the roadmap of the country towards a cashless society. Moreover, the project's outcomes will benefit the public sector, the business sector, and people. These parties will be able to access financial services comprehensively to realize the aphorism 'banking anywhere, anytime.'

### **Pragmatic Implementation**

In terms of providing support to the public, business, and civic sectors to enable them to access financial services via the electronic channel, the Bank of Thailand and the Office of the National Broadcasting and Telecommunications Commission signed an MOU on 17 June 2016. The MOU promotes the PromptPay project and stimulates cooperation between the supervised agencies. The MoU also promotes the project to all related sectors in the new business ecosystem. This new ecosystem ensures continuous development to upgrade the flexibility of the operating system.

Developments in IT will be the basis for modernizing and simplifying the system so that it remains flexible and adaptable in the long term. The internal control process too will be more automated in order to reduce operational risk and fraud. The system upgrade will ensure that it is aligned with the central infrastructure, and is interoperable, accessible, and allied with the databases of commercial banks, public-sector banks, and nonbanks with proxy ID or any ID. To ensure the success of the project, it is essential to incorporate user-experience in the design of the system. This design will be continuously improved throughout the implementation of the prototype and the planned quick-win projects.

### **Enablers**

The core strategy of the financial sector is to promote more collaboration than competition among the parties so that collaboration can contribute to the success of the vision and the desired outcome of the project. With related parties promoting financial literacy and protection of financial users, financial laws facilitate risk management and operation of financial institutions. Also, the development of criteria on supervision and monitoring of financial institutions and financial service providers will be undertaken in line with the international standards and security of the system.

Therefore, resources from various stakeholders in the new business ecosystem are integrated in a highly flexible and open architecture. This arrangement is different from the first phase that received funding only from the Federation of Thai Industries. Even though the operating cost is increasing, cost savings in the long term and opportunities for financial innovation make investments in project implementation attractive. Talented human resources drive the payment system so that it can be resilient at all times as per the guidelines and standards. In the meantime, laws and related regulations have been developed concerning electronic commerce and electronic information in order to monitor this new payment system and make it work flexibly and reliably. The recommendation from related parties and the advisory board will be applied to reduce blind spots while operating the project so as to enable the new ecosystem to be secure and meet the user needs both in normal as well as emergency situations.

### **Strong Fundamental Elements**

Policy implementation is guided by the National e-Payment Plan. The Office of the National Broadcasting and Telecommunications Commission has signed a memorandum of understanding

(MOU) with the Bank of Thailand, for studying guidelines on supervision and monitoring of e-payments. Also, the MoU is intended to lend support for financial transactions through PromptPay that are made without using a bank account number but using an ID number and mobile phone number instead. During the operation of the project, laws, rules, and regulations were amended in accordance with the Principles for Financial Market Infrastructure of BIS, or Bank for International Settlements. These amendments were to facilitate and ensure the security of the new payment system and to encourage financial institutions to verify customers' information (Customer Due Diligence: CDD), and to know their customer electronically (Electronic Know Your Customer: e-KYC) both in opening a bank account and in e-commerce transactions. Moreover, formats and remittance information should be able to verify the details of transactions, including international transactions in accordance with ISO20022. This standard is the international standard that applies to supervision and monitoring of the payment.

