Digital Government and Transformation

Academy of ICT Essentials
for Government Leaders

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The Academy of ICT Essentials for Government Leaders

Digital Government and Transformation

APCICT ASIAN AND PACIFIC TRAINING CENTRE FOR INFORMATION AND COMMUNICATION TECHNOLOGY FOR DEVELOPMENT

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ABOUT THE MODULE SERIES

In today's "Information Age", easy access to information is changing the way we live, work and play. The "digital economy", also known as the "knowledge economy", "networked economy" or "new economy", is characterized by a shift from the production of goods to the creation of ideas. This underscores the growing, if not already central, role being played by information and communication technologies (ICTs) in the economy, in particular, and in society as a whole.

As a consequence, governments worldwide have increasingly focused on ICTs for development (ICTD). For these governments, ICTD is not only about developing the ICT industry or sector of the economy, but also encompasses the use of ICTs to stimulate economic growth, as well as social and political development.

However, among the difficulties that governments face in formulating ICT policy is unfamiliarity with a rapidly changing technology landscape and the competencies needed to harness ICTs for national development. Since one cannot regulate what one does not understand, many policymakers have shied away from ICT policymaking. But leaving ICT policy to technologists is also wrong because often, technologists are unaware of the social and policy implications of the technologies they are developing and using.

The Academy of ICT Essentials for Government Leaders module series has been developed by the Asian and Pacific Training Centre for Information and Communication Technology for Development (APCICT) for:

1. Policymakers at the national and local government level who are responsible for ICT policymaking.
2. Government officials responsible for the development and implementation of ICT-based applications; and
3. Managers in the public sector seeking to employ ICT tools for project management.

The module series aims to develop familiarity with the substantive issues related to ICTD from both a policy and technology perspective. The intention is not to develop a technical ICT manual. Rather, its purpose is to provide a good understanding of what the current digital technology is capable of achieving and where technology is headed, and what this implies for policymaking. The topics covered by the modules have been identified through a training needs analysis and a survey of other training materials worldwide.

The modules are designed in such a way that they can be used for self-study by individuals or as a resource in a training course or program. The modules are stand-alone as well as linked together, and effort has been made in each module to link to themes and discussions in the other modules in the series. The long-term objective is to make the modules a coherent course that can be certified.

Each module begins with a statement of module objectives and target learning outcomes against which readers can assess their own progress. The module content

is divided into sections that include case studies and exercises to help deepen understanding of key concepts. The exercises may be done by individual readers or by groups of training participants. Figures and tables are provided to illustrate specific aspects of the discussion. References and online resources are listed for readers to look up in order to gain additional perspectives.

The use of ICTD is so diverse that sometimes case studies and examples within and across modules may appear contradictory. This is to be expected. This is the excitement and the challenge of this discipline and its promise, as countries leverage the potential of ICTs as tools for development.

Supporting the Academy of ICT Essentials for Government Leaders module series in print format is an online distance learning platform ─ the APCICT Virtual Academy (http://e-learning.unapcict.org) ─ with virtual classrooms featuring the trainers' presentations in video format and PowerPoint presentations of the module.

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Module Overview:

This module provides an overview of how digital technologies can be used to improve the quality of governance and, in turn, contribute to the Sustainable Development Goals (SDGs). While digital technologies have evolved rapidly and have the potential to transform governance sectors, the experience so far suggests that careful attention to strategy and implementation processes are necessary. This module highlights and builds on the key principles that are considered useful for digital government strategy and policy, namely effectiveness, inclusiveness, and accountability.

The module introduces the audience to some of the emerging design approaches that can benefit policymakers. Digital technologies are increasingly seen as socio-technical systems, and care must be taken to address the social contexts in which digital technologies are designed, deployed, and used. Digital government can benefit immensely from the emerging approaches of participatory design, agile methodologies, design thinking, and human-centered design. Moreover, digital government initiatives must be guided by overarching long-term strategies to ensure sustainable impact. While the strategies need to be country-specific, the three common pillars that are considered to underpin such a strategy include digital infrastructure, digitally enabled services, and capacity building and regulatory policies.

Digital government initiatives have the potential to make government services even more valuable to citizens. This module provides examples of such digitally enabled services from various countries in the fields of urban governance, law enforcement, judicial systems, education, healthcare, agriculture, procurement, tax administration, and disaster management. While this is by no means an exhaustive list, it provides a sense of how digitally enabled services can influence government-citizen interactions. The module also describes the various phases of the project lifecycle required to design and deploy such services, which includes project conceptualization, implementation, development, deployment, monitoring, and evaluation.

The module concludes by highlighting some of the emerging digital government topics that policymakers worldwide need to actively engage with – artificial intelligence, data governance, and digital identity, and provides suggestions on some best practices that governments could take to ensure sustainable social impact.

This module is largely an overview; it touches on ideas, concepts, and practices, drawing from experience and research worldwide. Other modules of the Academy of ICT Essentials for Government Leaders discuss different aspects in detail, expanding many of the themes introduced here. Please visit http://www.unapcict.org/flagshipprogrammes/academy to access all the modules.

Module Objectives

This module aims to:

1. Highlight the critical role that digital technologies can play in government.
2. Show the principles that must shape digital government initiatives.
3. Introduce design approaches to digital government.
4. Provide an overview of components of an overarching digital government strategy.
5. Suggest measures to develop digital infrastructure to bring in greater inclusiveness.
6. Highlight the role of emerging whole-of-government approach towards policymaking and public service delivery.
7. Show how digital technologies can be used to enhance the spirit of collaboration within and outside government.
8. Suggest some of the digital capacities and competencies required for sustainable impact.
9. Illustrate some examples of use of digital technologies to address a few governance/development challenges.
10. Draw attention to the various phases of a digital government project lifecycle including some emerging approaches such as agile methodology and user-centric design.
11. Introduce some of the opportunities and challenges (including ethical concerns) in using Artificial Intelligence in government.
12. Highlight the regulatory framework required for data governance.
13. Show how digital identity can be used for seamless interaction between citizens and government.
14. Suggest some of the steps that needs to be taken to ensure sustainable digital government.

Target Audience

The module is introductory in nature and does not assume any prerequisite knowledge of digital technologies. Government leaders from both technology development and substantive functional domains will benefit from understanding how digital technologies can be embedded in governance contexts. This module has been developed keeping in mind the existing regional diversity and levels of maturity across countries in terms of their digital government policy and practice.

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ABBREVEATION AND ACRONYMS

ADB	Asian Development Bank
AI	Artificial Intelligence
AP-IS	Asia Pacific Information Superhighway
APCERT	Asia Pacific Computer Emergency Response Team
APCICT	Asia and Pacific Centre for Information and Communication Technology for Development
API	Application Programming Interface
B2G	Business to Government
BMS	Bus Management System
CERT	Computer Emergency Response Team
CIO	Chief Information Officer
CPM	Critical Path Method
DEWA	Dubai Electric and Water Authority
DGRA	Digital Government Readiness Assessment
DIMS	Disaster Information Management Systems
DNMS	District Nutrition Management Systems
DRM	Disaster Risk Management
EHR	Electronic Health Records
UN	United Nations
ESCAP	Economic and Social Commission on Asia Pacific
FIR	First Information Report
FOSS	Free and Open-Source Software
G2B	Government to Business
G2C	Government to Citizens
G2G	Government to Government
GCPSE	Global Centre for Public Service Excellence
GDPR	General Data Protection Regulation
GeM	Government e-Marketplace
GIS	Geographical Information Systems
HCD	Human Centered Design
IA	Information Architecture
ICT	Information and Communication Technologies
IDEO	Innovation Design Engineering Organization
iELS	Integrated Electronic Litigation System
IoT	Internet of Things
IS	Information Systems
IVRS	Integrated Voice Response Systems
IEP	Internet Exchange Points
MIS	Management Information Systems
OER	Open Education Resources
OGD	Open Government Data
OGP	Open Government Partnership
PERT	Project Evaluation and Review Technique
PSU	Public Sector Undertaking

RTA	Road Transport Authority
SDG	Sustainable Development Goals
SEA-	Southeast Asian
MOOC	Massive Online Open Courses
SNAP	Supplemental Nutrition Assistance Program
SPV	Special Purpose Vehicle
STS	Science and Technology Studies
TOPIS	Transport Operation and Information Service
UCD	User Centered Design
UI	User Interface
UN CEPA	United Nations Committee of Experts on Public Administration
UN DESA	United Nations Department of Economic and Social Affairs
UN	United Nations
UNDP	United Nations Development Program
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNGA	United Nations General Assembly
UNTCAD	United Nations Conference on Trade and Development
USAF	Universal Service Access Funds
UX	User Experience
WCAG	Web Content Accessibility Guidelines
WoG	Whole of Government

1. Introduction

Outline: The chapter aims to:

- Discuss the growing pervasiveness of digital technologies in our public and private spheres, and how the adoption of these technologies can impact governance.
- Understand the causes of failure of digital government projects
- Establish the linkages between Sustainable Development Goals agenda-related values of good governance and how digital technologies can help achieve them.

1.1 Digital technology in everyday life and governance:

The last two decades have seen a rapid societal transformation in the way information is processed and consumed. Increasingly, the digital medium is dominating all aspects of our everyday life. More than 99 per cent of the world's population is within reach of a mobile tower, with over half of the world's population using the internet[1]. More than 3.3 billion people have a presence on at least one social media platform[2]. Over two-thirds of total financial transactions are carried out in the electronic medium[3]. The number of websites has increased exponentially from merely one in 1991 to 1.72 billion in 2019[4].

The use of digital technologies has also led to a shift in the way people go about their daily lives. For instance, the visually impaired have been actively using assistive technologies embedded in smartphones to expand on their opportunities. The adoption of the Internet of Things (IoT) technology in the industrial sector has enabled a newer form of automation. Telemedicine is helpful in providing healthcare to previously unserved or underserved populations. Customer service centres actively use chatbots to address customer queries with much shorter response times. The platform economy extensively uses location-based services to deliver services such as ride-sharing and food delivery. Social media applications have become entrenched in how we carry on with our everyday activities. Digital marketing on these platforms is now an integral part of any business strategy.

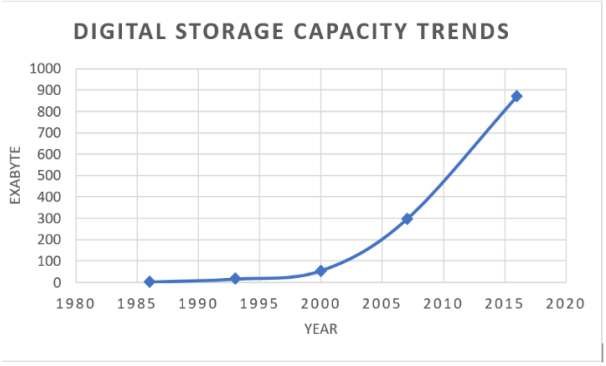
Even as there is a significant leap in our use of Information and Communication Technologies (ICT), newer technologies such as Artificial Intelligence, IoT, assistive technology, blockchain, and virtual reality continue to be innovated upon and adopted.

[1] 'Measuring the Information Society Report', 274.
[2] 'Number of Social Media Users 2025', *Statista* <https://www.statista.com/statistics/278414/number-of-worldwide-social-network-users/> [accessed 9 November 2020].
[3] 'World Payments Report (WPR) 2018', 2018, 56.
[4] 'Infographic: How Many Websites Are There?', *Statista Infographics* <https://www.statista.com/chart/19058/how-many-websites-are-there/> [accessed 1 April 2021].

Illustrative of technological innovation and adoption is our expansion in storing, computing and communicating information in recent decades[5].

Digital storage capacity has expanded exponentially over the last few decades (see Figure 1), mainly due to advancements in semiconductor technology. Thus, the total amount of digital data has exponentially increased in the last few decades.1.7MB[6] of digital data is generated every second for every person on the Earth. YouTube, for instance, adds more than 500 hours of digital content in video form every minute[7]. The cost of digital data storage has, meanwhile, seen a significant reduction.

Figure 1. Digital storage capacity trends and cost of digital storage from 1950 to 2020 per megabyte



Source: World Bank, *World Development Report 2016: Digital Dividends* (The World Bank, 2016) <https://doi.org/10.1596/978-1-4648-0671-1>

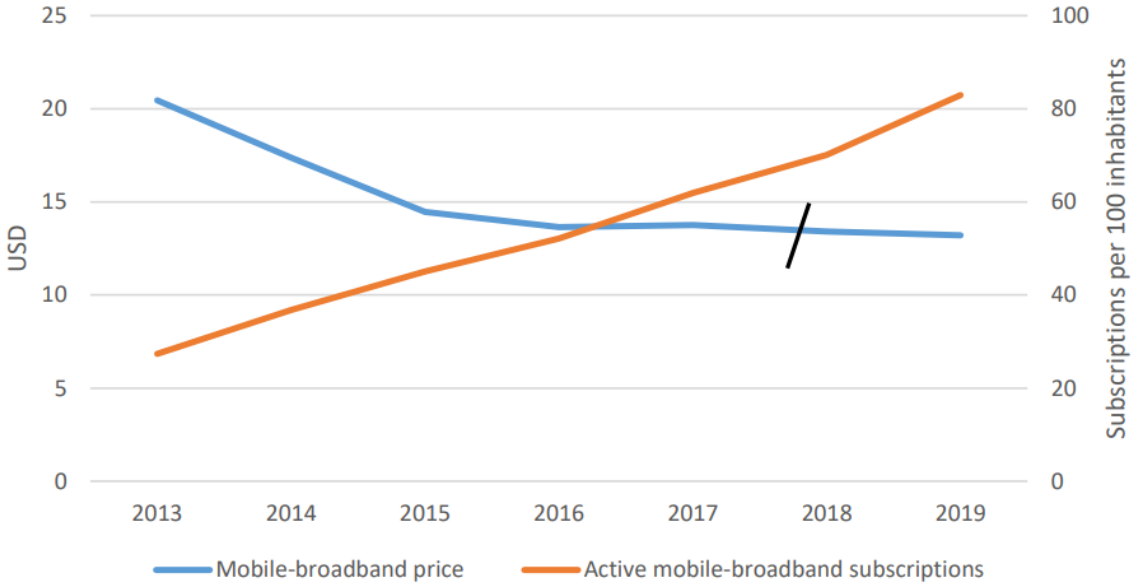
Computational power is central to the ongoing digital revolution. The miniaturization of computational systems and increased processing ability have together contributed to the ubiquitous use of digital technologies. For instance, today's smartphone has more computational power than Personal Computers a decade ago. The cost of computing power has come down, making it possible for these systems to process more data in less time.

Our ability to transfer digital data over long distances in real-time has multiplied manyfold thanks to improved communication technology. Telecommunication technology has seen a generational shift from 2G a decade ago to the 4G and 5G networks of present times. The new generation technologies have enabled

[5] Martin Hilbert and Priscila López, 'The World's Technological Capacity to Store, Communicate, and Compute Information', *Science*, 332.6025 (2011), 60–65 <https://doi.org/10.1126/science.1200970>.
[6] 'How Much Data Is Generated Every Minute? [Infographic]', *Social Media Today* <https://www.socialmediatoday.com/news/how-much-data-is-generated-every-minute-infographic-1/525692/> [accessed 9 November 2020].
[7] '• YouTube: Hours of Video Uploaded Every Minute 2019 | Statista' <https://www.statista.com/statistics/259477/hours-of-video-uploaded-to-youtube-every-minute/> [accessed 9 November 2020].

significantly higher data transmission rates, making it possible to transfer images and videos in real time. The cost of digital communication has also come down globally.

Figure 2. Declining trend of mobile-data prices and increasing trend in subscription rate worldwide 2013-2019



Source: ITU. 2020. *Measuring Digital Development: ICT Price Trends 2019*. ITU Geneva.

The wide array of backbone networks, such as the spread of optic fiber cables and low-earth satellites, has made this possible.

The interplay of improvements in our ability to store, compute, and communicate digital data has led to the emergence of newer technologies that have transformed organizations' work practices. For instance, high-speed network connectivity and advancements in storage have led to a proliferation of cloud computing technology, thanks to which data, computational power, and even applications reside on remote shared infrastructure. Similarly, IoT enables the real-time data collection from intelligent devices over the internet. Further, advances in Artificial Intelligence and Big Data are possible due to our ability to store and compute massive datasets.

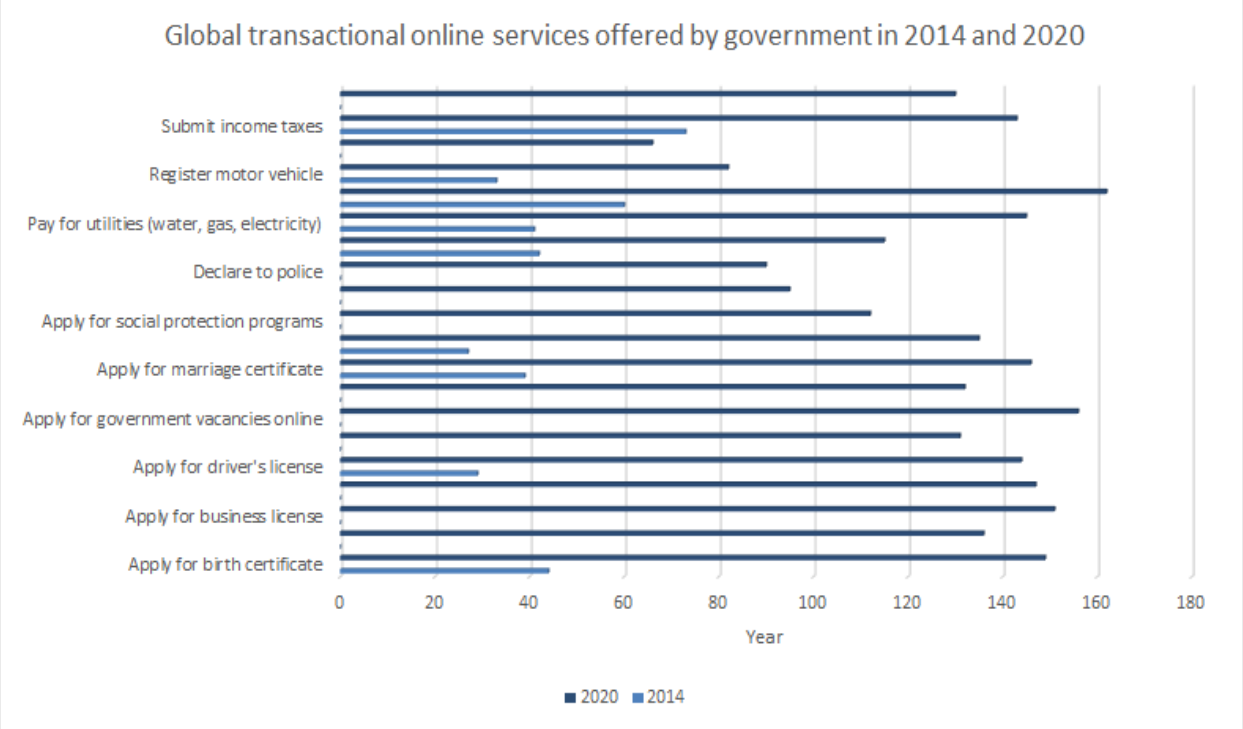
The benefits that accrue from these advances in digital technologies are changing the everyday lives of individuals, organizations, and societies at large. Governments across the world, too, have not lagged behind in embracing digital technologies. The general use of digital technologies, specifically ICTs by the Government, is broadly referred to using the terms, Digital Government or e-Government (even, Digital Governance and e-Governance)[8].

[8] The terms Digital Government and e-government are often used interchangeably.

Government departments and agencies have used digital government applications to enable better policymaking and effective public service delivery across multiple application domains, such as health, education, food and nutrition security, livelihoods, public order, safety, tax administration, and regulatory processes. For instance, different agencies of law enforcement use digital technologies to exchange crime records. Similarly, many countries provide facilities for the e-filing of taxes. Executive dashboards enable real-time monitoring of Human Development indicators involving health, education, and per-capita income.

Digital Government projects encompass a variety of ICTs which include online portals, mobile apps, Integrated Voice Response System (IVRS), Geographic Information System (GIS), and biometrics. Emerging technologies such as Artificial Intelligence (AI), blockchains, and cloud computing are also actively considered for use in multiple functions of government.