### **Lessons Learned and Insights from Case Analysis**

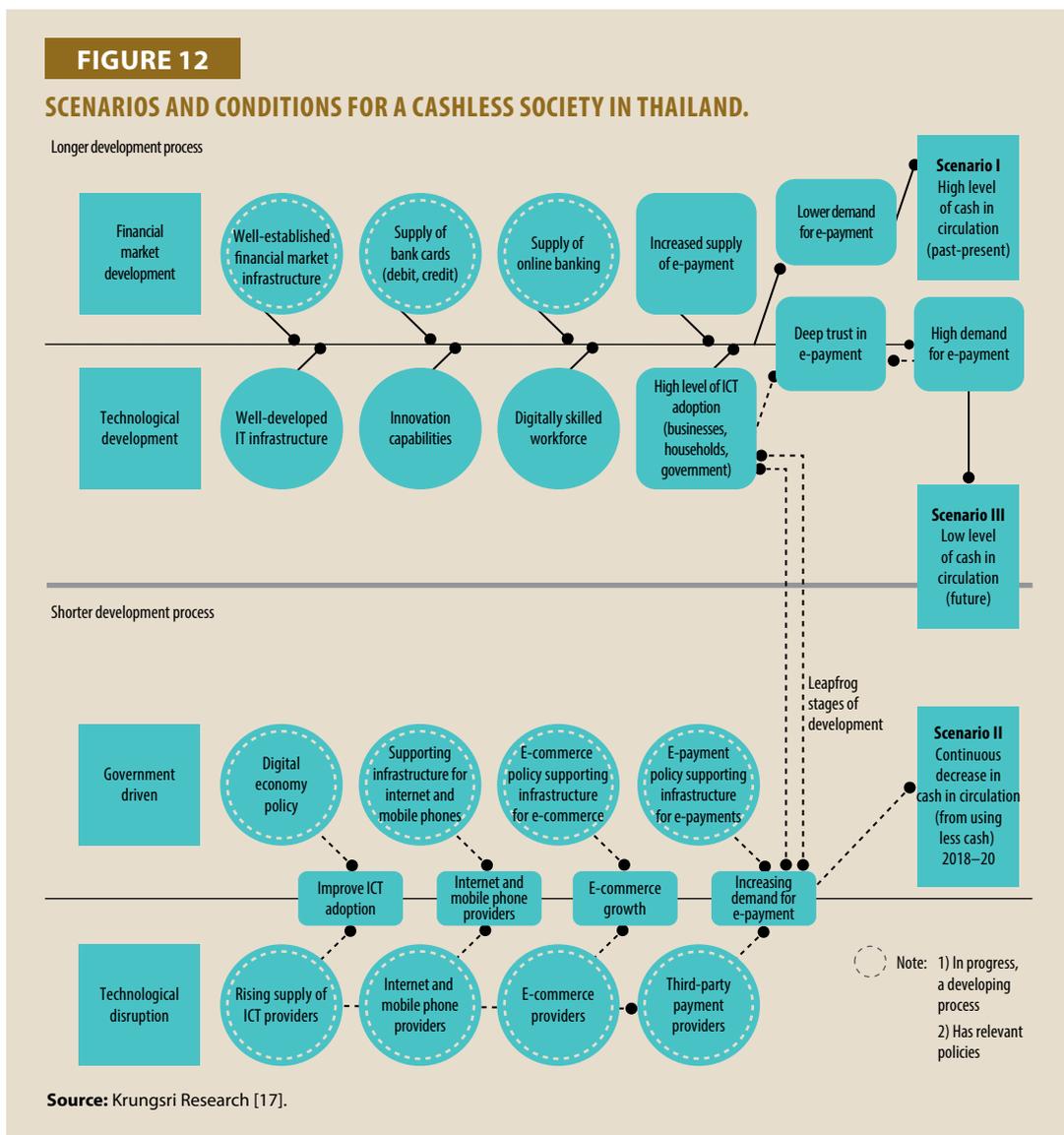
The concept of connecting the present to the future is to provide benefits to all sectors through digital technology. However, digital technology advances all the time, so it is difficult to predict the trend in the long run. This poses a challenge to the nation. Also, digital technology strongly impacts the activity patterns of individuals and organizations, as well as the economic system and society. Therefore, it is necessary for the government to consider that changes in digital technology will occur in both short and long terms.

A digital change will create both positive and negative effects on the economic system and the society at the micro and structural levels. It is therefore quite important to build the digital-technology capability as a tool of national development and promote the services of the state by applying technology in solving the problems of the nation.

From the perspective of Thailand, global forces (including the development of digital technology) result in opportunities and challenges for the country. This leads the state to determine circumspectly the option of leveraging technology in order to develop the country including its social paradigms and economic activities while applying the guidelines and strategies to transform the country into a cashless society. In the meantime, digital technology will drive financial development, which is the starting point of economic and social development. This will also lead to the nation's preferred future. Moreover, it encourages all sectors to collaborate and support each other in the same direction and for the same goals, i.e., 'security, prosperity, and sustainability' of Thailand and 'leave no one behind.'

Further, scenario projections of a cashless society that will bring the country into the digital era, reflect opportunities and risks of alternatives. They are the significant reasons for the introduction of the PromptPay project under the National E-Payment Master Plan as the first major project resulting from the development of fintech.

The significant achievement of PromptPay is a result of its design and the integration of both financial and nonfinancial resources of commercial banks, nonbanks, public sector, and networks in the new ecosystem. This ecosystem can connect each of these institutions under the operational guidelines in terms of supervision, monitoring, and user protection in the same model that meets the stringent international standards. Also, the design of the relationship system and the adoption of skillsets and capabilities in the new ecosystem are crucial for the project's success. The creation



of infrastructure and the key success factors are important for moving the project forward and to overcome obstructions and burdens. Ultimately, the project will accelerate the development of Thailand’s digital economy.

### Acknowledgement

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# CONCLUSION

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The diffusion and adoption of information technology are changing citizens' and businesses' expectations on governments' ability to deliver public services. Governments around the world are attempting to provide public services to people more efficiently by moving toward an open, bottom-up, agile, online, and integrated operational framework that offers new levels of interaction between citizens and the state.

This research aims to grasp the current state of digital-government transformation through an in-depth analysis of digital-service cases of public organizations in APO member countries and draw meaningful implications for other countries.

First, we presented the 'Policy Modeling Canvas (PMC)' and 'key building blocks for driving digitalization' as a methodology to analyze digital-government transformation cases. Second, we described the significant trends of digital-government transformation around the world and the critical success factors for digital transformation in the public sector. Third, we introduced case studies of successful government-digitalization initiatives from India, Indonesia, Malaysia, the Republic of Korea (ROK), the Philippines, and Thailand.

The national expert on India conducted the case study on 'Direct Benefit Transfer Scheme' of Government of India. Direct Benefit Transfer is an application of the digitalization of public service delivery that has transformed the process of delivery of benefits to deserving beneficiaries. It prevented leakages in the delivery mechanism, thereby causing a significant reduction in the cost of transactions and ensuring timely, efficient, transparent, and convenient transfer of benefits.