Figure 3. Global transactional online services offered by the government in 2014 and 2020



Source: https://publicadministration.un.org/egovkb/en-us/Reports/UN-E-Government-Survey-2020

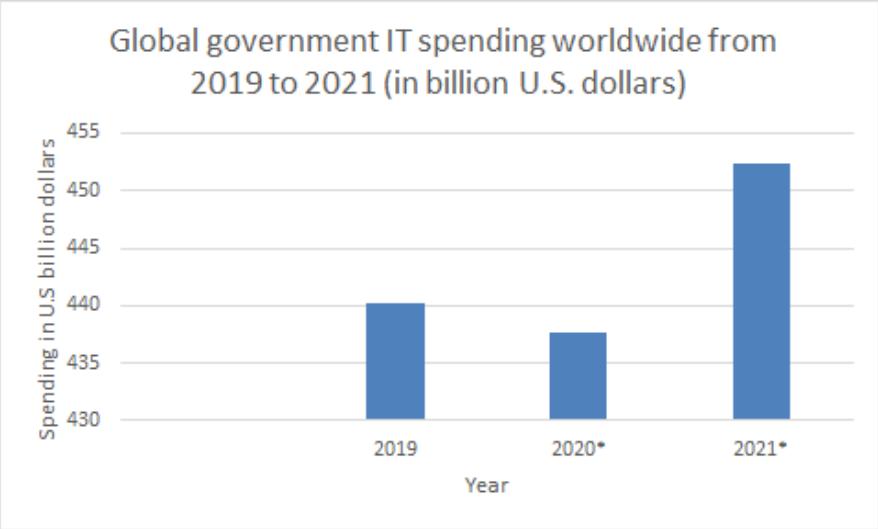
As evident in Figure 3, the number of online services has increased significantly in the last few years. Further, governments have begun to adopt data-centric and data-driven approaches to governance for more efficient and effective decision-making and monitoring program implementation. Data-driven decision-making "involves collecting data, extracting patterns and facts from that data, and utilizing those facts to make

inferences that influence decision-making."[9] Digital Government applications have been especially popular in local city governments. ICTs are being used to bring about efficiency and responsiveness in public utilities such as transportation, electricity, and water supply. Such use of digital government applications to improve city governance is also collectively referred to using the term "smart city."

Social media, too, is widely used by government leaders and agencies. In 2020, 189 of 195 countries (96 per cent) were represented through an official presence on Twitter, either by personal or institutional accounts run by heads of state and government and foreign ministers[10].

Government commitment to using digital technologies is evident in the worldwide trend on Information Technologies' public expenses, which is estimated to be US $440.14 billion[11] in 2019. Similarly, the worldwide spending on "smart cities," i.e., using digital technologies in city governance, for the year 2019 is estimated to be US $110 billion.

Figure 4. Global government IT spending worldwide from 2019 to 2021



Source: https://www.gartner.com/en/newsroom/press-releases/2020-08-05-gartner-forecasts-global-government-it-spending-to-de

Digital Government applications have had a visible impact on the quality of governance. For instance, the United Kingdom Treasury has estimated that implementing the website www.gov.uk, which was launched in 2012 and merged the

[9] 'Academy Module on "Realizing Data-Driven Governance" | APCICT/ESCAP' <https://www.unapcict.org/resources/publications/academy-module-realizing-data-driven-governance> [accessed 9 November 2020].
[10] 'Twitter: Heads of State with the Most Followers 2020', *Statista* <https://www.statista.com/statistics/281375/heads-of-state-with-the-most-twitter-followers/> [accessed 1 April 2021].
[11] 'Gartner Forecasts Global Government IT Spending to Decline 0.6% in 2020', *Gartner* <https://www.gartner.com/en/newsroom/press-releases/2020-08-05-gartner-forecasts-global-government-it-spending-to-de> [accessed 9 November 2020].

websites of all 25 ministerial departments and 385 other public agencies into a single portal, saved taxpayers £3.6 billion (US$4.7 billion) in its first three years of operation.

Recognizing the opportunities provided by Digital Government, multilateral development agencies have actively engaged in research, policy advocacy, and evaluation on many aspects of digital government[12].

The United Nations Department of Economic and Social Affairs (UN DESA) has been publishing the United Nations E-Government Survey since 2001. The Survey measures digital government effectiveness in delivering public services and identifies patterns in digital government development and performance. It also highlights countries and areas where the potential of ICTs) has not yet been fully exploited and where capacity development support might be helpful[13].

Similarly, the World Bank's Digital Government Readiness Assessment (DGRA) toolkit is an analytical tool to assess the state of digital government transformation readiness in a specific country. Its objective is to inform governments on their "as is" status; and to highlight gaps, and priority actions, to improve public administration and empower all citizens and entrepreneurs in low- and middle-income countries[14].

The Open Government Partnership (OGP) is a multilateral initiative that aims to secure concrete commitments from governments to promote transparency, empower citizens, promote public accountability, and harness new technologies to strengthen governance. 78 countries and a growing number of local governments—representing more than two billion people—along with thousands of civil society organizations are members of the Open Government Partnership (OGP).

The response to the COVID-19 pandemic, too, has highlighted the relevance of Digital Government applications. For instance, the uncertainty and fear in the pandemic's initial phases led to a wave of fake news, misinformation and viral hoax aggravating anxieties in society. In response to this, many governments used digital technologies to actively share information through websites, chatbots, and social media activities. For example, Brazil's Ministry of Health implemented an SMS service to combat fake news; other governments also started online campaigns against this threat.

Digital technologies were also extensively employed to develop contact tracing applications. These applications were designed to provide information to both government health authorities and citizens about infected cases and to trace down infected people's contacts for testing and other quarantine requirements. The initial applications used in many countries under different stages of lockdown were targeted at limiting the non-essential movement of individuals by obtaining permissions. In Malaysia, for instance, the Gerak Malaysia mobile application serves as a traveling permission application platform for Malaysians who wish to travel across states during the curfews imposed in the context of the pandemic. The QR Code generated by this

[12] 'Making Digital Government a Better Government' <https://www.nature.com/articles/d41586-018-07502-x> [accessed 9 November 2020].
[13] 'UN E-Government Survey 2020' <https://publicadministration.un.org/egovkb/en-us/Reports/UN-E-Government-Survey-2020> [accessed 4 November 2020].
[14] 'Digital Government Assessments: Recent Approaches and Methodologies | World Bank Group' <https://olc.worldbank.org/content/digital-government-assessments-recent-approaches-and-methodologies> [accessed 9 November 2020].

application serves as a digital authorization permit for interstate travel and other types of traveling as needed.

1.2 Some experiences with digital government:

While Digital Government projects have had positive impacts, there remains a significant gap between expected and actual benefits. One of the earlier studies by Prof. Richard Heeks [15] suggests that most implementations of e-government in developing countries fail. 35 per cent of these projects were classified as total failures (e-government was not implemented or implemented but immediately abandoned), and 50 per cent as partial failures (major goals were not attained and/or there were undesirable outcomes). These unintended consequences have mostly been undesirable, such as amplifying existing societal inequalities.

Table 1. Unintended consequences of digital government initiatives

Case	Unintended Consequences
Digitization of Land Records [16]	The digitization of land records in Bangalore "led to increased corruption, much more bribes and substantially increased time taken for land transactions," as well as allowing "very large players in the land markets to capture vast quantities of land when Bangalore experienced a boom in the land market."
Online consultation platforms[17]	Online discussions have little impact on the formal political process, and also that the quality of the discussions themselves tends to deteriorate over time.
Education Technology[18]	Providing laptops alone has little impact on students' learning and crowds out resources from substantive aspects such as teacher education and school infrastructure, adversely impacting the quality of education.

[15] Richard Heeks, 'Information Systems and Developing Countries: Failure, Success, and Local Improvisations', *The Information Society*, 18.2, 101–12.
[16] Joshua Tauberer April 2012, *The Bhoomi Program and Digital Divides - Open Government Data: The Book* <https://opengovdata.io/2014/the-bhoomi-program-digital-divides/> [accessed 9 November 2020].
[17] Marc ter Hedde and Jörgen Svensson, 'Online Discussion on Government Websites: Fact and Failure?', *ICT, Citizens and Governance: After the Hype*, 2009.
[18] Mark Warschauer and Morgan Ames, 'Can One Laptop per Child Save the World's Poor?', *Journal of International Affairs*, 2010, 33–51.

Digital Identity (Aadhar) [19]	India's digital identity program has authentication failure rates as high as 12 per cent leading to the potential exclusion of a large number of citizens from marginalized communities in various welfare programs
Predictive Policing[20]	The use of algorithms perpetuated and amplified discriminatory policing practices and biases against minority groups. (Box 4)

Some commentators argue that Digital Government projects often undergo a hype-cycle that begins with "presentations about the potential offered by technology for making governments more effective, efficient, democratic and legitimate[21]." Such narratives "have a natural appeal since everybody likes to believe in a better future." However, the hype can often end in disappointment if assumptions made by the digital government implementers are not a good representation of reality and the plurality of perspectives. This is not to dismiss the potential and the benefits of digital technologies in government. However, a better understanding of these often-faulty assumptions can help in ensuring digital government projects have the desired impacts. We need to examine assumptions about digital government on two key dimensions – on the digital (or those related to technology) and the government (i.e., on assumptions about governance).

Many proponents often expect technology to bring about a transformative change in society all by itself. As per this view, technology is the primary factor in determining societal change, and has its autonomous agency. Such a perspective is critiqued as "technological determinism." A considerable body of research work, especially from the science and technology studies (STS) and information systems (IS) areas, argues for a socio-technical view of digital technologies to ensure sustainable and desirable impacts. As per these perspectives, technology is socially shaped and carries with it the values and biases of the designers. Thus, rather than attributing certain successes and failures to technology, we need to be conscious of the social aspects that shape digital technology design and use. We discuss this perspective on technology in further detail in Chapter 2.

There is a need to examine the assumptions technology designers make about governance as well. While there is consensus on the need to achieve "better governance," what is "better" is not always clear. Governance is a contested term and has multiple meanings and incorporates diverse value systems. These implicit

[19] Vakasha Sachdev, 'Aadhaar Authentication for Govt Services Fails 12% of Time: UIDAI', *TheQuint*, 2018 <https://www.thequint.com/news/india/uidai-ceo-admits-aadhaar-authentication-failure-rate-12> [accessed 14 November 2020].
[20] Rashida Richardson, Jason M Schultz, and Kate Crawford, 'DIRTY DATA, BAD PREDICTIONS: HOW CIVIL RIGHTS VIOLATIONS IMPACT POLICE DATA, PREDICTIVE POLICING SYSTEMS, AND JUSTICE', *NEW YORK UNIVERSITY LAW REVIEW*, 94, 42.
[21] Albert Meijer, Kees Boersma, and Pieter Wagenaar, *ICTs, Citizens and Governance: After the Hype!* (IOS Press, 2009), XIV.

assumptions influence the way digital technologies are designed and used in governance programs.

1.3 Understanding governance:

Governance is the "process of decision-making and the process by which decisions are implemented (or not implemented)." Improving the quality of governance is central to achieving the Sustainable Development Goals (SDGs). Also known as the Global Goals, SDGs are a universal call to action to end poverty, protect the planet, and ensure that all people enjoy peace and prosperity. The need to strengthen governance institutions features prominently in the Sustainable Development Goals (SDGs) both as a cross-cutting issue in many of the goals and as a standalone goal (SDG 16).

Goal 16 aspires to "promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable, and inclusive institutions at all levels[22]." The targets under SDG 16 highlight several governance concepts, including effectiveness, transparency, accountability, anti-corruption, inclusiveness of decision-making processes, access to information, and non-discrimination of laws and policies (see Box 1).

BOX 1. SDGs and governance

Some of the Goals and Sub-Goals of SDGs concerning governance are:

- 16.5 Substantially reduce corruption and bribery in all their forms
- 16.6 Develop effective, accountable, and transparent institutions at all levels
- 16.7 Ensure responsive, inclusive, participatory, and representative decision-making at all levels
- 16.10 Ensure public access to information and protect fundamental freedoms, in accordance with national legislation and international agreements
- 16.b Promote and enforce non-discriminatory laws and policies for sustainable development

Source: 'Home | Sustainable Development' <https://sdgs.un.org/>

[22] 'World Public Sector Report 2019 | Multimedia Library - United Nations Department of Economic and Social Affairs' <https://www.un.org/development/desa/publications/world-public-sector-report-2019.html> [accessed 9 November 2020].

The United Nations Committee of Experts on Public Administration (CEPA) has developed a set of principles of effective governance for sustainable development to provide practical, expert guidance to interested countries in a broad range of governance challenges associated with implementing the 2030 Agenda for Sustainable Development. The 11 principles, endorsed by the Economic and Social Council in July 2018, highlight the need for pragmatic and ongoing improvements in national and local governance capabilities to reach the SDGs. The overarching three principles of **effectiveness**, **accountability**, and **inclusiveness** guide these 11 principles of good governance.

Figure 5. Good governance values

Table 2. Good governance values

EFFECTIVENESS	
1. Competence	To perform their functions effectively, institutions are to have sufficient expertise, resources, and tools to deal adequately with the mandates under their authority
2. Sound policymaking	To achieve their intended results, public policies are to be coherent with one another and founded on true or well-established grounds, in full accordance with fact, reason, and good sense
3. Collaboration	To address problems of common interest, institutions at all levels of government and in all sectors should work together and jointly with non-State actors towards the same end, purpose, and effect

ACCOUNTABILITY	
4. Integrity	To serve in the public interest, civil servants are to discharge their official duties honestly, fairly, and in a manner consistent with the soundness of the moral principle
5. Transparency	To ensure accountability and enable public scrutiny, institutions are to be open and candid in the execution of their functions and promote access to information, subject only to the specific and limited exceptions as are provided by law
6. Independent oversight	To retain trust in government, oversight agencies are to act according to strictly professional considerations and apart from and unaffected by others
INCLUSIVENESS	
7. Leaving no one behind	To ensure that all human beings can fulfil their potential in dignity and equality, public policies are to take into account the needs and aspirations of all segments of society, including the poorest and most vulnerable and those subject to discrimination
8. Non-discrimination	To respect, protect and promote human rights and fundamental freedoms for all, access to public service is to be provided on general terms of equality, without distinction of any kind as to race, colour, sex, language, religion, political or other opinions, national or social origin, property, birth, disability or other status
9. Participation	To have an effective State, all significant political groups should be actively involved in matters that directly affect them and have a chance to influence policy
10. Subsidiarity	To promote government that is responsive to the needs and aspirations of all people, central authorities should perform only those tasks which cannot be performed effectively at a more intermediate or local level
11. Intergeneratio nal equity	To promote prosperity and quality of life for all, institutions should construct administrative acts that balance the short-term needs of today's generation with the longerterm needs of future generations

Source: 'United Nations Department of Social and Economic Affairs > Intergovernmental Support > CEPA' <https://publicadministration.un.org/en/CEPA>

1.4 Digital government and SDGs[23]:

Digital Government strategy and programs should also be designed considering these governance values of effectiveness, accountability, and inclusiveness to align with the SDGs. For instance, social security application processing can be made effective through a digital portal. However, it must also ensure that the principles of inclusiveness and accountability are not compromised. No citizen should be left behind due to a lack of digital literacy, which requires ensuring adequate access to non-digital channels. Similarly, the principles of accountability should be followed by ensuring that application processing is transparent to citizens. Further, digital and non-digital avenues of grievance redressal must be available.

Digitization of the public information system can make valuable real-time data available for effective decision-making. It also enables easy exchange of data across different departments and tiers of government, allowing policy integration. Data-driven

BOX 2. Managerial and democratic governance values

Two often contesting governance values influence Digital Government applications – managerial values and democratic values.

Managerial values are key to governance reforms known as the "New Public Management" or "Reinventing Government" movement. These reforms focused exclusively on efficiency in allocating public services. For instance, the "Reinventing Government" movement in the United States in the 1990s advocated for the public sector's marketization and entrepreneurial administration to create "a government that works better and costs less". The focus on managerial practices in governance viewed citizens as clients/customers availing government services. Thus, there is very little distinction made between clients of public services and that of private services.

While efficiency in governance reforms is important, there is also a need to address the democratic values such as equity, inclusiveness, and accountability. The narrow treatment of citizen as a client/customer ignores the rights that citizens possess. Democracy requires the government to serve all citizens' interests and not only a narrow set of clients. Further, citizens are not merely passive recipients of public services but also have enormous potential to contribute towards innovative and improved decision-making.

Studies show that managerial values dominate much of the digital government applications. For instance, applications are designed to collect development indicators in real-time to enable centralised monitoring. While this is important, digital government applications should also enable citizens to hold the government accountable through initiatives such as Open Government Data.

[23] For a detailed discussion, please refer to APCICT Module on “An Overview of ICTs and Sustainable Development”

decision-making and evidence-based policymaking are gaining importance in a data-intensive world, with innovations in algorithmic decision-making.

However, such an approach must also consider the principles of subsidiarity and ensure that all levels of the government are empowered through the decentralization of power and resources. The principle of participation and collaboration requires that the information system's design enables capturing people's voices.

We illustrate some examples of how some of these governance values can be part of a digital government application (see Box 2).

1.4.1 Effectiveness:

Digital government applications should contribute to greater effectiveness in governance through improved competency, sound policymaking, and collaboration. Digital Technologies, for instance, can help governments to manage the risks of disaster. As the world's most disaster-prone region, Asia and the Pacific experience an immense toll caused by natural disasters. The high density of people, jobs, and assets that make cities so successful also make them extremely vulnerable to disaster risks[24]. Disaster risk management refers to both disaster risk reduction (prevention, preparedness, and mitigation) and humanitarian and development action (emergency response, relief, and reconstruction)[25].

Innovations in ICTs increasingly offer governments new tools to manage DRM effectively. For instance, ICTs can aid in two phases of disaster risk management: Early Warning System (EWS), before the occurrence of a disaster and Disaster Information Management System (DIMS), in the aftermath of a disaster to respond swiftly and effectively.

EWSs are designed to communicate risk information quickly and effectively to mitigate losses by taking timely actions. Japan's J-ALERT, for example, disseminates urgent information received directly from the government in vulnerable areas through automatic activation of local radio communications and other communication lines[26]. J-ALERT employs a satellite for communication from the government to municipalities and to citizens. The information delivered includes warnings for natural hazards such as earthquakes, tsunami, volcanoes, meteorological events, flood forecasts, and man-made hazards such as ballistic missiles and terrorism.

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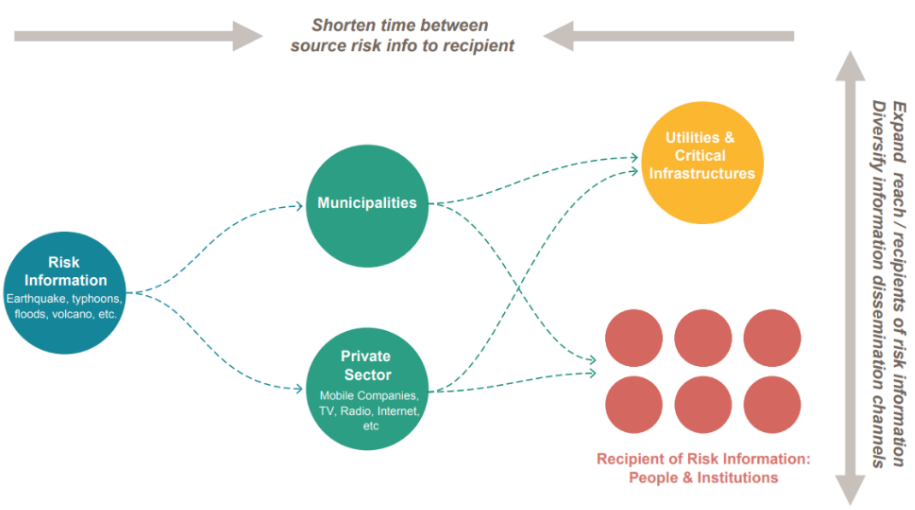
[24] Asian Development Bank, United Nations, and United Nations Development Programme, *Asia-Pacific Sustainable Development Goals Outlook* (United Nations, 1 March 2017) <https://doi.org/10.22617/TCS178699-2>.

[25] Lisa Schipper and Mark Pelling, 'Disaster Risk, Climate Change and International Development: Scope for, and Challenges to, Integration', *Disasters*, 30.1 (2006), 19–38 <https://doi.org/10.1111/j.1467-9523.2006.00304.x>.

[26] 'Information and Communication Technology for Disaster Risk Management in Japan', *Other Infrastructure Study* <https://elibrary.worldbank.org/doi/pdf/10.1596/32797> [accessed 9 November 2020].

Figure 6. Japan disaster information management system

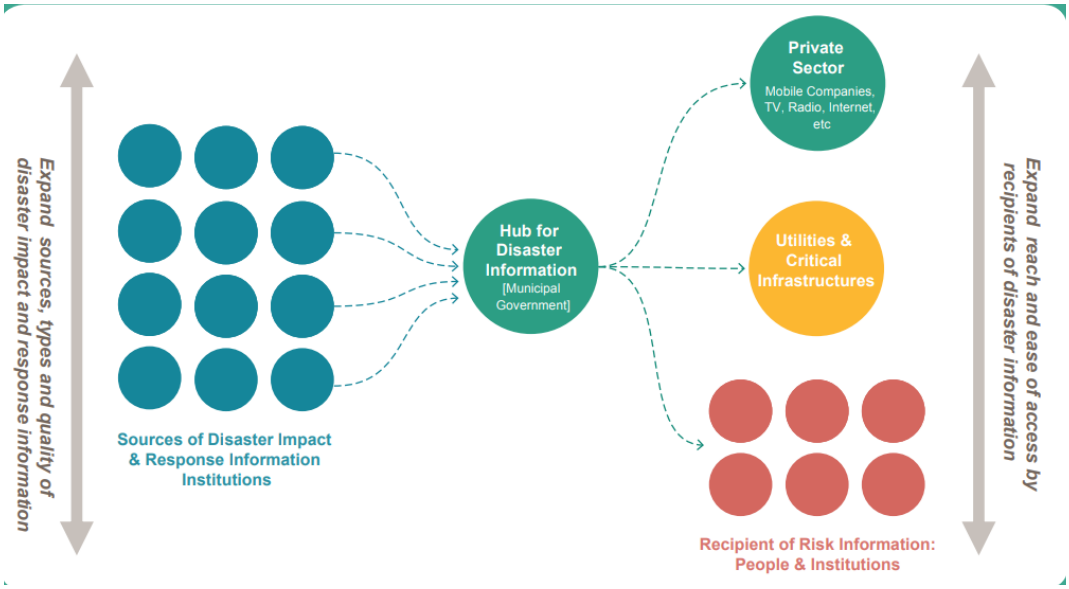


Source: https://reliefweb.int/report/japan/information-and-communication-technology-disaster-risk-management-japan-how-digital

Disaster Information Management Systems (DIMSs) allow information related to a specific disaster to be readily accessed by relevant stakeholders. After a disaster, delivering the right information to the right recipients allows response and recovery teams to begin their work quickly and effectively.

As evident in the above example of DRM, the use of digital technologies can improve effectiveness in the decision-making of governments.

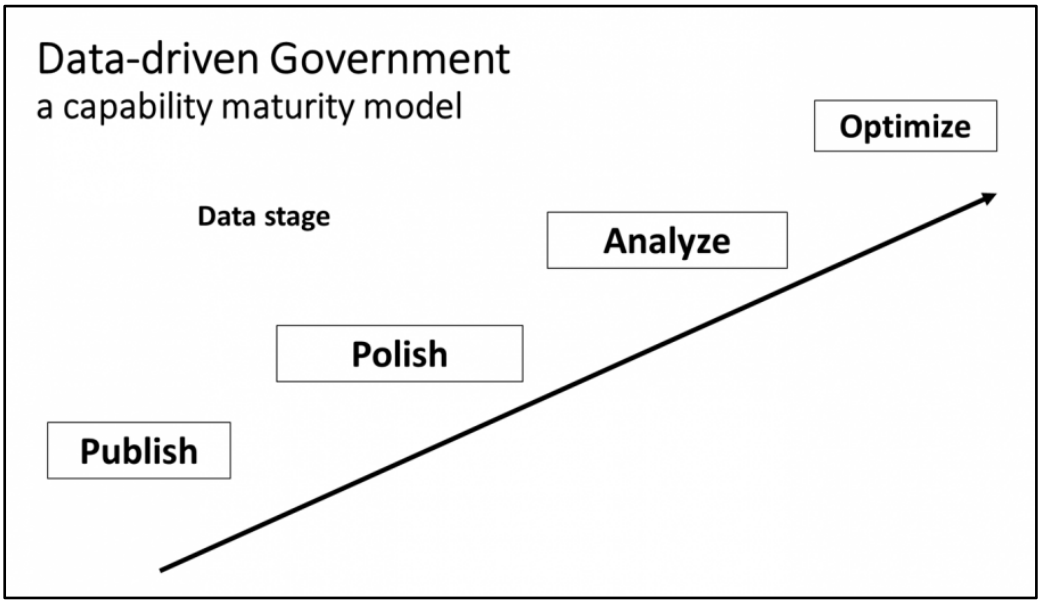
Figure 7. Japan disaster management information system



Source : https://reliefweb.int/report/japan/information-and-communication-technology-disaster-risk-management-japan-how-digital

Digital technologies can aid in decision-making through a data-driven approach to governance. The idea of using data to make decisions in government is not new. Yet, the scale and velocity at which data is available have provided huge opportunities for governments. Since governments are often hard-pressed for resources, digital data availability in near real-time makes it possible for governments to efficiently allocate resources and monitor performance. Data-driven governance is an approach to governance where data is used on an unprecedented scale to inform policy decisions, set goals, measure performance, and increase government transparency. Rather than merely use data, data-driven governance is about bringing in a "data culture" in governmental organizations.

Figure 8. Data-driven Government —a capability maturity model



Source: Jane Wiseman, "Analytics Excellence Roadmap: A Four-Stage Maturity Model for Data-Driven Government," Data-Smart City Solutions, Ash Center at Harvard Kennedy School, July 2016.

A data-driven governance maturity framework shows the varying levels of data-driven governance and consists of the following phases[27]:

1. **Publish:** The first stage of maturity toward excellence in data-driven government is publishing data in a format usable to the public. Publishing data builds appetite for more open data as users inside and outside of government begin to use the data for their analytic purposes. Data is unlikely to be standardized across departments at this stage of data-driven government, limiting the capacity for analytics across the enterprise.

[27] Jane Wiseman, "Analytics Excellence Roadmap: A Four-Stage Maturity Model for Data-Driven Government," Data-Smart City Solutions, Ash Center at Harvard Kennedy School, July 2016.

2. **Polish:** The second stage of data maturity builds on the foundation of published data by improving its quality – "polishing" it. At this stage of data maturity, publishing is routine, and data volume increases rapidly. Publishing data in greater volume typically generate increased interest in and use of the data by the public, the media, universities, non-profits, and other government users. These users can be expected to provide feedback that improves the accuracy of data released. Users will often notice inconsistencies in datasets, as well as inconsistencies across related datasets from different source departments
3. **Analyze:** With large volumes of high-quality open data, cities can begin to use it to analyze data, seek patterns and new insights, and drive better decisions. At this stage of data maturity, data science specialists are either brought into government or developed internally. Data visualization and analytics can help spot trends and gain insights through the comparison of related datasets from different sources.
4. **Optimize:** At the highest level of data-driven government maturity, the use of data is optimized throughout the enterprise. At this stage, all levels of government use data to make decisions, and data analytics and data science experts contribute actively to decision-making processes.

Data-driven governance[28] is widespread across different sectors such as education, health, social security, livelihood, agriculture, crime management, disaster management, and climate change. For instance, the Nepal Department of Hydrology and Meteorology[29] worked on the digitization of climate data and downscaling of climate projections for better sectoral impact analysis, and policy development. It also supported archiving of historical meteorological data and made it publicly accessible through the Nepal Climate Data Portal. Users can fetch printable maps, time-series charts, data filter and queries, data comparison and aggregation, multiple color legend options, and information about observation stations. Computer modeling of climate will help develop future climate projections used in planning adaptation measures, and digitalization of the old data will help juxtapose the degree of variations in existing climate conditions.

1.4.2 Inclusiveness:

Social inclusion is a key concern in achieving Sustainable Development Goals. Historical inequities based on gender, class, race, disability, and ethnicity persist despite years of developmental effort by governments across the world. Even as they grapple with the challenge of social inequities, the governments look up to the ubiquitous presence of digital technologies to address some of these challenges. Digital technologies are often considered to be a leveling force.

[28] For more information, please refer to APCICT Academy module on “Realizing Data-Driven Governance”

[29] ‘World Bank Climate Change Knowledge Portal’ <https://climateknowledgeportal.worldbank.org/> [accessed 1 April 2021].

The evidence, however, has also been to the contrary. Digital technologies have also perpetuated the existing social divide rather than mitigate it. More worrying is the tendency of digital technologies to have an amplifying effect on social inequalities[30].

For instance, there is a tendency for governments to adopt a "Digital-first" or a "Digital-only" approach whereby a government service is available exclusively through a digital medium. However, such an approach might not be socially inclusive. The goal of "leaving no one behind" might not be achieved through such an approach. A large section of the population still faces barriers to access digital technologies. This is traditionally known as the "**digital divide**," a gap between those who have access to ICTs and those who do not. For instance, even now, 47 per cent[31] of the world's population does not have internet access.

The lower cost of digital devices and cheaper access has reduced the digital divide to some extent. However, inclusiveness requires going beyond the traditional understanding of access to the internet to "meaningful access[32]" or "effective use[33]. " Inclusiveness in digital government requires ensuring that the citizens can use the digital government services. Governments are adopting user-centered design principles and accessibility standards to ensure that "no one is left behind." Governments are also ensuring multi-channel delivery of services, including non-digital mediums and mediated access through common service centers. The end goal is to ensure inclusiveness in governance, i.e., in public service delivery and not just in access to digital service (see Box 3). Thus, digitization must be cognizant of the end goals of governance. While the digitization of public services may often contribute to greater inclusiveness, this need not always be the case. Governments must therefore explicitly consider if the digitization of a government service fulfills its goals at all.

[30] Kentaro Toyama, 'Technology as Amplifier in International Development', in *Proceedings of the 2011 IConference*, IConference '11 (New York, NY, USA: Association for Computing Machinery, 2011), pp. 75–82 <https://doi.org/10.1145/1940761.1940772>.
[31] 'Global Internet Penetration 2020', *Statista* <https://www.statista.com/statistics/209096/share-of-internet-users-in-the-total-world-population-since-2006/> [accessed 1 April 2021].
[32] Mark Warschauer, 'Technology and Social Inclusion: Rethinking the Digital Divide', 2003 <http://dl.acm.org/citation.cfm?id=640680>.
[33] Michael Gurstein, 'Effective Use: A Community Informatics Strategy beyond the Digital Divide', *First Monday*, 8.12 (2003) <http://firstmonday.org/ojs/index.php/fm/article/view/1107> [accessed 11 July 2017].

BOX 3. From digital divide to inclusiveness

The concept of **digital divide** emerged in the early 1990s to signify the wide gap between those who have access to digital technologies and those who do not, mainly due to lack of affordability. However, with the passage of time, digital divide, as a concept, has broadened significantly, now represented by the term **inclusiveness**.

Rather than mere access to a device or internet, it is also important to ensure that citizens have the required skills to use the digital technologies. Thus, governments are now investing on building **digital literacy** of citizens.

Equally important is to ensure that the design of digital technology is responsive to citizens' context. For instance, non-literate citizens need to be supported with voice interfaces. The field of human-centred and **user-centered design** concerns itself with making technology design user-centric.

Further, technology design must ensure that citizens are not mere consumers of a digital service but must also enable collaboration with government in decision-making where appropriate. **Civic Technologies** (Civic Tech) refers to such technologies that enable engagement, participation or enhance the relationship between the people and government by enhancing citizen communications and public decision.

A far more inclusive approach is to provide an active role for citizens in the design and evaluation of digital services. This approach values citizens partnership in every phase of technology design, from needs analysis to design and evaluation and borrows from the field of **participatory design**.

Inclusiveness also requires conscious efforts to ensure **non-discrimination**. This principle of non-discrimination is especially a concern in the emerging area of Artificial Intelligence. Advancements in this field are introducing machines with the capacity to learn and perform cognitive tasks that were limited to human beings[34]. One such application of AI in Governance is its use in policing, also known as predictive policing.

Predictive policing generally describes any system that analyses available data to predict either *where* a crime may occur in a given time window (place-based) or *who* will be involved in a crime as either victim or perpetrator (person-based)[35]. It is the latest iteration of data-driven crime analysis techniques that law enforcement agencies are increasingly relying on for crime control and forecasting. Such algorithms are expected to bring about precision in policing and lead to efficient police utilization on

[34] 'Preliminary Study on the Ethics of Artificial Intelligence - UNESCO Digital Library' <https://unesdoc.unesco.org/ark:/48223/pf0000367823> [accessed 9 November 2020].
[35] Richardson, Schultz, and Crawford.

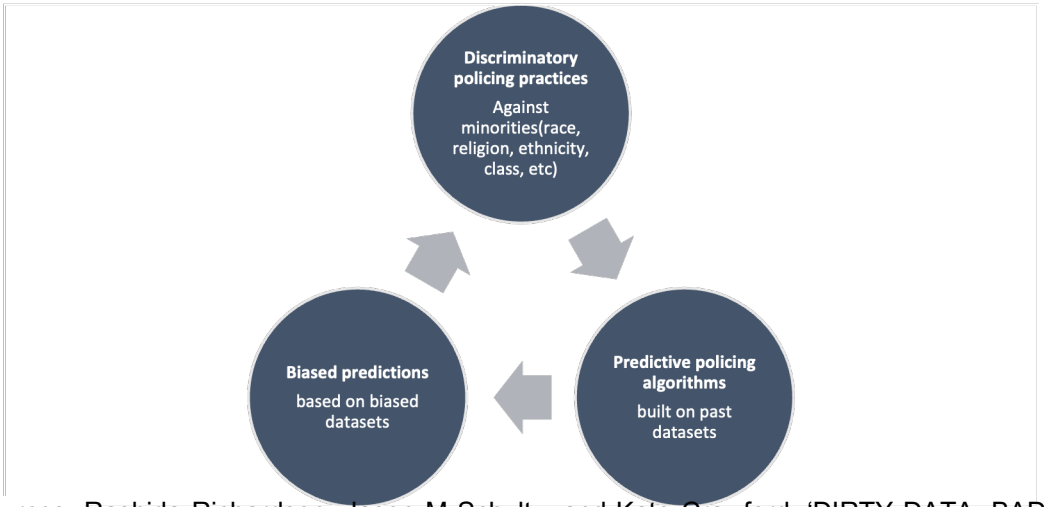
the streets. However, predictive policing has been found to amplify the historically discriminatory practices against minority groups (see Box 4).

BOX 4. Discriminatory algorithms? The case of Predictive Policing

Law enforcement agencies are increasingly using predictive policing systems to forecast criminal activity and allocate police resources. Yet, in numerous jurisdictions, these systems are built on data produced during documented periods of flawed, racially biased, and sometimes unlawful practices and policies. These policing practices and policies shape the environment and the methodology by which data is created, which raises the risk of creating inaccurate, skewed, or systemically biased data.

If predictive policing systems are informed by such data, they cannot escape the legacies of the unlawful or biased policing practices that they are built on. These predictions function like a mirror. Its premise is that we can learn from the past because the future will repeat it. Individual traits that correlated with crime perpetration in the past will correlate with crime perpetration in future. Predictive analysis, in effect, holds a mirror to the past. It distils patterns in past data and interprets them as projections of the future.

Deploying predictive policing systems in jurisdictions with extensive histories of unlawful police practices presents elevated risks that data will lead to flawed or unlawful predictions, which in turn risk perpetuating additional harm via feedback loops throughout the criminal justice system. The use of predictive policing must be treated with high levels of caution and mechanisms for the public to know, assess, and reject such systems are imperative.



Sources: Rashida Richardson, Jason M Schultz, and Kate Crawford, 'DIRTY DATA, BAD PREDICTIONS: HOW CIVIL RIGHTS VIOLATIONS IMPACT POLICE DATA, PREDICTIVE POLICING SYSTEMS, AND JUSTICE', *NEW YORK UNIVERSITY LAW REVIEW*, 94, 42.

'Mayson_p5g2tz2m.Pdf' <https://www.yalelawjournal.org/pdf/Mayson_p5g2tz2m.pdf> [accessed 9 November 2020].

Policymakers are recognizing these concerns and responding by developing frameworks to ensure inclusiveness, equity, and transparency in the use of AI technologies in government. For instance, UNESCO's ROAM principles and IEEE's General Principles in Ethically Aligned Design emphasize ensuring inclusiveness, explainability, transparency, and accountability in the design of AI systems. These principles are discussed in more detail in Chapter 5.

1.4.3 Accountability:

Accountability is concerned with keeping the government's power in check[36]. In the context of public governance, the key accountability relationships are those between citizens and holders of public office, and within it, between the elected politicians and appointed officials[37]. Accountability has two key dimensions – "answerability" of the government to citizens and further "enforcement" of sanctions on the agents of the State.

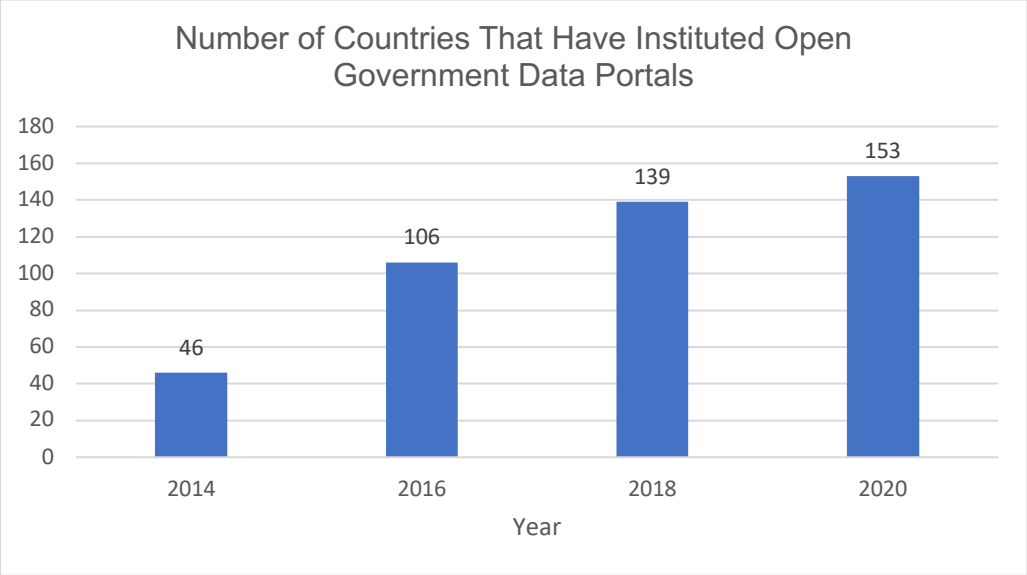
To ensure accountability and enable public scrutiny, institutions are to be open and candid in executing their functions and promoting access to information, subject only to the specific and limited exceptions as are provided by law. Digital technologies can play a significant role in ensuring the free flow of information between the government and citizens. Increasingly, Governments are using the digital medium to disclose government data proactively. Such initiatives are known as Open Government Data (OGD).

OGD initiatives have the following distinct advantages.

1. Reduce the response time, thereby enabling near to real-time transparency.
2. Lower cost of distributing data.
3. Information processing capabilities are making interpretation easier, for instance, through the search and visualization of data.
4. Often, centralized disclosure of data, reducing resistance from frontline officials to disclose data.

[36] Andreas Schedler, 'Conceptualizing Accountability', *The Self-Restraining State: Power and Accountability in New Democracies*, 13 (1999), 17.
[37] Richard Mulgan, '"Accountability": An Ever-Expanding Concept?', *Public Administration*, 78.3 (2000), 555–73 <https://doi.org/10.1111/1467-9299.00218>.

Figure 9. Number of countries that have instituted open government data portals



Source: 'UN E-Government Survey 2020' https://publicadministration.un.org/egovkb/en-us/Reports/UN-E-Government-Survey-2020

As is evident in Figure 9, the number of countries instituting Open Government Data portals has steadily increased over the years. While OGD initiatives can potentially contribute to greater transparency and accountability, much depends on the demand-side issues such as access, interpretation, and use[38] of such data.

1.5 Digital Government Units

As discussed above, digital government involves promoting the values of effectiveness, inclusiveness, and accountability in every sphere of government using digital technologies. Thus, digital government is as much about governance as it is about digital technologies. Accomplishing these goals requires a rethinking of the way governments design and implement digital technologies. Such a rethinking can be possible only through governments restructuring the way they are organized. The traditional rule-based hierarchical, bureaucratic organization might not be best suited to facilitate innovative digital government approaches. Digital technologies evolve at a rapid pace. Designing digital solutions while keeping complex governance challenges requires special expertise, which often a traditional bureaucratic organization lacks.

Private business organizations have cutting-edge know-how of the technological changes and are well placed to contribute to digital government initiatives. However, mere contracting of digital government initiatives to the private sector is a recipe for failure. Many governments in the past have resorted to large-scale outsourcing of

[38] 'View of Open Data: Empowering the Empowered or Effective Data Use for Everyone? | First Monday' <https://firstmonday.org/article/view/3316/2764> [accessed 9 November 2020].

digital solutions development, especially in the 1990s and early 2000s. Taking inspiration from the private sector practices, many countries sought to make government "business-like." Such an approach meant contracting out functions such as technology design where the government lacks expertise and decentralizing decision-making to respective government units.

However, as it soon became evident, such an approach had many adverse consequences. Due to competitive bidding processes, contracts were won by a small number of large IT companies developing large-scale solutions. Contract management activities were limited to mere oversight and narrow compliance with bureaucratic requirements[39]. Governments often lacked the skill to assess and evaluate private sectors' offerings. Large-scale IT projects often ran over budget and over time [40]. A United Kingdom parliamentary committee report summed up the situation as follows – "*The lack of IT skills in government and over-reliance on contracting out is a fundamental problem which has been described as a 'recipe for rip-offs.'* According to the committee, one of the underlying reasons for failure is the "*lack of sufficient leadership and skills to manage IT within the Civil Service, and in particular the absence of an 'intelligent customer' function in Departments."*

While governments can use the private sector's capabilities, it is imperative to develop its own expertise. Such realization has prompted a newer form of organizational units with in-house expertise in digital government solutions. Such units are called Digital Government Units (DGU) or Digital Service Teams. DGUs began to be formed in the United Kingdom in response to the above-discussed failures of the outsourcing approach to digital government. However, they soon became popular in many countries the world over.

Table 3. Digital government units in various countries

Country (year of formation)	**Digital Government Unit**
UK (2011)	Government Digital Service (GDS)
Denmark (2011)	Danish Agency for Digitization
USA (2014)	United States Digital Service (USDS) and 18f
Australia (2015)	Digital Transformation Agency (DTA)
Italy (2016)	Team Digitale
Canada (2017)	Canadian Digital Service (CDS)
Finland (2017)	D9 Team

[39] Ines Mergel, 'Digital Service Teams in Government', *Government Information Quarterly*, 36.4 (2019), 101389 <https://doi.org/10.1016/j.giq.2019.07.001>.
[40] Wilfred W. Wu, Gregory M. Rose, and Kalle Lyytinen, 'Managing Black Swan Information Technology Projects', in *2011 44th Hawaii International Conference on System Sciences* (IEEE, 2011), pp. 1–10.