The case study from Indonesia presented 'Sehatpedia,' the online health-service application coined and developed by Ministry of Health, Government of Indonesia. Sehatpedia allows all citizens to get all health information freely, safely, and easily. It is an innovative solution in public service delivery, primarily aimed at improving better public-health service delivery and increasing the quality of health of citizens as direct beneficiaries.

The case study from Malaysia presented the country's journey in digitalizing the delivery of public services across the government. It offered a macro perspective of the motivation and processes involved in the evolution of digital transformation that has enabled most of the public services to be delivered online. Key initiatives of the digital delivery of public services include E-Procurement, Jobs Malaysia, E-Tanah, E-Courts, and E-Syariah.

The case study from the ROK introduced the 'Open Data Portal.' Open Data Portal is a single window for opening and providing public data held and managed by central governments, local

governments, and public institutions to citizens and businesses. Through this portal service, the ROK government has made a quantum leap in open data, and numerous private companies have acquired and used the data for creating additional value.

The case study from the Philippines presented the Project ‘Nationwide Operational Assessment of Hazards (NOAH).’ NOAH is the application of big-data analytics for disaster risk reduction and management, and climate actions through the production of hazards-and-risks maps for vulnerability assessment and early warning. The innovative solutions introduced by Project NOAH led to a marked decrease in fatalities from natural disasters.

The case study from Thailand highlighted the financial payment system ‘PromptPay.’ The PromptPay service is the new option for financial transactions that aims to allow individuals to transfer money between banks using any ID such as a mobile number, ID number, bank account number, E-Wallet ID, or e-mail address. This service will help the business sector and people to be able to easily access the financial service and provide a basis for other financial services in future.

Each case study presented the results of the analysis of the building blocks of PMC, including issues/problems, goals/objectives, strategies, and the governance structure adopted for the digitalization of public service delivery. Besides, each case study identified key resources for implementing the digitalization, listed critical activities for successful implementation, and presented the outputs and outcomes for beneficiaries.

Also, each case analysis identified key success factors that have contributed to the success of each digital transformation of governments. According to the results of the analysis in most case studies, we found that all five building blocks, i.e., aligned vision, prioritized goals, pragmatic implementation, enablers, and strong foundations, are required for successful implementation of a government digitalization. There were, however, some differences in the specific components in each building block, depending on the environment to which each case belonged.

Each case analysis presented challenges that were overcome in the process of promoting successful government digitalization, and provided insights or lessons learned through the transformation process. The analysis results will be valuable assets in implementing similar digital transformation policies in other countries.

The significance of this research project is as follows:

First, it presents various latest digital transformation cases of APO member countries. The report presents cases of countries with high IT technology capabilities and infrastructure as well as of those that have yet to develop those capabilities. The authors believe that APO member countries can understand the current issues of neighboring countries and improve mutual understanding by comprehensively reviewing how their respective digital-transformation projects have been implemented. We also believe that this report will be a useful resource for other countries not participating in this research project to gain knowledge and experience in various digital transformation cases indirectly.

Second, despite being a project that includes various case studies, the authors analyzed the digital transformation cases of each country using standardized analysis methodologies such as ‘PMC’ and ‘key building blocks for driving digitalization.’ This allowed us to provide a basis for a more

standardized comparison between various digital-transformation cases. In particular, we were able to confirm that the five building blocks, including aligned vision, prioritized goals, pragmatic implementation, enablers, and strong foundational elements, are essential to the successful digital transformation of the governments.

Our research project also has some limitations.

The first is the methodological limitation. This project was conducted through a case study. The advantage of a case study is that it can provide detailed and rich qualitative information and insights on the subject to be investigated. However, it lacks scientific rigor and there is little evidence to generalize the results. In this research project, standardized analytical methodologies were used to overcome the limitations of a typical case analysis. Nevertheless, the limitations of generalization and verification still exist due to the limitations of the case study method. In particular, a systematic in-depth analysis of the correlation between success factors and the degree of impact of each building block has not been presented. In addition, whether the same policy can be pursued in other countries based on the results of the case analysis depends on the similarity in maturity of digitalization, the ability to obtain additional information on the digitalization policy of the host government seeking to adapt the benchmarked experience, and the ability of that government to pursue the same policy.

Given these limitations, we present the following as future research issues in analyzing government digitalization.

Chiefly, research on the elaboration of the analytical methodology is needed. Especially for PMC, further research is required for each building block. The advantage of PMC is that it is a standardized analytical method, which is composed of nine building blocks. In contrast, the main shortcoming of the PMC is its fixed structure. For case analysis, it is necessary to review whether there are other building blocks that could also better explain and help undertake a country's experience in government digitalization; or, whether any modifications to the PMC methodology are required.

As mentioned earlier, a systematic in-depth analysis of the correlation between success factors and the degree of impact of each building block is necessary. As a solution to this, a quantitative methodology using surveys can be adopted. In addition, the case will serve its purpose more effectively if more information on failures or trials and error factors can be presented in addition to the critical success factors.

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