While Digital Government Units vary in their organizational form across different countries, some commonalities are noteworthy. DGUs often emphasize developing in-house expertise in digital technologies with a startup-inspired organizational model[41]. They often recruit staff from private sector organizations who bring with them new capabilities and skills[42]. Most of DGUs are headed by leading private sector executives[43]. Often, the DGUs are located high-up in each national governments' hierarchy, wielding significant power and influence over nations' digital government policy. While individual departments and agencies of the government might have their own Chief Information Officers (CIOs), the DGUs help build a knowledge base of digital government and ensure the sustainability of the initiatives.

Governments often operate in a resource-constrained environment. Investment in DGUs ensures significant cost reductions due to smarter approaches to procurement and deployment of digital government initiatives. DGUs, with in-house expertise, have brought significant changes in government procurement. DGUs facilitate a whole-of-government approach by centrally aggregating demand across governments for IT services and disaggregating these services' supply across multiple vendors[44]. This approach leads to significant cost-saving benefits for governments (see Box 26). DGUs also help departments break down large contracts into smaller components so that a more pluralistic, competitive marketplace of a large, medium, and small suppliers can bid on government work[45].

DGUs have played a central role in bringing in many of the best practices of digital government such as a whole-of-government approach (see 3.3.1), modular contracting (Box 9), use of open-source software (4.2.2.1), in-house capacity building, use of agile approach to technology development (2.3) and a user-centered approach (chapter 2).

[41] Amanda Clarke, 'Digital Government Units: What Are They, and What Do They Mean for Digital Era Public Management Renewal?', *International Public Management Journal*, 23.3 (2020), 358–79 <https://doi.org/10.1080/10967494.2019.1686447>.
[42] Mergel.
[43] Mergel.
[44] Cabinet Office, *Government Transformation Strategy: Platforms, Components and Business Capabilities* (UK: Cabinet Office, 2017) <https://www.gov.uk/government/publications/government-transformation-strategy-2017-to-2020/government-transformation-strategy-platforms-components-and-business-capabilities> [accessed 25 March 2021].
[45] Clarke.

CASE STUDY 1: Digital Transformation Agency : Australia's DGU

The DTA aims to improve the user experience for all Australians accessing government information and services through leading the design, development and continual enhancement of whole-of-government service delivery policies and standards, platforms, and joined-up services.

Role and functions:

- Provide strategic leadership on whole-of-government and shared ICT and digital services, including sourcing and capability development.
- Deliver policies, standards and platforms for whole-of-government and shared ICT and digital service delivery.
- Provide advice to agencies and the Government on ICT and digital investment proposals.
- Oversee significant ICT and digital investments, assurance policy and framework, and the whole-of-government digital portfolio.

Agency Structure:

The DTA is headed by a CEO to whom the Chief Portfolio Officer, Chief Strategy Officer and the Chief Digital Officer report. The responsibilities are as follows:

- **Chief Executive Officer**: leading the agency to ensure that it delivers digital transformation in government.
- **Chief Portfolio Officer**: strategic policy and coordination, digital governance and engagement, ministerial and parliamentary engagement, digital investment strategies and coordination, agency engagement and advice, and data and analysis.
- **Chief Strategy Officer**: whole-of-government digital strategy, whole-of-government architecture, experience and innovation, and building digital capability across government.
- **Chief Digital Officer**: strategic sourcing and sourcing transformation, digital sourcing, digital infrastructure service, corporate and enabling services, and joint agency taskforces.

DTA is staffed with people with unique and wide-ranging capabilities and skills such as:

- User-centred research and design.
- Agile delivery methodologies.
- Technology design and build.
- Systems architecture.
- Sophisticated procurement approaches.

Some of the projects implemented by DTA include-

- Digital Marketplace - helps government agencies and digital experts do business with each other.
- GovX - drive change across government to provide seamless, connected services and improve people's user experience during key life events.
- National Map – A website that provides map-based access to spatial data from government agencies.

Source: Digital Transformation Agency, 'Digital Transformation Agency' (Commonwealth

1.6 Key Points

- There has been a quantitative and qualitative shift in the use of digital technologies in our everyday life. Our ability to store, compute and communicate digital data has increased exponentially.
- Governments, too, have adopted digital technologies in different areas of governance.
- While Digital Government projects have had positive impacts, there remains a significant gap between expected and actual benefits. Many projects have failed either partially or fully in achieving the intended objectives with significant time and cost overruns.
- There are two overarching reasons for failure – simplistic assumptions about technology (discussed in chapter 2) and inadequate attention to governance values.
- The United Nations Committee of Experts on Public Administration has developed a set of governance principles for sustainable development. These values of inclusiveness, accountability, and effectiveness must guide the design and use of digital government applications.
- Digital government applications can contribute to greater effectiveness in governance through improved competency, sound policymaking, and collaboration.
- Inclusiveness has been and continues to be a key concern of sustainable development. Care must be taken to ensure that the use of digital technologies does not lead to further exclusion. The digital divide concept has now broadened to ensure inclusiveness, which includes digital literacy, user-centered design, civic technologies, and participatory design.
- Accountability is a key pillar of democratic governance. If thoughtfully designed, digital government applications can enhance the accountability of government to citizens by enhancing transparency and providing grievance redressal mechanisms.
- Digital Government Units are centralized units with in-house expertise and multi-disciplinary teams which help all government agencies launch and sustain digital government initiatives.

2. Design approaches for Digital Government

Outline: The chapter aims to:

- Introduce the socio-technical perspectives of digital government.
- Explores the use of design thinking in public service delivery.
- Discuss collaborative and participatory tools and methods to encourage both citizens and civil servants to participate in the design of digital government services.

2.1 Socio-technical systems and social shaping of technology:

Technology design is not considered independent of the conception of development that it seeks to advance. From this perspective, technology is increasingly seen as socially constructed rather than merely following a technical logic and exhibiting only unidirectional and deterministic impacts on society. In other words, technology is not assumed to be independent of the underlying socio-economic and political configurations that exist in its design context, and, therefore, it is useful to look at the technology-society relationship as one that is mutually reinforcing and constitutive of each other[46,47]. This understanding of technology as a social construction allows us to subject it to more critical socio-political inquiry rather than leave it aside as a neutral tool (see Box 5 below).

BOX 5. Neutrality of technology

Neutrality of technology, including of the ICTs and the Internet, is often invoked when deterministic claims are to be made about its effects, of the type that 'an increased Internet penetration will lead to improved health and education indicators'. This view considers the nature of technology and the direction of change it can lead to as unproblematic or pre-determined, often subject to an inner technical-logic (as Robin Williams and David Edge point out in their oft-cited 1996 article on social shaping of technology) – hence, the notion of neutrality. What it does not consider is that the production and use of technology is a social process, influenced by individual dispositions and social structures. A number of choices are made, both during the production and use of technology, many of which are governed by cultural, political, economic and other institutional factors – all of which contribute to making technologies 'non-neutral'.

Source: 'Beyond "free" and "neutral": An Internet Policy for India | Deccan Herald' <https://www.deccanherald.com/content/522382/beyond-free-neutral-internet-policy.html> [accessed 9 November 2020].

[46] *The Social Shaping of Technology*, ed. by Donald A. MacKenzie and Judy Wajcman, 2nd ed (Buckingham [Eng.] ; Philadelphia: Open University Press, 1999).
[47] Williams, R. and Edge, D. The Social Shaping of Technology, *Research Policy (25)*, pp. 865-899, 1996.

The sustainable development paradigm accords significant importance to the diversity of local contexts and inclusion of marginal groups and individuals in the development plans and priorities of governments. Governance approaches that align well with the SDGs focus more on issues of effectiveness, accountability, and inclusiveness, as highlighted in Chapter 1. Digital Governance efforts to achieve the SDGs should be appreciative of this understanding of development and governance in their technology design approach.

Inconsistencies in managing the design and deployment processes in many governance projects, especially those that seek to leverage the potential of digital technologies, lead to various issues not only with respect to time and cost overruns but also in terms of their overlooking critical considerations and viewpoints while setting desired objectives, as noted earlier.

Digital Governance projects are also found to display the characteristics of complex socio-technical systems. They are technical not only in the sense of the widespread use of various Information and Communication technologies but also of other techniques involving management science models, procedures, and organization of work. They are social in that their design and implementation process require effective interactions among diverse stakeholder groups - designers, technology providers, organizational users, policy planners, and beneficiaries. They are complex as they are part of broader governance reform programs, often trying to address problems considered wicked[48], having heterogenous constituent parts and stakeholders with emergent relationships. Box 6 below further elaborates the characteristics of a complex system.

BOX 6. Complex systems

"A complex system encompasses a large number of interacting parts and has structure and behavior that are difficult to understand and predict. The large number of components creates difficulty in comprehending the structure that binds them. In addition, the nontrivial and complicated interaction among the components creates uncertainty in predicting the emergent behavior of the system. The system is interactively complex [i.e., has varied components that tend to interact in nonlinear ways] and exhibits rapid, unpredictable change with no apparent pattern." (p. 38)

Source: Tan, J., Wen, H.J. & Awad, N. (2005). Healthcare and services delivery systems as complex adaptive systems. *Communications of the ACM*, Vol. 48 No. 5, pp. 36-44.

[48] Problems in the realm of government planning are considered wicked as they are often ill-defined and rely upon elusive political judgement for resolution, as opposed to those in the natural sciences which are definable and separable and may have solutions that are findable. For more details about wicked problems, please refer to "Rittel, H. & Webber. M.(1984). Planning problems are wicked problems. Developments in Design Methodology. New York: John Wiley & Sons, pp. 135-144."

Since governance and development challenges often display characteristics of complexity, it is useful to be aware of the above-discussed notions of non-linearity, emergence, and self-organization while managing technology design and development. Given the general uncertainty demonstrated in these contexts, it becomes important to adopt mechanisms that incorporate divergent views and are responsive to feedback during the various stages of the project life cycle.

The vast literature on ICTD (ICTs and Development) and E-Governance that has come up over the last few decades also calls for design approaches that are more participatory and demonstrate agility in responding to feedback to manage the complexities inherent in the problematic contexts under consideration.

2.2 Participatory design approaches:

The adoption of participatory design in the development of digital government services can allow citizens to become more involved in the decision-making, design, and delivery of digital services by promoting a culture of innovation in the government which is more accountable and transparent[49]. The United States of America's Digital Services playbook, for example, also highlights the need to include real people in their design process from the beginning to understand the needs of the users[50].

Using a participatory approach in the creation of digital government technologies can facilitate a shift in the design and development approach towards co-creation to enhance stakeholder value. By integrating the technology development process into higher networks of power and practice, digital government initiatives can also become more effective[51].

More often than not, the implementation of digital governance applications takes place in contexts with unequal power relationships and resource endowments. The ICT application tends to reflect the biases that arise out of such varying power levels. Involving the key stakeholders at all levels in the process of design and development and ensuring that all voices are heard can bring these biases to the fore and help in dealing with them effectively[52]. By understanding the extent of goal congruence of the stakeholders, the participatory design also allows the development team to take certain decisions on how various objectives for the system can be achieved. Since a socio-technical system has multiple facets to it, a thorough understanding of how technology introduction in one area will affect the rest of the system is also important. Hence, having multiple stakeholders involved from the beginning of the design process is desirable. Constant feedback from key stakeholders also ensures that the technology development process continues to be aligned with its original vision.

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[49] *E-Government Survey 2020* (New York: United Nations, 2020).
[50] 'The Digital Services Playbook — from the U.S. Digital Service' <https://playbook.cio.gov/> [accessed 4 November 2020].
[51] Priyanka Ivatury, Angel Jeena, and Amit Prakash, 'Relevance of Participatory Approaches in Creating ICT Systems for Public Health Programmes', in *Proceedings of the 10th International Conference on Theory and Practice of Electronic Governance*, ICEGOV '17 (New York, NY, USA: Association for Computing Machinery, 2017), pp. 346–54 <https://doi.org/10.1145/3047273.3047370>.
[52] Mark Warschauer, *Technology and Social Inclusion: Rethinking the Digital Divide* (Cambridge, Mass: MIT Press, 2003).

A community-based digital application focused on *child health in rural areas of South Africa*, for example, used a participatory action research model to favorable effect in incorporating diverse stakeholder viewpoints at various stages of the design and development process[53]. This included vision building for the ICT project, situation assessment, application development, testing, and evaluation stages. The experience from the project provides support to include not only the end-users but also those people who will be affected through the delivery of the digital services by these end-users in the processes of participation, involving multisectoral and multilevel groups and attending to the need of developing the capacity of the diverse stakeholders to meaningfully participate in the socio-technical system design process.

On the other hand, a study carried out on the use of digital technologies in public health and nutrition programs of the governments in India[54] concluded that there was a neglect of the perspective of even grassroots healthcare providers (end-users, in its case) in the design of projects. It highlighted that while the healthcare personnel were expected to provide data to feed into computerized reporting systems in their organizations, the organizations' use of digital technologies did not empower them with improved ways to manage and plan their work.

The focus of the design approach in many digital governance projects, as in this case, seems to be merely on automating existing work processes (in a few cases, re-engineered, to bring in greater standardization), which is restricted mainly to the reporting function and a one-way flow of information, with a neglect of the value add that can be brought if the needs of the grassroots institutions and service providers were better attended to.

An ICT strategy that has the grassroots service delivery unit and functionary at its core and actively seeks to empower them by bringing about visible improvements in their work content to enhance their information-processing and decision-making capabilities can lead to a better and more sustainable return on the massive investments currently being made in low and lower-middle-income countries on large-scale digital government projects. Recent reports from the United Nations Conference on Trade and Development (UNCTAD) also take a favorable view of grassroots innovation as an important way to make technologies better aligned with the needs of the poor and the marginalized communities. See Box 7 for more details.

[53] Elaine Byrne and Sundeep Sahay, 'Participatory Design for Social Development: A South African Case Study on Community-Based Health Information Systems', *Information Technology for Development*, 13.1 (2007), 71–94 <https://doi.org/10.1002/itdj.20052>.
[54] Amit Prakash, 'E-Governance and Public Service Delivery at the Grassroots: A Study of ICT Use in Health and Nutrition Programs in India', *Information Technology for Development*, 22.2 (2016), 306–19 <https://doi.org/10.1080/02681102.2015.1034639>.

BOX 7. Grassroots innovation

"Harnessing innovation for sustainable and inclusive development requires changes in the direction of key economic and social processes (for example with regards to sustainable patterns of production and consumption) which cannot take place without the strong involvement of civil society. That is why growing attention is being given to several new approaches to innovation. Such approaches are variously termed pro-poor, inclusive, below-the-radar, frugal, bottom-of-the-pyramid, grass-roots and social innovation, largely reflecting differences in emphasis." (UNCTAD 2018, pp. 86-87)

"Grass-roots innovation approaches seek to practice innovation, in both technology and service provision, in ways that include local communities in the knowledge, processes and outcomes involved." (UNCTAD 2018, p. 87)

Source: *Harnessing Frontier Technologies for Sustainable Development*, ed. by UNCTAD, Technology and Innovation Report, 2018 (New York Geneva: United Nations, 2018).

"New technologies can enable communities and individuals to coordinate and collaborate in novel forms of innovation. Grass-roots innovation facilitates the involvement of grass-roots actors, such as social movements and networks of academics, activists and practitioners experimenting with alternative forms of knowledge-creation and innovation processes." (UNCTAD 2019, p. 5)

"Pro-poor, inclusive and frugal innovations can incorporate marginalized and under-represented communities as producers and beneficiaries of innovation processes in new production models that address social needs, stimulate pro-poor entrepreneurship and facilitate solidarity across groups." (UNCTAD 2019, p. 6)

Source: The Impact of Rapid Technological Change on Sustainable Development', 17.

2.3 Agile methodologies:

Agile is a recent and new entrant in the field of software development and digital technologies and is considered better suited to deal with project environments, like those demonstrated in digital governance initiatives for SDGs, which are set in contexts of complexity. Its proponents describe it as "the ability to create and respond to change …. [and] a way of dealing with, and ultimately succeeding in an uncertain and turbulent environment." The authors of the Agile Manifesto[55] (See the Box 8) chose "Agile" as the label for this whole idea because that word represented the adaptiveness and response to change which was key to their approach. The

[55] The Agile Manifesto was written in 2001 by seventeen independent-minded software practitioners. While the participants didn't often agree, they did find consensus around four core values. For more details, please visit https://www.agilealliance.org/agile101/the-agile-manifesto/

BOX 8. The Agile manifesto

The Agile Manifesto

We are uncovering better ways of developing software by doing it and helping others do it. Through this work we have come to value:

Individuals and interactions over processes and tools

Working software over comprehensive documentation

Customer collaboration over contract negotiation

Responding to change over following a plan

That is, while there is value in the items on the right, we value the items on the left more.

Source: 'Agile Manifesto for Software Development | Agile Alliance', 2015 <https://www.agilealliance.org/agile101/the-agile-manifesto/>

Agile Alliance [56] defines Agile as "really about thinking through how you can understand what is going on in the environment that you are in today, identify what uncertainty you are facing, and figure out how you can adapt to that as you go along."

Agile is considered as a mindset informed by the values contained in the Agile Manifesto and the 12 Principles behind the Agile Manifesto (see Chapter 4 for more details), which provide guidance on responding to change and dealing with uncertainty. The mindset can be summarized as "when you face uncertainty, try something you think might work, get feedback, and adjust accordingly."

A design approach guided by the Agile mindset and related methodology can help digital governance programs better align with the diverse needs and requirements of the various constituencies they seek to serve and also ensure rapid course corrections in the face of unintended negative consequences.

Many governments across the world now actively incorporate Agile within their digital transformation strategies and plan and execute large-scale projects using an Agile approach. Some government agencies championing Agile include the Australian Government's Digital Transformation Agency[57], the United Kingdom's Government

[56] 'What Is Agile Software Development? | Agile Alliance', 2015 <https://www.agilealliance.org/agile101/> [accessed 10 November 2020].
[57] Digital Transformation Agency, '3. Agile and User-Centred Process' (Commonwealth of Australia, 2019), Australia <https://www.dta.gov.au/help-and-advice/digital-service-standard/digital-service-standard-criteria/3-agile-and-user-centred-process> [accessed 10 November 2020].

Digital Service[58] , and the United States of America's 18F[59] setup under their General Services Administration.

2.4 Design thinking and human-centered design:

Design thinking is a multi-disciplinary process for meeting people's needs and desires in product and service delivery in a technologically feasible and strategically viable way[60]. It is a methodology that imbues the full spectrum of innovation activities with a human-centered design (see Box 9) ethos[61]. Design thinking is a nonlinear, iterative process that seeks to understand users, challenge assumptions, redefine problems, and create innovative solutions to prototype and test[62]. It is quickly developing into an established discipline that uses the designer's sensibility and methods to match people's needs with what is technologically feasible and what a viable strategy can convert into value for its stakeholders.

BOX 9. Human Centred Design

Human-centered design is a creative approach to problem solving ….. It is a process that starts with the people one is designing for and ends with new solutions that are tailor made to suit their needs. Human-centered design involves building a deep empathy with the people for whom the design is being done, generating multiple ideas and building rapid prototypes, sharing them with the people and eventually putting the innovative new solution out in the world.

Human-centered design consists of three phases. In the Inspiration Phase, one learns directly from the people as one immerse oneself in their lives and comes to deeply understand their needs. The Ideation Phase involves making sense of this learning, identifying opportunities for design, and prototyping possible solutions. In the Implementation Phase, the solution is brought to life, and eventually, to use/market. The possibility of the solution being a success gets significantly improved as the very people one is interested in serving are at the heart of the process.

Source: 'Design Kit' <https://www.designkit.org/human-centered-design> [accessed 10 November 2020].

[58] 'About the Government Digital Service - Government Digital Service' <https://gds.blog.gov.uk/about/> [accessed 10 November 2020].
[59] '18F: Digital Service Delivery | Home' <https://18f.gsa.gov/> [accessed 10 November 2020].
[60] 'IPAA ACT | Welcome to IPAA ACT' <https://www.act.ipaa.org.au/aboutipaa> [accessed 10 November 2020].
[61] 'Design Thinking', *Harvard Business Review*, 1 June 2008 <https://hbr.org/2008/06/design-thinking> [accessed 10 November 2020].
[62] *Futures Thinking in Asia and the Pacific: Why Foresight Matters for Policy Makers* (Asian Development Bank, 1 April 2020) <https://doi.org/10.22617/TCS200126-2>.

As per an Accenture brief[63], the concept of design-led innovation is driven by a deep understanding of user needs and an ethos of shaping an organization, service, or product around that user. This is done using research, rapid prototyping, constant feedback, and experimentation to deliver quick, effective results.

Design thinking is increasingly being adopted within government agencies across the world. A report brought out by the UNDP Global Centre for Public Service Excellence (GCPSC) argues that "design thinking can equip governments with innovative approaches to face contemporary challenges such as inter-connected and diffused economic and social patterns, more complex problems, blurred governance boundaries, and reduced trust in public action"[64]. The report also considers design thinking useful in formulating solutions that can be "progressively refined through an iterative process of providing a voice to end-users and engaging them in shaping decisions (professional empathy and co-creation); of considering multiple causes of and diversified perspectives to the problems at hand (scaling); and experimenting initial ideas (prototyping and testing)." Box 10 highlights some key features considered useful by UNDP GCPSC in deploying a design thinking approach within governments.

[63] Accenture (2015). Re-designing government innovation: Why digital government transformations must be design-led, not technology-led. https://www.accenture.com/t00010101T000000__w__/au-en/_acnmedia/Accenture/Conversion-Assets/DotCom/Documents/Local/au-en/PDF/1/Accenture-Redesigning-Government-Innovation.pdf

[64] UNDP Global Centre for Public Service Excellence (2014). Design Thinking for Public Service Excellence. http://www.undp.org/content/dam/uspc/docs/GPCSE_Design%20Thinking.pdf

BOX 10. Key features of the design thinking approach

Design thinking results from a number of essential components that follow a process of empathizing, co-creating, scaling, prototyping, experimenting and testing.

Empathizing and co-creating: Collaboration is essential when faced with a complex challenge because innovation is unlikely to occur in isolation. Design thinking starts with 'professional empathy', i.e., the capacity to understand and imaginatively enter into another person's feelings. As such, it is the cornerstone of a human-centred design process.Co-creation seeks to multiply the productive capacities within the public service tank by involving people (policy users) in the creation of new solutions to the problems affecting them.

Scaling: Scaling implies identifying and disentangling the problems up-front as webs of factors, looking for direct and prima facie indirect causal relationships, rather than moving straight to specifications. It is an iterative method that makes the observer – the policy designer – rationally swing from the macro- to the microdimension. It thereby enables us to frame multiple and various questions to address a policy problem.

Prototyping, experimenting and testing: One of the most visible outputs of design thinking are policy prototypes. A prototype is an early sample, model or release of a product built to test a concept or process or to act as a thing to be replicated or learned from

Source: UNDP Global Centre for Public Service Excellence (2014). Design Thinking for Public Service Excellence. http://www.undp.org/content/dam/uspc/docs/GPCSE_Design%20Thinking.pdf

Design thinking is considered a favored approach by UNDP for achieving the SDGs because it is based on empathy, it makes it possible to materialize ideas, uses methods that combine analysis and intuition, leads to desirable, feasible and viable solutions, and involves those who are most affected by a given problem[65].

The Asian Development Bank (ADB), in an April 2020 report titled 'Futures Thinking in Asia and the Pacific: Why Foresight Matters for Policy Makers'[66] argues that solutions to Asia-Pacific's socioeconomic, political, environmental, and climate change challenges lie in people's visions of futures they can actively shape, first imagining

[65] *Design Thinking: A Guide for Prototyping and Testing Solutions for the Sustainable Development Goals* (United Nations Development Program, 2017) <https://www.arabstates.undp.org/content/rbas/en/home/library/Sustainable_development/design-thinking-.html>.
[66] *Futures Thinking in Asia and the Pacific: Why Foresight Matters for Policy Makers* (Asian Development Bank, 1 April 2020) <https://doi.org/10.22617/TCS200126-2>.

them and working backward to make them happen. Design thinking is considered as a preferred way to inform these road maps and the charting out of the desired future.

Many design thinking toolkits, especially those for use in the public sector, are now available as a ready reference for government officials, including those involved in digital technology projects and policies. Some useful resources include the one brought out by the UNDP's Youth Leadership Programme (YLP) in the Arab States (mentioned above) and 'Designing for Public Services: a practical guide'[67] brought out by the innovation firm Nesta in collaboration with the design firm IDEO.

Realizing the growing relevance and potential of design thinking and human-centered design for digital systems, the International Organization for Standardization has brought out the 'ISO 9241-210:2019 Ergonomics of human-system interaction — Part 210: Human-centered design for interactive systems', which provides good principles concerning requirements and recommendations for human-centered design principles and activities throughout the life cycle of computer-based interactive systems. It is intended to be used by those managing design processes and is concerned with ways in which both hardware and software components of interactive systems can enhance human-system interaction[68]. This is another useful resource available to digital governance practitioners who are interested in incorporating design thinking approaches.

2.4.1 Some examples and cases:

Design thinking approaches have been implemented to streamline the processes in government departments. For example, in Auckland, New Zealand, design thinking and participatory approaches are embraced by the City Mayor's office. The initiative has revolutionized the governance in the city substantially over 17 months. Collaborating with over 15,000 citizens and businesses has improved the urban city planning with more pedestrian-friendly shared spaces, resulting in increased retail hospitality takings by more than 430 per cent in places[69].

Case study 2 highlights how Georgia has leveraged design thinking to enhance better access to information on the official government website of the country.

[67] 'Nesta_ideo_guide_jan2017.Pdf' <https://media.nesta.org.uk/documents/nesta_ideo_guide_jan2017.pdf> [accessed 10 November 2020].
[68] 14:00-17:00, 'ISO 9241-210:2019', *ISO* <https://www.iso.org/cms/render/live/en/sites/isoorg/contents/data/standard/07/75/77520.html> [accessed 10 November 2020].
[69] 'Accenture-Redesigning-Government-Innovation.Pdf' <https://www.accenture.com/t00010101T000000__w__/au-en/_acnmedia/Accenture/Conversion-Assets/DotCom/Documents/Local/au-en/PDF/1/Accenture-Redesigning-Government-Innovation.pdf> [accessed 4 November 2020].

CASE STUDY 2: Design thinking in Georgia government

Georgia used design thinking methodologies to update its official government website. The designers empathized with the needs of the user realising that citizens seek only 10 to 15 per cent of the information present on the previous version. This was achieved by using heat maps, analyzing the search data that presented traffic patterns, and analysing what content received the highest number of clicks.

It helped to gain insights that most editorials should be curated around the most searched content to ensure that citizens benefit from the website. The team also listed the high priority topics and grouped the content corresponding to each topic on a single web page ensuring that users see the consolidated information from multiple agency websites. The efforts have significantly increased browsing time on the website.

Source: Govtech.com. 2020. *Design Thinking In Action*. [online] Available at: https://www.govtech.com/computing/Design-Thinking-in-Action.html

Human-centric design (HCD) approaches are helping governments to progress from the traditional "waterfall approach," which considered analysis, design, and implementation as discrete phases in a project. HCD ensures rapid prototyping and iterations so that resources are allocated for a service development after testing it with users, unlike the waterfall approach, which is much more rigid due to limited possibilities of iterations[70]. The failed launch of the HealthCare.gov platform in the United States of America in 2013 is a good example where service has suffered huge unplanned investments from $93.7M to $1.7B[71]. It is argued that HCD makes it easy to get frequent feedback from the stakeholders involved and, thus, decreases the costs and the risks of failure. It allows all the stakeholders involved to have a shared and clear understanding of the problem while designing a service which helps to reduce cost and time spent on the project.

HCD can also help provide solutions to the problems which prevent widespread adoption of government digital services. For instance, **California, United States of America, State's GetCalFresh**[72] project, which aims to ease out the process of online application of **California's food stamps (SNAP) program**, proved futile. The majority of citizens abandoned it as the online application consisted of 50 web pages and

[70] 'Design Thinking for Better Government Services | Government Innovators Network' <https://www.innovations.harvard.edu/blog/design-thinking-better-government-services-human-centered> [accessed 4 November 2020].
[71] Amy Goldstein, 'HHS Failed to Heed Many Warnings That HealthCare.Gov Was in Trouble', *Washington Post*, 23 February 2016, section Health & Science <https://www.washingtonpost.com/national/health-science/hhs-failed-to-heed-many-warnings-that-healthcaregov-was-in-trouble/2016/02/22/dd344e7c-d67e-11e5-9823-02b905009f99_story.html> [accessed 4 November 2020].
[72] 'Apply for California Food Stamps Online | GetCalFresh.Org' <https://www.getcalfresh.org/en> [accessed 4 November 2020].

nearly 100 questions, which instead of easing out the process, made it toilsome and time-consuming for the user. However, when the online and mobile application was designed utilizing concepts of HCD, it significantly improved user experience, allowing users to transfer documents by taking photos of them with their phone than sending them via fax, scan, or snail mail, and reducing the time it takes to complete the application to less than 10 minutes[73]. These improvements have resulted in an 18 per cent increase in enrolments[74].

A human-centered design approach has also been considered useful in reducing chronic childhood malnutrition in Madagascar through better implementation of **Madagascar's National Community Nutrition Program**. The policymakers were under the impression that malnutrition was prevalent due to financial constraints, therefore most initiatives had a focus on overcoming financial barriers, which did not result in significant gains. The adoption of a human-centered approach showed that there was a lack of awareness among mothers as to what constitutes nutritious food and how to prepare it rather than a lack of financial resources[75]. Later, the team developed campaigns and demonstrations on how to prepare a nutrient-rich meal which helped curb malnutrition significantly by increasing program effectiveness through innovative solutions.

[73] Code for America, 'State of California Partners with GetCalFresh to Deliver the Human-Centered Service Across the State', *Code for America* <https://www.codeforamerica.org/news/state-of-california-partners-with-getcalfresh-org-to-deliver-the-human-centered-service-across-the-state> [accessed 4 November 2020].
[74] 'Design Tweak Yields 18 Percent Rise in SNAP Enrollment' <https://www.govtech.com/gov-experience/Design-Tweak-Yields-18-Percent-Rise-in-SNAP-Enrollment.html> [accessed 4 November 2020].
[75] 'Addressing Chronic Malnutrition in Madagascar', *World Bank* <https://www.worldbank.org/en/programs/sief-trust-fund/brief/addressing-chronic-malnutrition-in-madagascar> [accessed 4 November 2020].

2.5 Key Points

- Technology is not inherently neutral. The values (explicit and tacit) of the designers influence the design and use of digital technologies. Such a view is known as the social shaping of technology.

- We need to view digital government from a socio-technical perspective. In addition, digital government applications display complexity, i.e., there are a large number of interacting parts, and they have a structure and behavior that are difficult to understand a priori and make definite predictions.

- Using a participatory approach in the creation of digital government technologies can facilitate a shift in the design and development approach towards co-creation to enhance stakeholder value.

- Agile methodology is a new entrant in the field of software development and has gained widespread acceptance, especially in addressing the complex socio-technical challenges of governance. Agile mindset can be summarized as follows: "when you face uncertainty, try something you think might work, get feedback, and adjust accordingly."

- Governments are also adopting a design thinking approach to public policy problems, including digital government. Design thinking is a nonlinear, iterative process that seeks to understand users, challenge assumptions, redefine problems, and create innovative solutions to prototype and test.

- Human-centered design approach begins with a deep understanding of the problem context from the user's perspective. Building a deep empathy with the people for whom the design is being done is central to a human-centered design approach.

- The approaches to digital technology design discussed in this chapter, if adopted, can ensure that digital government applications further the values of inclusiveness, accountability, and effectiveness in governance.

3. Digital Government strategies:

Outline: This chapter aims to:

1. Explain components of Digital Government strategies and plans, and the associated processes.
2. Discuss the key components of a digital government strategy.
3. Expand on the regulations and legal framework required for effective digital government transformation.
4. Provides an overview of national digital government strategy and plans of few countries in the Asia Pacific region.

3.1 Introduction:

Digital technologies have been undergoing rapid advances in the last few decades. From the earlier practice of publishing information on websites, governments can now leverage emerging technologies such as the IoT, Blockchain, 5G, digital payments, Big Data, and Artificial AI. Even as governments look to adopt these emerging technologies, it is important to remember that the vision guiding Digital Government should be to achieve good governance towards achieving Sustainable Development Goals. Thus, governments need a holistic Digital Government strategy, which is not merely technological but also incorporates governance values. The contours of such a policy can vary depending on the local contingencies. Yet, some common underlying values can be delineated. Thus, before we outline the components of a digital strategy, we need to review these overarching values.

3.1.1 Digital governance values

The prevailing global consensus on governance values is best articulated in Sustainable Development Goal 16, which seeks to "Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels." As per the Committee of Experts on Public Administration of UNESCO, effectiveness in governance requires improving the competency of governments in their daily functioning, with sufficient expertise, resources, and tools to deal with the mandates under their authority[76]. It also requires sound policymaking and collaboration among institutions at all levels of Government and in all sectors as well as non-State actors towards addressing problems of common interest. Ensuring accountability in governance requires

[76] 'Committee of Experts on Public Administration, "Relating the Principles of Effective Governance for Sustainable Development to Practices and Results" (United Nations Economic and Social Council, 2019) <https://documents-dds-ny.un.org/doc/UNDOC/GEN/N19/018/77/pdf/N1901877.pdf?OpenElement>.

institutions to be open and candid in the execution of their functions and promote access to information, subject only to the specific and limited exceptions as are provided by law. Inclusive governance implies that public policies take into account the needs and aspirations of all segments of society, including the poorest and most vulnerable and those subject to discrimination. This would mean non-discrimination of any kind as to race, color, sex, language, religion, political or other opinions, national or social origin, property, birth, disability, or any other status. Further, it would require the direct participation of people in policies that influence their lives.

These governance values should govern the design and implementation of a digital government strategy, as well. For instance, inclusiveness in the digital Government would mean that no one is left out of digital service, and governments provide multiple channels of service delivery, including non-digital and mediated channels (see Box 11).

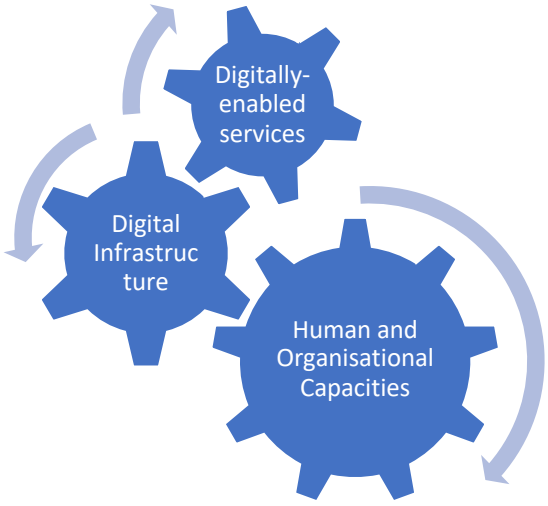
E-government is not about building award-winning design, nor is it just about using state-of- the-art computers or technologies in providing services to the public. On the contrary, e-government is a way for governments to achieve their objectives to better serve people, including the poorest and most vulnerable, and for people to be involved in the design and use of public services to ensure the well-being of all.

Source: E-Government Survey 2016 (New York: United Nations, 2016).
Note: The terms Digital Government and e-government are often used interchangeably.

Similarly, accountable governance could imply that governments publish data in a manner that enables meaningful participation. Effective governance could, for example, involve a single point of contact for citizens and data-sharing within different tiers and agencies of government for effective policymaking.

Governments need to consider these values consciously while designing a digital government strategy. A holistic digital government strategy consists of three interrelated factors – digital infrastructure such as devices and internet connectivity, digitally-enabled services, and individual and institutional capacities. These factors need to be supported with an overarching legal and regulatory policy. These three components of a digital government strategy are very much interrelated. For instance, digital infrastructure is a prerequisite for the digital services to be provided as well as accessed. Similarly, building capacities of policymakers, policy-implementers as well as citizens towards digital technology is critical to ensure a successful digital government. We discuss each of the three components, along with the overarching regulatory and legal framework in the following section.

Figure 10. Components of a Digital Government Strategy



3.2 Digital Infrastructure

Infrastructure denotes a system that supports the performance of a certain activity[77]. A digital or information infrastructure thus refers to all the systems, including devices, communications networks, and services that support the performance of digital government operations. Any vision of a digital government thus needs to focus on an enabling digital infrastructure without which we might end up exacerbating the digital and social exclusion. Like an industrial infrastructure, digital infrastructure requires a considered governmental role and an overarching strategy.

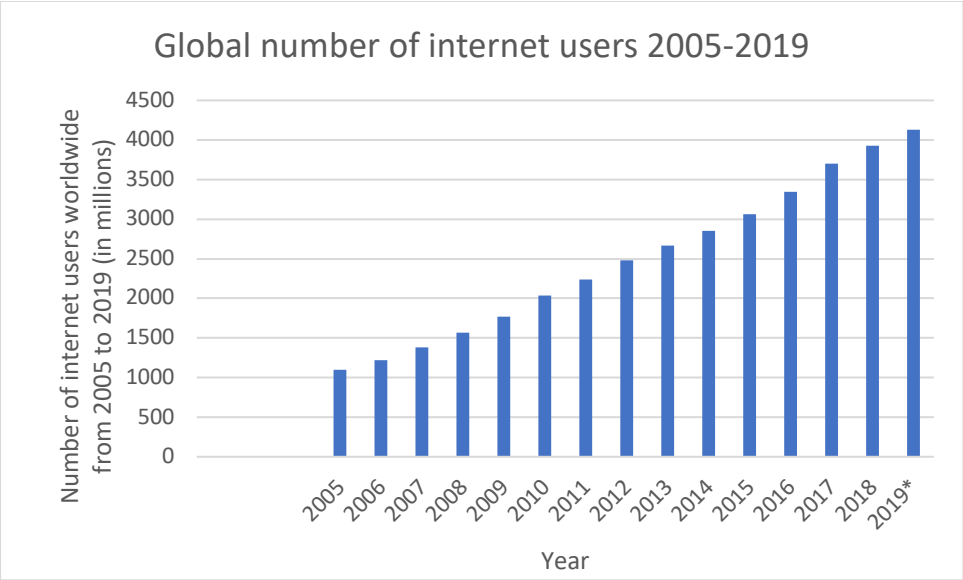
The objective of a digital infrastructure strategy is to ensure that the users, citizens as well as government staff, have access to digitally enabled services. By access, we mean not merely the availability of the Internet but a much broader conception. The Broadband Commission's concept of "meaningful universal connectivity" encompasses broadband adoption that is not just **available**, **accessible**, **relevant,** and **affordable**, but that is also **safe**, **trusted**, **empowering** [for] users, and leading to positive impact[78]. This ensures that users can benefit from online participation while mitigating the downsides of digital connectivity.

ITU estimates show that the proportion of individuals using the Internet has been steadily growing over the last decade (see Figure 11). For the first time, more half of the world's population began using the Internet at the end of 2018[79]. Mobile access to telecommunication services continues to grow while fixed-telephone subscriptions

[77] 'Information Infrastructure - an Overview | ScienceDirect Topics' <https://www.sciencedirect.com/topics/computer-science/information-infrastructure> [accessed 10 November 2020].
[78] 'The State of Broadband 2019 Broadband as a Foundation for Sustainable Development', 148.
[79] 'Press Release' <https://www.itu.int/en/mediacentre/Pages/2018-PR40.aspx> [accessed 10 November 2020].

continue to decline. Nearly the entire world population (96 per cent), now lives within reach of a mobile cellular network. While overall broadband internet access has grown significantly, the growth of mobile-broadband subscriptions has been much more substantial than a fixed broadband subscription.

Figure 11. Individuals using the Internet



Source- Statistics. (2020). https://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx

93 per cent of the global population can access the Internet through a 3G or higher speed network[80]. Despite these impressive gains, a large proportion of the population still has no access to the Internet. As per the ITU statistics of 2019, most people are online in developed countries, with close to 87 per cent of individuals using the Internet. In the least developed countries (LDCs), on the other hand, only 19 per cent of individuals were online in 2019. Even within these countries, the rural regions tend to have a disproportionally lower digital connectivity level. These disparities are not just geographic but also social. For instance, the proportion of women using the Internet globally is 48 per cent, compared to 58 per cent for men. In relative terms, this means that the global Internet user gap is 17 per cent. Aggregate and averaging data obscure the substantial differences in usage levels[81].

While data has become cheaper, affordability of internet-enabled handsets remains a challenge. The cost of internet-enabled devices has not significantly fallen; it remains a key barrier to mobile ownership and mobile internet adoption in low- and middle-income countries (LMICs)[82]. According to a recent study by Alliance for Affordable Internet (A4AI), a smartphone costs about 82 per cent of monthly income for most of the households in low-income countries, while it is only 8 per cent of monthly income

[80] 'Measuring Digital Development Facts and Figures 2019' <https://www.itu.int/en/ITU-D/Statistics/Documents/facts/FactsFigures2019.pdf> [accessed 10 November 2020].
[81] 'The State of Broadband 2019 Broadband as a Foundation for Sustainable Development', 148 (p. 2).
[82] 'Countries with Gross National Income (GNI) per Capita Is between $1,026 and $3,995 Are Referred to as LMIC's.'

for households of upper-middle-income countries[83]. Much of the data on mobile ownership is on the supply-side. However, demand-side surveys of mobile ownership and internet usage, such as that of AfterAccess[84] show that significant barriers such as the unaffordability of mobile devices and the Internet, absence of electricity, and lack of mobile coverage continue to exist. Thus, supply-side mobile ownership data does not always accurately represent mobile internet usage. The survey also highlights the significant gender disparity. Therefore, the challenge of achieving meaningful universal connectivity is not yet behind us. Very often, when public service delivery is based entirely on digital technology, it creates challenges not only for the citizens but also for the service providers within the public sector.

Thus, internet access cannot be left to the private sector market players alone. Governments will have to play an active role in ensuring meaningful universal connectivity, which involves regulatory policies such as open and shared infrastructure, appropriate spectrum allocation policy, and more direct measures like Universal Service and Access Funds, expanding public access options providing and incentivizing mediated access centers.

3.2.1 Universal Access and Service Funds:

Universal Service and Access Funds (USAFs) are a funding mechanism to incentivize the expansion of internet services in remote and underserved locations[85]. These funds are often financed through mandatory contributions from telecommunications service providers and are designed explicitly to address access and use gaps in communications services.

According to the Web Foundation, USAFs provide a mechanism for ensuring that the contributions made to the fund are put toward market developments that will benefit citizens and will create new business opportunities for telecommunications companies and content providers alike[86]. Ideally, the services developed through the USAF will become commercially sustainable. Properly administered, a USAF serves as a collective investment mechanism for the telecommunications industry as a whole rather than a vehicle for social welfare redistribution of private income. Since the financial benefits of extending service to these underserved areas (mostly poor and rural communities) may be slower to materialize, the USAF approach is designed to tackle this market failure and develop a 'win-win' situation for both industry and society by developing new markets and ensuring wider access to the social benefits of connectivity.

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[83] Alliance for Affordable Internet, *From Luxury to Lifeline: Reducing the Cost of Mobile Devices to Reach Universal Internet Access* (Web Foundation, 2020).

[84] 'After-Access-Website-Layout-R1.Pdf' <http://afteraccess.net/wp-content/uploads/After-Access-Website-layout-r1.pdf> [accessed 11 November 2020].

[85] D Thakur and L Potter, *Universal Service and Access Funds: An Untapped Resource to Close the Gender Digital Divide* (Washington DC: Web Foundation, 2018).

[86] Thakur and Potter.

India's national optical fiber network (BharatNet) is an example of the successful deployment of the Universal Service and Access Fund. It is the biggest rural telecom project in the world to empower citizens digitally and to bridge the digital gap between rural and urban India. The project was launched on 25 October 2011 to augment the network infrastructure of the country. It is the flagship mission of the Government of India, which aims to deliver broadband services on optical fiber over 250,000 gram panchayats (village offices) in the country to serve as the backbone of Digital India[87]. In some countries such as Finland, universal access obligations are legislated as a legal right of citizens to broadband access (see Case Study 3).

CASE STUDY 3 : Right to internet access, Finland

In July 2010, the Finnish Government became the first country to declare broadband access a basic right in the world. It implies that all citizens of the country must be able to access the Internet to exercise and enjoy their rights to freedom of expression and opinion and right to development. The state must ensure that Internet access is broadly available and may not unreasonably restrict an individual's access to the Internet.

The government obligated all telecom operators that are defined as universal service providers to provide every permanent residence and business office with access to a reasonably priced and high-quality connection with a downstream rate of at least 1 Mbit/s under the national broadband project, stating universal service also includes a functional Internet connection.

The program was a success as access to the internet in Finland increased by 13 per cent from 2010 to 2019 with (94 per cent) of the households having access to the internet. In 2011, the United Nations declared the right to broadband as a fundamental human right. After Finland, Costa Rica, Estonia, Greece, Spain, France, and the United Kingdom included the right to access technologies that facilitate access to worldwide web.

Source: Facilitating Access to Networks and Services - Unesco." http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/CI/CI/pdf/2nd_report_finland.pdf.

3.2.2 Provision of Public Access:

Yet another digital government strategy in many countries has been to provide internet access through public access facilities to ensure that even if network access is available in a given geography, costs of devices or services do not remain prohibitive for low-resourced individuals to participate online. Public access facilities include libraries and community centers with computers equipped to provide free internet access, as well as sites providing free public Wi-Fi.

[87] 'Vikaspedia Domains' <https://vikaspedia.in/e-governance/digital-india/national-optical-fibre-network-nofn> [accessed 11 November 2020].

While providing such open-access facilities, especially through private telecom providers, governments should guard against the bundling of content and network access by the service provider and ensure the principle of net neutrality (see Box 12). Further, it is vital to keep in mind the social context of locations where public access is made available (see Box 13).

BOX. 12 Net neutrality

Net neutrality is the normative principle that states that Internet service providers and governments regulating the Internet should treat all data on the Internet the same, not discriminating or charging differentially by user, content, website, platform, application, type of attached equipment, or mode of communication.

The notion of Net neutrality promotes:

1. **No blocking**: If a consumer seeks a request to access a website/Service with legal content, ISP cannot block the content providing equal accessibility of the content to every user.
2. **No throttling**: The ISP cannot intentionally provide variable bandwidth to users to slow down some content and at the same time speeding up others.
3. **No paid prioritization**: To foster neutral internet growth no service should be stuck in the slow lane only because it does not pay a fee and malpractices such as paid prioritization and similar restrictions should be curbed.
4. **Enhanced transparency**: ISPs are supposed to disclose network management practices, performance, and commercial terms of their broadband internet access services on publicly accessible websites, including those with disabilities.

The principle of Net Neutrality stands as a foundation for an alternative principle of global governance of internet, one that prioritizes the value of open and universal communication and information.

The consequences of breaching net neutrality principles are not only economic, as Internet has emerged as one of the key pillars of digital society, and the right to broadband has been proclaimed as the basic right, including access to information, health, education, and freedom of expression. Endangering the openness of the Internet could, therefore, impact fundamental rights.

Source : "Net Neutrality: A Free and Open Internet | The White House." 10 Nov. 2014, https://obamawhitehouse.archives.gov/net-neutrality.

BOX 13. Is public Wi-Fi truly inclusive?

Public Wi-Fi networks are increasingly viewed as last-mile Internet solutions for rural areas given the infrastructure-intensive nature of fibre optic broadband connectivity. However, an ethnographic study from rural India suggests that public spaces are often gendered, and the location and design of hotspots can easily exclude women accessing and using such hotspots. Governments need to remain sensitive to gendered notions of space and practicing inclusivity in the spaces where they deploy Wi-Fi services.

Source: Mudliar, Preeti. 2018. "Public WiFi Is for Men and Mobile Internet Is for Women: Interrogating Politics of Space and Gender around WiFi Hotspots." *Proceedings of the ACM on Human-Computer Interaction* 2(CSCW):1–24.

While such provisioning of the Internet in public spaces can go a long way in ensuring access to digitally enabled services, it is equally important to note the role of shared infrastructure spaces and mediated access. As already discussed, individual device ownership is still not universal. Even when people have access to devices, they might not afford internet services or might not have the required digital skills and trust in the digital medium to access digital services individually. Thus, the idea of shared infrastructure becomes relevant, where the intermediaries support them in accessing the digital infrastructure and services. Governments must therefore support the telecentres, cybercafes, and common service centers to ensure inclusion and equity.

Alongside the above measures of improving access to digital infrastructure, countries can benefit immensely through regional cooperation as well. For instance, the Asia-Pacific Information Superhighway (AP-IS) initiative was launched with the vision to catalyze the development of seamless regional broadband networks which improve affordability, reliance, resilience, and coverage and thereby address the causes of digital divides, develop the Internet ecosystem to support the implementation of the SDG and stimulate the digital economy in Asia and the Pacific. The AP-IS promotes the development of terrestrial and submarine fiber-optic connectivity and provides a regional intergovernmental platform scrutinizing the missing fiber-optic links between ESCAP countries.

The AP-IS Master Plan 2019-22 identified the following four thematic pillars (see Box14):

BOX 14. Asia-Pacific Information Superhighway (AP-IS)

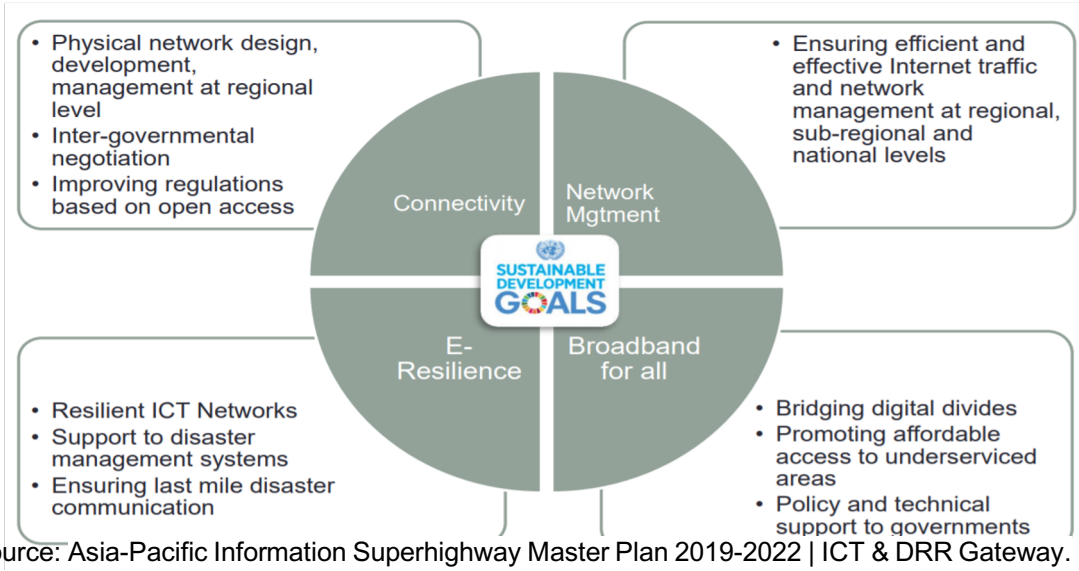
The AP-IS Master Plan 2019- 2022, identified the following four thematic pillars:

Connectivity: improving connectivity as a cohesive web of open access cross border infrastructure, which serves as a foundation for all digital technologies.

Internet traffic management: The fixed broadband access calls should be enhanced by establishing sufficient Internet exchange points (IXPs) within the region to improve reliance, quality and cost of internet connectivity for better intra-regional content exchange.

E-resilience: AP-IS calls for e-resilience which can be defined as the ability of a society and its Information Communication Technologies (ICT's) to resist, absorb, accommodate, adapt and transform and recover from the effects of a hazard in a timely and effective manner. For instance, in Bhutan, a hydro med services website provides hazard-related information. The hazard monitoring system is linked to sensors, which send real time data.

Broadband for all: To build an environment leading to the promotion of inclusive broadband internet access for all, including the least developed and landlocked developing countries to bridge the digital divide.



Source: Asia-Pacific Information Superhighway Master Plan 2019-2022 | ICT & DRR Gateway. (2020). Retrieved 26 October 2020, from https://drrgateway.net/Asia-Pacific-Information-Superhighway-master-plan

BOX 15. E-resilience: Mitigating disruptions to ICT infrastructure in disaster

Governments and businesses' adoption of digital technologies is increasing rapidly over the last few years. Ensuring smooth functioning of the underlying digital infrastructure is of utmost importance now. However, many countries, especially in the Asia-Pacific region, are prone to natural disasters such as earthquakes, tsunamis, floods, and landslides, posing a disruption to the reliability of digital infrastructure and digital services. E-Resilience is defined as the ability of ICT systems to withstand, recover from, and change in the face of an external disturbance such as a natural disaster. Besides, e-resilience is concerned with utilizing ICT for societal resilience. In the event of a disaster, access to communication networks is considered a necessity, along with access to food, water, and clothing.

There are two major causes for disruption to service in a disaster. First, the damage caused by the disaster might impact the physical backbone or the last-mile connectivity. Disruptions to the power supply might also interrupt telecommunication services. Second, the people's response to the disaster might lead to unusually heavy network traffic, hampering recovery efforts. An e-resilience plan must proactively address both these disruptions. Hazard maps that highlight areas that are highly prone to disaster must be considered while deploying the ICT backbone. Furthermore, some recent innovations such as mobile cell sites and Airborne base stations can contribute to e-resilience. Mobile cell sites such as Cell on Wheels (COW) act as mobile radio base stations and extend telecommunication coverage to disrupted areas in a short span of time. Similarly, airborne base stations use unmanned aerial vehicles (UAVs) to rapidly deploy and extend telecommunication to inaccessible regions.

Source: UNESCAP (2020) Understanding E-Resilience for Pandemic Recovery in Asia and the Pacific.

3.3 Digitally Enabled Services:

Digitally enabled services refer to all those government services which are fully available online or are enabled through some form of digitization. Such services have evolved significantly from the earlier era of the Internet, where governments barely published information on a few websites. Traditionally known as e-government services, these have been categorized based on the stakeholders of the service as Government-to-Government (G2G), Government-to-Citizen(G2C), and Government-to-Business(G2B). However, Digital Government is not merely about the increased use of technology in governance. It also provides opportunities for restructuring the nature of interaction within the Government as well as with society. Such restructuring takes two forms – a Whole-of-Government (WoG) approach and a collaborative

government approach. A WoG approach implies breaking the solos within and among different tiers of government to achieve an integrated view of the Government for policymaking and public service delivery. The collaborative government approach promotes such extending of boundaries beyond the Government to citizens, enabling collaboration with citizens towards better governance. As discussed earlier, these approaches would allow governments to achieve the principles of effectiveness, accountability, and inclusivity in governance.

3.3.1 Whole-of-Government approach:

The growing importance attached to WoG approaches has been accompanied by a more integrated approach to e-government and online service delivery[88]. A whole of government approach implies greater coordination among different layers of Government as well as between various departments of Government to provide unified service delivery to citizens. Such an approach also has implications for policymaking. An integrated and coordinated approach is required to address some of the development challenges, such as poverty eradication and disaster management, which have multiple root causes. Thus, a WoG approach allows greater communication and coordination among policy areas and agencies at all levels, in a way that governments can deliver "as one" in pursuit of an increased quality of and an inclusive access to services to the benefit of its citizens[89]. A WoG approach is, therefore, not an end but a means to achieve governance values of inclusion, transparency, and accountability.

Digital technologies can play an essential role in this new approach to governance by enabling vertical and horizontal coordination among different agencies. Such a technology-enabled approach ensures public service delivery through an online one-stop-shop to citizens or through call centers. According to the United Nations E-government Survey 2020, over 90 per cent of countries surveyed have one-stop-shop portals suggesting that governments are adopting an integrated approach to public service delivery. Further, digitally enabled seamless information sharing among multiple agencies within the governments also allows for an integrated approach to policymaking. Such an approach requires -

(i) the use of a common organizational and technical platform to ensure back-office integration so that internal processes are coordinated and run smoothly together,
(ii) robust interoperability (i.e., each system is compatible and works with other systems), and
(iii) an infrastructure that supports the use of electronic identity cards and signatures.

[88] E-Government Survey 2016 (New York: United Nations, 2016).
[89] E-Government Survey 2014 (New York: United Nations, 2014).

3.3.1.1 Public Service Delivery:

Online delivery of public services requires, as a first step, the citizens to authenticate themselves with the service providers. Digital identity plays a central role in digital government development and data applicability, as it provides the basis on which data can be safely and securely shared within and between agencies to improve public services and their delivery[90]. Such digital identities also enable the achievement of SDG 16.9, which states that "by 2030 legal identity will be provided for all including free birth registrations". However, they need to be backed by sufficient legal safeguards to ensure privacy and prevent misuse.

Increasingly, some of the services are being delivered through mobile technologies. Frontline service providers of health, nutrition, housing, and livelihoods, for instance, use mobile services, especially the smartphone, to provide services. This is enabled by Mobile apps that creatively use Global Positioning System (GPS), Internet, camera, and voice services to authenticate service recipients. Citizens, too, are using mobile apps to access government services. Despite these advances in digitally-enabled service delivery, not all citizens might be able to participate equally. Digital by default approach to public service delivery should thus be avoided (see Box 16).

[90] *E-Government Survey 2018* (New York: United Nations, 2018).

BOX 16. "Digital First" vs "People First" Approach

The digital divides become more apparent as an increasing number of government services are provided online. By promoting a "digital first" approach, governments may inadvertently create new digital divides by excluding those who cannot use online services. Thus, supplementing online services with technology-enabled offline services is increasingly important as countries move towards adopting a more digital government with the aim of promoting efficiency and inclusiveness. To leverage digital use, some countries are making services "digital by default" designed primarily for use online but when some services are not available offline, the potential implications are significant.

Source: 2016 UN E-Government Survey | Multimedia Library - United Nations Department of Economic and Social Affairs. (2020), p6

Public service delivery should include facilitation centers such as the traditional common service centers. Further, governments must invest in digital literacy campaigns (see the following section). Alongside this, appropriate mechanisms must exist to take citizens' feedback actively. Citizen satisfaction surveys should be periodically conducted, and results published proactively. Similarly, grievance-redressal mechanisms must exist, not only for the service delivery but also for digital services.

3.3.1.2 Policymaking:

The need for an integrated approach to policymaking has been expressed in major international agreements, including the 2030 Agenda for Sustainable Development (United Nations, 2015a), which calls for enhanced policy coherence in its target 17.14.[91] Big Data[92] analytics offers specific benefits as a tool to strengthen policy integration for sustainable development. According to the United Nations (2012), Big Data analytics refers to tools and methodologies that help transform massive quantities of raw data into useful insights. These Big Data tools and methodologies build on powerful algorithms to detect patterns, trends, and correlations in the primary data, and they also utilize advanced visualization techniques. Big Data analytics can help assess the impact of sectoral policies across the three dimensions and thus support cross-sectoral integrated policies, which tend to face more complexities and uncertainties than single dimension policies. Predictive modeling and computer simulations are some of the techniques that can be used to analyze and manage the sectoral trade-offs[93].

[91] E-Government Survey 2016.
[92] 'Academy Module on "Realizing Data-Driven Governance" | APCICT/ESCAP'.
[93] E-Government Survey 2016.

However, caution must be exercised while using big data for policymaking. The accuracy of such models' rests on the quality of data fed into such models. Thus, adequate care should be taken to ensure data quality. Further, Artificial Intelligence algorithms for predictive models need to be fair. The issue of algorithmic fairness and algorithmic audits is becoming much relevant in the context of governance goals of equity, inclusion, and transparency. Policymakers must be involved in the design of such algorithms, and they cannot be delegated to technical experts alone.

3.3.1.3 Accountability in WoG approach

As discussed above, a WoG approach to digital governance has the potential to ensure effectiveness in both policymaking and public service delivery. This is achieved through greater horizontal and vertical information exchanges. However, care must be taken to ensure that the values of accountability are not compromised in the process of achieving greater effectiveness.

There is an inherent tendency to use digital technologies such as Management Information Systems (MIS) to centralize decision-making at the higher tiers of Government. A digital governance strategy should consciously design technology such that the principle of subsidiarity is followed. The WoG approach can enable better integration at the local government level, if carefully designed. Similarly, unless consciously designed, a WoG approach might lead to dilution of transparency and accountability as different departments and tiers of Government provide a single-window service. Thus, it might lead to buck-passing behind the digital veil. The centralization of services might also add to this lack of accountability as the centers of decision-making might be further away from the reach of ordinary citizens. Further, digital government strategy has also to adopt principles of collaborative governance whereby the use of digital technologies facilitates citizens' participation in governance.

3.3.2 Collaborative governance:

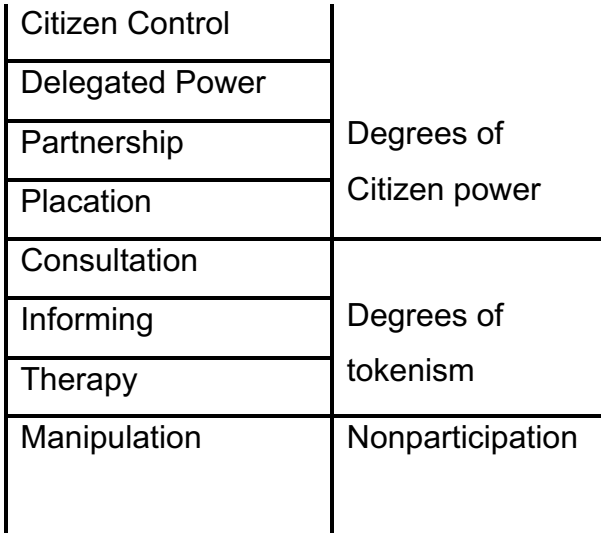
Digital technologies provide new opportunities for service providers to collaborate and partner with citizens in the process of governance. Whereas in the past, citizens were seen as passive recipients of services, and governments were the primary providers of "solutions," today in all corners of the globe, we witness a shift in how services are being conceptualized, managed, and delivered. Where citizens are involved in public decision-making processes and public service delivery, there is an increased sense of ownership and greater sustainability of public initiatives[94]. Such forms of governance are known as collaborative, participatory, or open Government. The process of "engaging citizens through ICT in policy, decision-making, and service design and

[94] E-Government Survey 2014.

delivery to make it participatory, inclusive, and deliberative"[95] is known as e-participation.

E-participation can learn much from the long history of participatory development. The degrees of participation vary from mere tokenism to much stronger citizens' control. While digital technologies can enable e-participation, the extent of participation might vary widely. Arnstein's ladder of participation can help assess the degree of participation in different e-participation technologies.

Figure 12. Eight rungs of Citizen Participation



Source: S.Arnstein, "A ladder of citizen participation." Journal of the American Institute of Planners 35: pp. 216-244 (1969).

The degree of citizens' participation that might be enabled by digital technologies varies depending on how they are designed. For instance, some e-participation technologies might involve mere information dissemination (Informing) through public portals. Other e-participation portals might actively solicit citizen's feedback on various policies and grievances (see Case Study 4).

[95] E-Government Survey 2016.

CASE STUDY 4: REACH-e-participation portal, Singapore

REACH (reaching everyone for active citizenry @ home) is the lead agency in facilitating Whole-of-Government efforts to engage and connect with citizens, on national and social issues. It facilitates communication between Singaporeans and Government agencies by proactively initiating discussions on various topics and gathering feedback on policy issues. All feedback submitted to REACH, regardless of the sentiments expressed, is read by REACH staff which will then be conveyed in its entirety, to the relevant agencies for information and consideration.

Source: 'REACH (Reaching Everyone for Active Citizenry@ Home)' <https://www.reach.gov.sg/>.

E-participation technologies need to be mindful of local contexts. For instance, in most of the developing countries, low internet penetration and lack of digital skills might limit opportunities for e-consultation and e-deliberation. Also, video and audio-based information might have more uptake over text-based information. Two critical aspects of e-participation include the publishing of OGD and the use of social media (see Case Study 5).

CASE STUDY 5: Public information portal and kiosks, India

The government of Rajasthan, in India. launched its Public information portal (Jan Soochana portal) in September 2019, to encourage proactive disclosure of information on public domains thus strengthening Right to Information Act by creating more transparent and accountable e-government. The portal aims to **provide real-time information** to the public about 36 government departments providing information about 65 schemes pertaining to universal social security, health, and education schemes as well as welfare schemes specifically aimed at farmers, construction workers, miners, and students accommodating marginalized sections of the society.

The information can be accessed in both the local language and English through Citizen friendly Automated information kiosks (e-mitra+) that have been installed in villages and towns. It not only ensures 24/7 uninterrupted access to information on JSP, but also delivers a host of services in a sustainable, cost-viable, and efficient manner, especially to the rural population.

Source: "A lifeline called Jan Soochna: How Rajasthan's public ...." 26 Oct. 2019, https://www.thehindu.com/news/national/other-states/a-lifeline-called-jan-soochna/article29802195.ece.

3.3.2.1 Open Government Data

Open Government Data refers to "government information proactively disclosed and made available online for everyone's access, reuse and redistribution without restriction" (United Nations, 2014a, p.163). Open Government Data helps promote active participation in decision-making processes, reduce waste of resources, and unleash opportunities for innovation and economic growth[96]. The use of ICTs in Government has allowed people to access data that was previously difficult to obtain unless one would visit a government office in person. Governments produce and collect vast amounts of data on numerous issues, from expenditures for national education or the military to the number of hospitals, quality of the air, transcript of judicial hearings, vital records, traffic congestion, and weather, to name a few. Providing government information online in open standards makes this information readily available for anyone to know or use. However, for the information to be put to effective use by the citizens, it needs to be in a form that is appropriate to the local context.

3.3.2.2 Use of Social Media[97]

The interactive qualities of social media are essential for networked collaboration and conducting consultations that can reach desired constituencies that may otherwise not be reachable. Social media is easily accessible these days and does not cost much more than paying for internet connectivity and hiring a content manager. To benefit from such an opportunity, many governments have established pages on social media to promote interactive networking and communication with the public. This is particularly important for those countries that do not have a dedicated portal for public consultation and deliberation online[98]—further, users' familiarity with social media aids in their trust and participation in these mediums. Social media presence by governments is further necessitated by the need to fight the propagation of fake news (see Case Study 6).

[96] E-Government Survey 2016.
[97] 'Academy Module on "Social Media for Development" | APCICT/ESCAP' <https://www.unapcict.org/resources/publications/academy-module-social-media-development> [accessed 11 November 2020].
[98] *E-Government Survey 2016*.

CASE STUDY 6: Countering fake news through social media, India

The Karnataka government has set up a 24/7 helpline on social media app Telegram to check the proliferation of fake news and rumors about the coronavirus pandemic as well as address residents' queries and concerns. Telegram has been chosen for the initiative because it allows one group to have thousands of members. It is handled by teams of five members — including doctors — in eight-hour shifts.

Officials from government departments form the back-end team to ensure seamless coordination and dissemination of accurate information. They provide information on matters such as closure of schools, procedures for home quarantine and emergency contact numbers.

Source: 'In Its Fight against Coronavirus Panic, Karnataka Govt Finds Unlikely Ally in Telegram App' <https://theprint.in/health/in-its-fight-against-coronavirus-panic-karnataka-govt-finds-unlikely-ally-in-telegram-app/381486/> [accessed 11 November 2020].

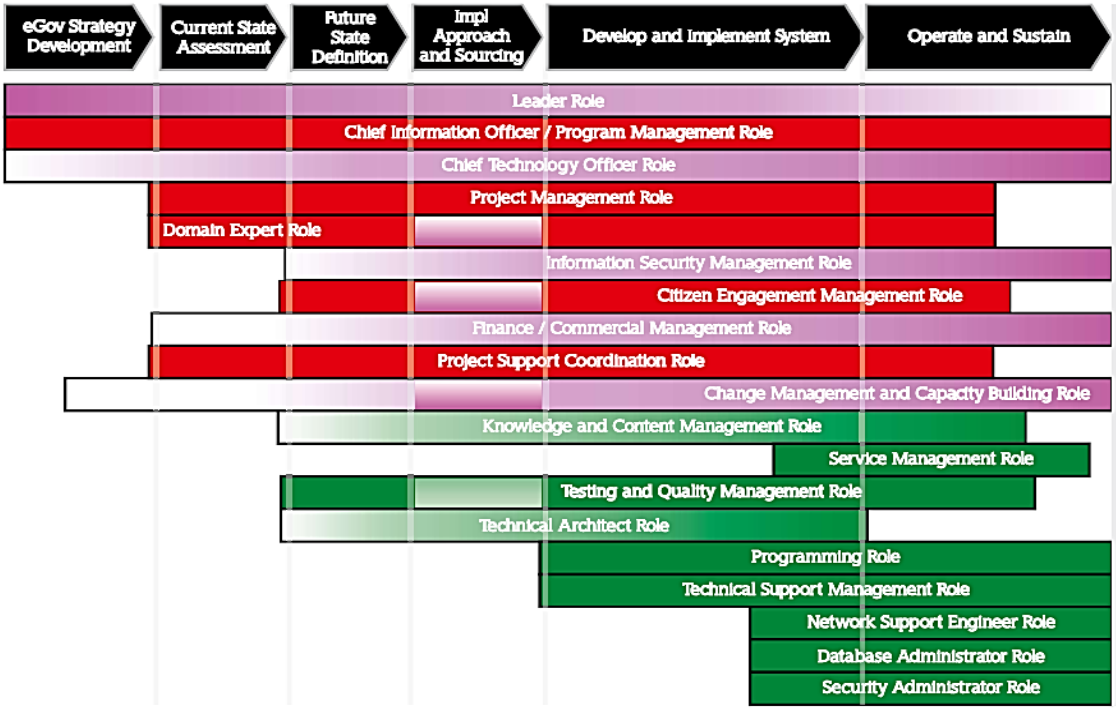
3.4 Capacity Building:

The vision of a digital government rests on people's capacity to actively engage with digital technologies. Therefore, any digital government strategy necessarily requires a holistic approach to capacity-building. The United Nations Sustainable Development Group defines capacity as "the ability of people, organizations, and society as a whole to manage their affairs successfully" and capacity development as "the process whereby people, organizations and society as a whole unleash, strengthen, create, adapt, and maintain capacity over time" to achieve their development objectives[99]. Comprehensive digital government capacity development is needed to ensure the delivery of accessible, reliable, fast, personalized, secure, and inclusive digital services and the engagement of people in decision-making processes and service design and delivery[100].

A key challenge is the diverse set of competencies required by an even diverse set of stakeholders. For instance, the implementers of a digital government project need to have project management skills, while the users need to be trained on operational aspects of an application. The users, too, are very diverse and can include policymakers, program implementers, frontline staff, and a heterogeneous set of citizens. India's digital government competency framework illustrates the mapping of different digital government roles with the digital government project lifecycle.

[99] 'UNDG-UNDAF-Companion-Pieces-8-Capacity-Development.Pdf' <https://unsdg.un.org/sites/default/files/UNDG-UNDAF-Companion-Pieces-8-Capacity-Development.pdf> [accessed 11 November 2020].
[100] 'UN E-Government Survey 2020'.

Figure 13. E-governance Competency Framework



Source: Source: e-governance Competency Framework (2014), NeGD, Government of India

3.4.1 Digital government strategy development:

Developing a digital government strategy requires understanding a country's history, social norms, values, beliefs, attitudes, and national perceptions surrounding digital technologies. It should also consider a country's future development goals. Such a strategy needs to be anchored by the political and administrative leadership at various levels of Government.

Governments require the right institutional capacities to harness new technologies for the realization of broader societal goals, including the achievement of the SDGs[101]. Policymakers across all sectoral areas must have the capacity to assess the impact of using frontier and digital technologies in Government. They also need to recognize the implications of policies for digital Government and take proactive steps to ensure that public policies support rather than impede efforts to leverage ICT to transform Government. A thorough understanding of the potential positive and negative effects of existing policies on the use of new and emerging technologies (such as AI) and a comprehensive understanding of the technologies themselves are necessary to formulate relevant new laws and policies. Partnerships among public and private sector actors, universities, and think tanks can help build the necessary understanding of the impacts of new technologies, how they can benefit societies, the risks they pose in terms of safety and security, and the ethical issues that must be addressed in their

[101] E-Government Survey 2020.

design and use. Bringing together different perspectives and expertise makes the policy implications of a quickly evolving digital landscape more readily accessible to government officials (see Box 17). Furthermore, governments need to strengthen institutions that build capacity for these diverse skills required in a digital government strategy.

BOX 17. Interdisciplinary capacities for digital government

Digital government is no longer only about technology. It involves understanding the nature of relationships within government as well as the interaction of the government with society. Thus, studies on digital government require perspectives from fields as diverse as public administration, management, political science, sociology, anthropology, psychology, economics, and law apart from traditional domain of computer science. Governments need to actively encourage knowledge production and innovation which contribute to sound digital government policies.

3.4.2 Project design and implementation:

A digital government project design and implementation require project management skills such as procurement, finance, testing, and quality assurance and maintenance. Depending on the broader digital government strategy and the local contingencies, governments might develop the applications through specialized agencies or contract out the development and maintenance to private players.

3.4.3 Usage of digital government applications:

Further down the life cycle, the operation and sustains require capacity-building at the organizational level. Such capacities relate to government structures that define authority, roles and responsibilities, accountability and reporting lines, and mechanisms and processes for coordination and communication. A whole-of-government (WoG) approach requires newer organizational practices of data sharing and coordination across traditional government silos. Thus, capacities need to be built at an organizational level for change management towards such newer forms of functioning. A common practice is to institutionalize a Chief Information Officer (CIO) or a Chief Innovation Officer to enable capacity-building and transition towards digital Government. Innovation must be promoted with a clearly defined purpose, and the Government should provide incentives that benefit both public and private sectors and encourage partnerships and collaboration.

3.4.4 Digital literacy for citizens:

Digital government capacities and capacity development for the achievement of the SDGs are inextricably linked to the capacities of all stakeholders in society. Digital capacity development is a significant undertaking because all actors in society must be equally empowered. The United Nations World Social Report 2020: Inequality in a Rapidly Changing World emphasizes that "the potential of new technologies to foster sustainable development can only be realized if everyone has access to them (see Case Study 7). Regrettably, new technologies are reinforcing various forms of inequality and creating new 'digital divides'.

CASE STUDY 7: Digital literacy initiative, Kazakhstan

Kazakhstan is aiming to raise the population's level of digital literacy to 83 per cent by 2022 under the umbrella of digital Kazakhstan program to develop a creative society where individuals have competences and skills for the digital economy.

Digital literacy courses have been successfully launched in all regions of Kazakhstan (district centres, villages, and townships) free of costs for society to upgrade their digital literacy skills. The courses encompass a wide range of skills under several levels of digital literacy, where the basic level refers to one's skill in using the computer and mobile gadgets and getting information from the internet. The second level denotes the ability to use e-government services and make payments, while the third level allows a person to engage in e-commerce – buy, sell, and promote goods online. The fourth level entails the use of digital solutions and mobile applications. The skills necessary to use Open Government, including its four components – open data, open regulations, open dialogue, and budgets are obligatory under the program.

To ensure the effectiveness of service by civil servants under the telecommunication model of the work training program are introduced by the Academy of Public Administration which is interactive, inclusive, and takes into account the needs of civil servants with disabilities, who are participating in the program.

Increasing the overall digital literacy of the population will contribute to the development of the domestic IT sector, as well as improve the quality of education and healthcare in Kazakhstan.

Source: 'Digital Literacy in Kazakhstan | Electronic Government of the Republic of Kazakhstan' <https://egov.kz/cms/en/articles/digital_literacy> [accessed 11 November 2020].

3.4.5 Capacities for continuous monitoring, evaluation, and improvement:

Since Digital Government is a journey and not a final destination, the continuous monitoring and evaluation of digital services are essential. This requires the capacity-building of agencies that are institutionally distinct from the implementation agency. While numerous performance indicators might have to be assessed, the evaluation needs to be grounded in the governance value principles of effectiveness, accountability, and inclusiveness. Performance indicators can include variables such as user uptake, user satisfaction, the share of automated customer service generated by the digital government system, as well as grievances and complaints on the digital government application. The extent to which the digital government project impacted the respective government service (such as agriculture price information, tax collection, or job application) needs to be assessed. This would involve collecting data not only from the users but also from potential non-users where applicable.

3.5 Regulatory and legal framework:

A robust and proactive legal and regulatory framework is needed for an inclusive and effective digital transformation. Such policies can aid in taking advantage of digital technologies while at the same time mitigating the associated risks. Three broad areas need attention – ensuring open standards and interoperability, addressing concerns of privacy and information security.

3.5.1 Open standards and interoperability:

A whole-of-government approach and a collaborative government approach both require opening the boundaries between the Government and society as well as within the multiple agencies within the Government. Such approaches necessitate the free flow of information across these boundaries. Setting up open standards enables such free information exchange as well as interoperability.

For instance, Open Data refers to information released in a machine-readable format in an open standards format with no legal barriers to access[102]. Such open standards enable data exchange across different actors in Government, thus supporting data integration. Governments need to promote interoperability through explicit legal and regulatory frameworks. The Government of Australia, for example, through its 2018 legislation on new data governance arrangements, has made it mandatory for all government agencies to use open standards for interoperability[103]. Norway too has a

[102] E-Government Survey 2018.
[103] E-Government Survey 2020.

regulation to ensure the universal design of ICT solutions, including data schemas, with legal requirements that apply to both public- and private-sector entities[104].

Interoperability can also be encouraged through the concept of Open APIs (see Box 18).

BOX 18. APIs and interoperability

Application programming interfaces (APIs) are machine-to-machine digital interfaces that facilitate the exchange of data and services (functionalities). API offers the possibility of requesting the exact subset of values of a dataset needed by the client application. Compared with the traditional 'bulk download' of a dataset from a traditional data catalogue, this allows the client application to save transactional time and storage. To be reliable, the essential characteristics of APIs are their availability, documentation, consistency, and versioning.

APIs play a fundamental role in digital transformation of governments both from the technical and the governance perspectives. APIs are boundaries where the interactions among digital actors are defined: what digital assets are exposed, to whom, under which conditions.

API solutions can expose government digital assets and facilitate digital interactions with both internal (e.g. G2G intra-agency interactions) and external players (G2G interagency interactions and G2B and B2G extra-government interactions). The European Commission Open Data Directive makes it mandatory to provide 'high-value' and dynamic datasets through APIs to facilitate data reuse.

Source: Vaccari L., Posada M., Boyd M., Gattwinkel D., Mavridis D., Smith R. S., Santoro M., Nativi S., Medjaoui M., Reusa I., Switzer S., Friis-Christensen A., *Application Programming Interfaces in Governments: Why, what and how*, EUR 30227 EN, Publications Office of the European Union, Luxembourg, 2020, ISBN 978-92-76-18982-4, doi:10.2760/58129, JRC120429.

Similarly, the debate around net neutrality concerns the issue of open access and standards. The principle of net neutrality advocates non-discriminatory access to the content by the network service provider.

3.5.2 Privacy[105]:

Historically, the Government has been the principal producer and custodian of citizen data in various domains. However, increased digitization of government functioning

[104] E-Government Survey 2020.
[105] Please refer to APCICT Academy module on "Information Security and Privacy" for more information

raises concerns about violating the privacy of citizens. Issues are surrounding not only the proliferation of data collected on the public but also the profiling and surveillance applications used by the public sector to gather information on the population[106]. The use of digital identifies and approaches to the integration of data from different domains about individuals further raises concerns about the violation of privacy. The use of emerging technologies such as surveillance cameras, drones, biometric authentication, and the IoT, all of which collect massive amounts of data, raise newer concerns about data privacy. Beyond these concerns about government data, there is a need for governments to regulate the use of data by private agents. Social media and apps, for instance, collect massive amounts of data about users. These concerns need to be addressed through privacy and data protection legislation (see Box 19). The United Nations General Assembly adopted a resolution in 2013, recognizing people's right to privacy in the digital age (see Box 20).

BOX 19. EUGDPR- Bigger responsibilities, bigger repercussions!

The European Union General Data Protection Regulations, 2018, is one of the most comprehensive legal regimes for defining the rights of data owners, and principles for managing privacy. The regulations are aimed at harmonizing the different privacy and data protection laws present within different member States of the European Economic Area (EEA). The standards apply to the personal data of EU internet users regardless of the location of the entity holding their data translating to significant extraterritorial reach. The key principles of GDPR include:

- Lawfulness, fairness and transparency
- Purpose limitation
- Data minimization
- Storage limitation
- Integrity and confidentiality
- Accountability
- Ensure “privacy by design”
- Individual rights

To promote interoperability, users are provided with data portability facilitating the reuse personal data across service providers. The regulations also clearly spell out the obligations and accountability of data processors and penalties for privacy breaches.

Source: ‘What Is GDPR, the EU’s New Data Protection Law?’, *GDPR.Eu*, 2018 <https://gdpr.eu/what-is-gdpr/> [accessed 11 November 2020].

[106] ‘UN E-Government Survey 2020’.

BOX 20. Right to privacy in the digital age

The United Nations General Assembly adopted a resolution on 18 December 2013 recognising the right to privacy in the digital age.

The rapid pace of technological development enables individuals all over the world to use new information and communication technologies and at the same time enhances the capacity of governments, companies and individuals to undertake surveillance, interception and data collection, which may violate or abuse human rights, in particular the right to privacy, as set out in article 12 of the Universal Declaration of Human Rights and article 17 of the International Covenant on Civil and Political Rights, and is therefore an issue of increasing concern.

It called upon all state:

(a)To respect and protect the right to privacy, including in the context of digital communication;

(b) To take measures to put an end to violations of those rights and to create the conditions to prevent such violations, including by ensuring that relevant national legislation complies with their obligations under international human rights law;

(c) To review their procedures, practices and legislation regarding the surveillance of communications, their interception and the collection of personal data, including mass surveillance, interception and collection, with a view to upholding the right to privacy by ensuring the full and effective implementation of all their obligations under international human rights law.

3.5.3 Cybersecurity:

While the reliance of societies and government on digital infrastructure is growing, technologies remain inherently vulnerable [107]. The confidentiality, integrity, and availability of ICT infrastructure are challenged by rapidly evolving cyber-threats, including electronic fraud, theft of intellectual property and personally identifiable information, disruption of service, and damage or destruction of property [108]. Cybercrime refers to such technology-mediated criminal activities that cause intentional harm to individuals, organizations, and society at large. A digital government strategy needs to address cybercrime proactively to fully benefit from the

[107] Guide to Developing a National Cybersecurity Strategy (International Telecommunication Union, 2018).
[108] Guide to Developing a National Cybersecurity Strategy.

potential power of digital technology for both economic growth and social development (see case study 8).

CASE STUDY 8: Information technology act, India

The information technology act is the primary law dealing with cybercrime and e-commerce in India. The act provides a legal framework to recognize electronic records, digital signatures, and digital certificates as an alternative to paper-based documents and records.

The law encompasses various crimes such as violation of privacy, identity theft, sending obscene material, child pornography, and cyber-terrorism. IT act fostered the adoption of e-government as it facilitated electronic filling of data and documents, recognized the online transfer of data. Furthermore, the act granted the power to the authorities to intercept, monitor, or decrypt information through computer resources in order to combat cybercrime in cyberspace. The act ensured amendments in the older Indian laws of Indian penal laws to make them technology compliant.

Source: 'THE INFORMATION TECHNOLOGY ACT, 2000' <https://www.indiacode.nic.in/bitstream/123456789/1999/3/A2000-21.pdf> [accessed 11 November 2020].

Two broad categories of cybercrimes exist – those targeted at individuals and those aimed at organizations, both public and private. Cybercrimes targeted at individuals intend to cause either financial, reputational, or psychological damage. These crimes are often the extension of traditional crimes to cyberspaces.

Table 4. Types of Cyber Crime

Cyber Crime	Description
Cyberbullying and Cyberstalking	Cyberbullying is the "willful and repeated harm inflicted through the use of computers, cell phones, and electronic devices." Cyberstalking, the unwanted (and sometimes unknown) monitoring or harassment of another person online, often overlaps with cyberbullying behaviors. Cyberstalkers gather personal information to threaten or intimidate the victim.
Digital Piracy	Digital piracy is the act of illegally copying music, movies, software, and other digital materials without permission from or payment to the copyright holder (Higgins & Marcum, 2011)
Hacking and Malware	the access and/or unauthorized use of a computer system for illegal purposes. Malware is a form of software that accesses computer systems to collect information, exploit, or destroy programs.

Identity Theft	Identity theft is the theft of a person's identity through the use of personal identification with the intention of fraudulent activity.
Sex-Related Crimes Online	Sexting is the use of cell phones, tablets, or other electronic devices to share sexually explicit content (Jaishankar, 2009; Weins, 2014). The cybercrime of sexual solicitation occurs when an offender tries to persuade someone to talk about sex, doing something sexual, or disclosing unwanted personal sexual information. The grooming process involves an adult initiating a nonsexual relationship with a child online to build trust, eventually seducing the youth into sexual acts (Marcum, 2014)

Source: Adapted from Handbook on Crime and Deviance (p.459)

The first step towards addressing cybercrime is to legally recognize individual rights and civil liberties and adopt a legislation that defines what constitutes illegal cyber-activity. Either new laws can be enacted, or the existing ones such as the penal code and laws regulating banking, telecommunications, and other sectors can be amended. Fighting cybercrime further requires equipping law enforcement agencies to identify, recognize, and prosecute cybercrime. Cybercrime police stations or special units might also have to be constituted to deal specifically with cybercrimes. Such law enforcement agencies might require capacity-building on cyber-forensics, a specialized branch of forensic science dealing with digital technologies.

However, cybercrimes also impact organizations and governments, where the attacks are targeted at digital infrastructure. Such cybercrimes have a much wider destabilizing effect and thus need a much more proactive approach. For instance, Critical Information Infrastructures (CII), which form the backbone for the everyday functioning of banking, transport, energy, and other sectors, might be attacked, having a crippling effect on the economy and society. Addressing these challenges requires a comprehensive cybersecurity policy. Cybersecurity refers to the collection of tools, policies, security concepts, security safeguards, guidelines, risk management approaches, actions, training, best practices, assurance, and technologies that can be used to protect the cyber environment and organization and user's assets. In addition, like a natural disaster management strategy, the cybersecurity strategy needs to be proactive in addressing vulnerabilities. A cybersecurity strategy cannot afford to be static and needs to evolve dynamically and catch-up with fast-emerging threats and vulnerabilities.

One of the best practices in ensuring Cybersecurity is the establishing of a national incident response capability to respond in real-time to cybersecurity threats. Often, this takes the form of Computer Emergency Response Teams (CERTs), Computer Security Incident Response Teams (CSIRTs), or Computer Incident Response Teams (CIRTs) with national responsibility[109].

[109] Guide to Developing a National Cybersecurity Strategy.

A new challenge posed by cybercrime is its de-territorialized character. Traditionally, law enforcement agencies had territorial jurisdiction over the locations where crimes occur. However, given the global nature of cybercrimes, it is very likely that offenders, victims, and targets might well be located in different countries and continents[110]. Thus, fighting cybercrime requires operational international-cooperation mechanisms. Countries will have to cooperate to develop common legal frameworks, cooperate on law enforcement, incident-sharing, and response, as well as information sharing on newly emerging vulnerabilities and threats. The Budapest Convention on Cybercrime is one of the first international conventions on cybercrime. It seeks to:

- Harmonize the domestic criminal substantive law elements of offenses and connected provisions in the area of cyber-crime
- Provide for domestic criminal procedural law powers necessary for the investigation and prosecution of such offenses as well as other offenses committed by means of a computer system or evidence in relation to which is in electronic form
- Set up a fast and effective regime of international cooperation[111].

Increasingly, many regional platforms of incident sharing and cooperation are coming to existence, which in itself is a recognition of the need for a transnational response to cybercrime. The Asia Pacific CERT (APCERT), for instance, is a coalition of CERTs and CSIRTs within the Asia-Pacific region[112]. The organization was established in February 2003 to encourage and support the activities of CERTs/CSIRTs in the region (see Box 21).

[110] 'Cybercrime and Society', *SAGE Publications Ltd*, 2020 <https://uk.sagepub.com/en-gb/eur/cybercrime-and-society/book260644> [accessed 11 November 2020].
[111] 'Convention on Cybercrime, 23.XI.2001' <https://www.europarl.europa.eu/meetdocs/2014_2019/documents/libe/dv/7_conv_budapest_/7_conv_budapest_en.pdf> [accessed 11 November 2020].
[112] 'APCERT_Annual_Report_2019.Pdf' <https://www.apcert.org/documents/pdf/APCERT_Annual_Report_2019.pdf> [accessed 11 November 2020].

BOX 21 Asia-Pacific Computer Emergency Response Team

APCERT maintains a trusted network of cyber security experts in the Asia Pacific region to improve the region's awareness of malicious cyber activity and its collective ability to detect, prevent and mitigate such activity through

1. Enhancing the Asia-Pacific's regional and international cooperation on cyber security;
2. Jointly developing measures to deal with large-scale or regional network security incidents;
3. Facilitating information sharing and technology exchange on cyber security among its members;
4. Promoting collaborative research and development on subjects of interest to its members;
5. Assisting other CERTs and CSIRTs in the region to conduct efficient and effective computer emergency response; and
6. Providing inputs and/or recommendations to help address legal issues related to cyber security and incident response across regional boundaries.

Source:'APCERT_Annual_Report_2019.Pdf' <https://www.apcert.org/documents/pdf/APCERT_Annual_Report_2019.pdf> [accessed 11 November 2020].

3.6 Digital government strategies:

The adoption of ICT and the use of the internet to build government applications has resulted in a huge data deluge. Concurrently, it also unmasked the increasing gap in terms of access to information and access to communication technologies. The digital divide is prominently observed between a developed and developing nation and also between the people of different social strata within a nation[113]. The development of a national digital strategy ensures that digital issues are taken care of and proposes a strategic approach to administer the nation's use of digital technologies[114]. A national digital government strategy articulates the government's vision for the digitalization of government processes, service delivery, and policymaking.

It provides a comprehensive view of all the government initiatives across a nation which are sensitive to the existing political and economic conditions rather than benchmarking on global best practices.

[113] Rodrigo Sandoval Almazan and others, *Building Digital Government Strategies*, 2017 <https://doi.org/10.1007/978-3-319-60348-3>.
[114] 'It's Time for a National Digital Strategy', *Nextgov.Com* <https://www.nextgov.com/ideas/2019/05/its-time-national-digital-strategy/156842/> [accessed 14 November 2020].

A well-articulated digital government strategy for a country helps to achieve the following strategic objectives[115]:

1. Facilitates the citizens with access to high-quality digital government information and services anywhere, anytime, on any device.

2. Corroborates that the government adjusts to the new digital world, ensuring the opportunity to procure and manage devices, applications, and data in smart, secure, and affordable ways.

3. Use the data collected by the government to its full potential to propel innovation across the nation and improve the quality of services.

The Philippines, for instance, has a digital transformation strategy that encourages the Filipino government to realize the plan to make it become a fully digital country by 2022[116].

To expand the country's existing digital infrastructure iGovPhil is working on the creation of data center, cloud infrastructure and laying of fiber-optic networks to interconnect government offices and provide high-speed communication.

It also focuses on building the Government network ("GovNet"), which will promote the concept of government roaming (i.e., it will allow the employee access via GovNet credentials remotely). The establishment of a national government data center will help optimize ICT resources and operations and address data security concerns for faster data exchange and easier collaboration among agencies. To validate the authenticity and integrity of government documents, the Philippine National Public Key Infrastructure (PNPKI) is put in place[117]. Since its operations, the PNPKI has already issued digital certificates to 1,475 individuals, five organizations, and 41 machines.

The strategy also emphasizes on creation of a national government portal that will serve as a one-stop-shop of government's online services that will lead to a reduction in financial, human resource, and spatial costs. Additionally, it will help to maintain a common repository of data, and information can be shared among government agencies.

Similarly, Thailand's digital government development plan aims to provide government services across all sectors rapidly, precisely, in a paperless format. It also talks about developing a digital government infrastructure that collects and manages an integrated database, supports cooperation among agencies, and efficiently provides government services[118].

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[115] 'Digital-Government-Strategy.Pdf' <https://obamawhitehouse.archives.gov/sites/default/files/omb/egov/digital-government/digital-government-strategy.pdf> [accessed 14 November 2020].
[116] 'E-Government Master Plan 2.Pdf' <https://www.gov.ph/documents/495812/518611/egmp-2.0-popular-version_final.pdf> [accessed 14 November 2020].
[117] 'E-Government Master Plan 2.Pdf'.
[118] 'Thailand Digital-Government-Development-Plan-2017-2021'<http://jfcct.bypronto.com/wp-content/uploads/sites/1871/2018/05/Digital-Government-Development-Plan-2017-2021-executive-version.pdf> [accessed 14 November 2020].

Viet Nam is working on digital transformation with the aim of increasing digital infrastructure and capacity in government, industry, and society[119]. As a part of the national digital transformation program, the national e-document exchange platform was launched in March 2019 to incorporate document management systems in digital government systems with the aim of increasing interoperability[120]. The strategy also emphasizes the role of artificial intelligence, blockchain, augmented reality in the digital transformation of Viet Nam. In 2019, Viet Nam also launched its National Public Services Portal, an electronic platform connecting the government, citizens, and businesses and providing information on public services and administrative procedures.

To strengthen the digital infrastructure of the country, the strategy states the deployment of nationwide 5G services nationwide and last-mile access to the fiber-optic network by 2030. Digital skills training programs are also organized for both government and business contributing to the capacity development of the country.

To facilitate e-identification and authentication, the program mentions digitization of land and population records[121].

The Republic of Korea, realizing the need to align the digital government strategy with the sustainable development goals, came up with the "ENJOY" framework in its 2020 e-government masterplan with the objective to[122] :

1. Enhance digital experiences by redesigning government services.
2. Build cognition and prediction-based intelligent administration.
3. Creating an e-government ecosystem that co-exists with industries.
4. Create a secure cloud-based next generation of administrative infrastructure.
5. Establish the Republic of Korea as a pioneer in e-government.

3.7 Key Points

- Governments need a holistic digital government strategy rather than a piecemeal approach to automating certain functions.

- A digital government strategy must consist of mainly three interrelated factors Digital infrastructures such as devices and internet connectivity, digitally enabled services: and individual and institutional capacities.

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[119] 'Vietnam to Unveil National Strategy on Digital Transformation 2020', *OpenGov Asia*, 2020 <https://opengovasia.com/vietnam-to-unveil-national-strategy-on-digital-transformation-2020/> [accessed 28 November 2020].
[120] 'Vietnam's Digital Ambitions and ICT Strategy', *OpenGov Asia*, 2020 <https://opengovasia.com/vietnams-digital-ambitions-and-ict-strategy/> [accessed 28 November 2020].
[121] 'Digital Government at the Heart of Vietnam's National Strategy – and Online at ITU Virtual Digital World 2020' <https://www.itu.int/en/myitu/News/2020/10/09/10/32/Digital-government-Vietnam-national-strategy-ITU-Virtual-Digital-World-2020> [accessed 28 November 2020].
[122] Doh Yoon Kim, 'Korea E-Government Master Plan 2020', 2017 <https://www.kdevelopedia.org/resource/view/04201706080147946.do#.X68OwmgzZPY> [accessed 14 November 2020].

- **Digital infrastructure:** Whil0e there has been a quantitative leap in access to digital infrastructure, there are geographic and social disparities in accessing digital infrastructure. Universal Service and Access Funds (USAFs) and provisioning of public access can bring about greater access to digital infrastructure.

- **Digitally enabled services:** A whole-of-government approach (WoG) brings greater coordination among different layers of Government as well as between various departments of Government to provide unified service delivery to citizens. Digital Government applications can also open up new avenues for collaboration with the citizens.

- **Human and institutional capacity-building:** Digital government requires a special set of skills and competencies for a diverse set of actors, including citizens and officials. It also requires government to encourage knowledge production and innovation in multiple disciplines such as public administration, management, political science, sociology, anthropology, psychology, economics, and law, apart from the traditional domain of computer science.

- **Regulatory and legal framework:** A sound regulatory and legal framework addressing issues of interoperability, privacy and cybersecurity can greatly facilitate in realizing a digital government strategy.

4. Implementing digital government programs and projects

Outline: This chapter aims to:

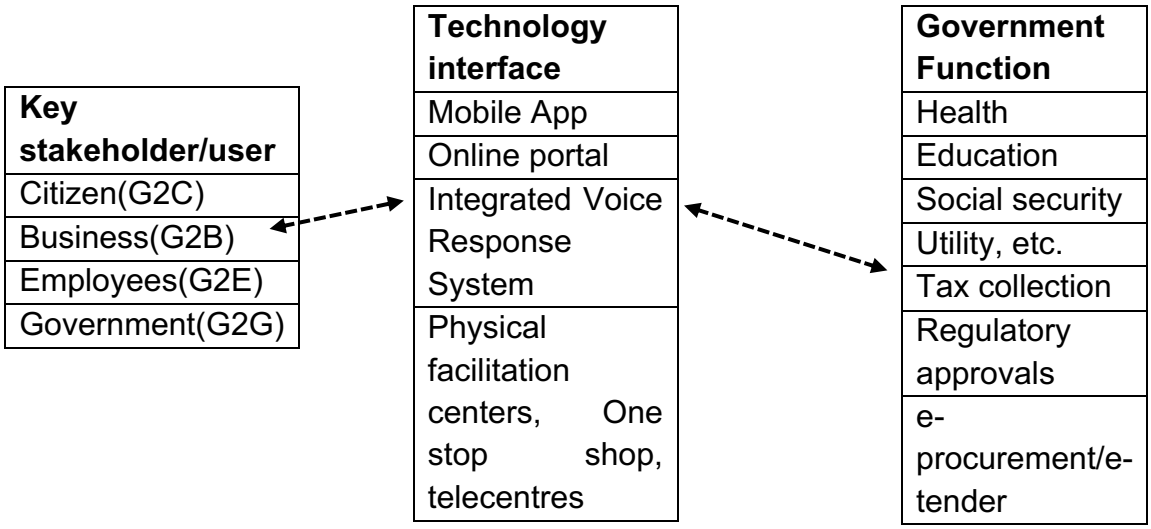
- Discuss sector specific cases where digital government programs can contribute to citizen-centric services.
- Understand the different phases involved in implementing a digital government project life cycle.
- Explore the emerging trends in digital government program implementation.

4.1 Delivering citizen-centric services and the role of Digital Government

Digital government applications have been widely used towards making government services citizen-centric. These applications might be categorized based on a combination of the following factors:

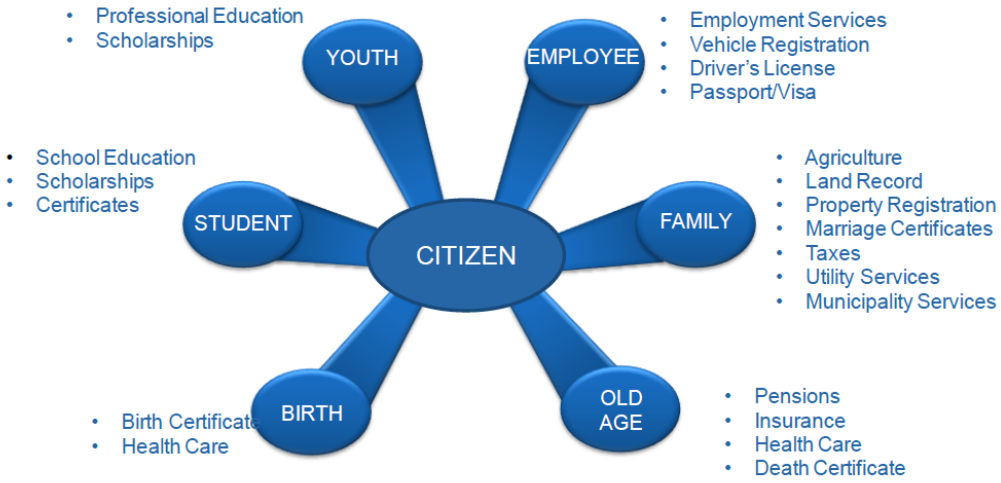
1. Who is the user/stakeholder of the service? (Citizen, Businesses, Employees, Governments)
2. What technology is used for interfacing with the user? (Mobile app, online portal, facilitation centre, etc.)
3. Which government function (domain) is this application concerned with? (Agriculture, Health, Law and Order, Housing, etc.)

Figure 14. Mapping digital government services



G2C services deal with the interaction of the Government with citizens through different phases of a citizens' life. An illustrative list is shown in the below figure.

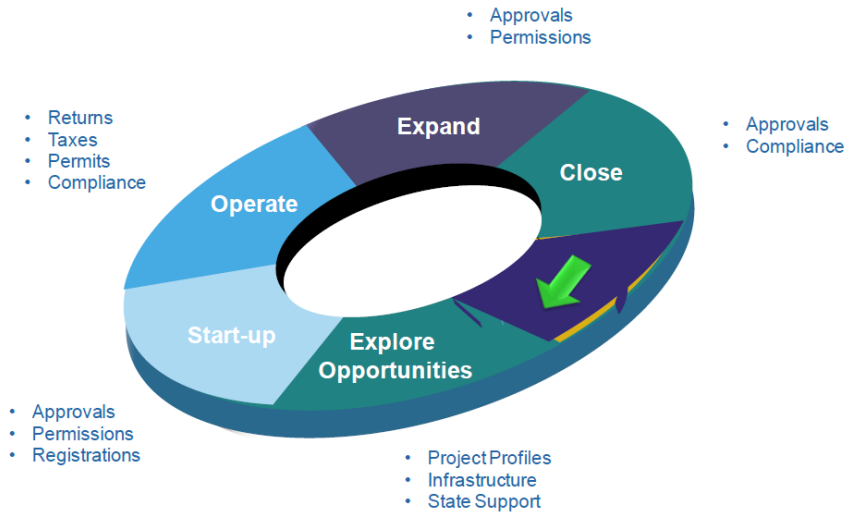
Figure 15. G2C services



Source: https://www.meity.gov.in/writereaddata/files/e-Governance_Project_Lifecycle_Participant_Handbook-5Day_CourseV1_20412.pdf

G2B services mostly address regulatory aspects of businesses and are closely related to enhancing the ease of doing business.

Figure 16. G2B services



Source: https://www.meity.gov.in/writereaddata/files/e-Governance_Project_Lifecycle_Participant_Handbook-5Day_CourseV1_20412.pdf

Finally, G2G services deal with the conduct of intragovernmental and intergovernmental interactions, leading to horizontal and vertical interactions within the Government. Examples include the sharing of data relating to law enforcement and criminal justice, tax collection data, etc. We discuss below some of the key applications of digital technologies in different areas of governance and development.

4.1.1 Urban governance and smart cities:

The increasing pace of urbanization has put the local city governments under stress. Some of the key challenges include traffic congestion, rising levels of pollution, huge demand for public transport, urban land records management, and provision and maintenance of utilities such as electricity supply, roads, drinking water, and sanitation. The use of digital technologies, often under a "smart city project,"[123] is aimed towards addressing many of these challenges by ensuring efficient resource allocation as well as through greater transparency and accountability. For instance, vehicle tracking/identification systems help in fleet tracking, routing, dispatching, and security concerns. Many countries have adopted Integrated transportation management systems, Congestion Management Process, Transportation Demand Management, and Smart sanitation to enhance the citizens' quality of life.

The Republic of Korea has implemented **TOPIS** [124] (Transport Operation and Information Service), an integrated traffic management center that operates and manages Seoul's traffic situation. TOPIS collects traffic information from various traffic-related organizations such as bus Management System (BMS), traffic card system, enforcement systems, traffic broadcasts, etc. The real-time information is shared with the user via a web portal, mobile application, and electronic road signs. The initiative has helped to alleviate road congestion, better response in an emergency, and better formulation of transportation policies. It has brought 96 per cent of the user satisfaction rate in public transportation with a 4.6 per cent increased accuracy of bus arrival times.

Incheon, South Korea is utilizing VMS (Variable message signboard) to manage traffic[125]. VMS informs drivers of traffic conditions, traffic accident information, lane usage guidance, and weather forecast through a display system. By being informed on traffic conditions, drivers can take proper actions more quickly and efficiently, which guarantees the stability of road traffic management. The city has also installed Traffic

[123] 'Case Study on "ICT Good Practices of a Smart City: Incheon Metropolitan City" | APCICT/ESCAP' <https://www.unapcict.org/resources/publications/case-study-ict-good-practices-smart-city-incheon-metropolitan-city> [accessed 11 June 2021].

[124] 'TOPIS: Seoul's Intelligent Traffic System (ITS) | 서울정책아카이브 Seoul Solution' <https://seoulsolution.kr/en/content/2595> [accessed 11 November 2020].

[125] 'Case Study on "ICT Good Practices of a Smart City: Incheon Metropolitan City" | APCICT/ESCAP'.

Signal Detectors that present information regarding vehicle and pedestrian detection systems used in modern traffic signal control. The detectors are highly effective and are used to count vehicles and operate gates at exits of parking garages and other restricted entrances. It also facilitates incident detection on freeways by measuring speeds and other traffic characteristics, Automatic Vehicle Identification (AVI) for automatic toll collection and provide emergency vehicle detection for use in signal preemption.

Some city governments are using chatbots to make citizen services responsive. Dubai city government uses **RAMMAS**[126], an Artificial Intelligence chatbot application launched by the Dubai Electricity & Water Authority (DEWA). It can communicate in English as well as Arabic. Since its launch, RAMMAS has processed close to 698,000 requests across various channels. This bot application comes with capabilities to take people's requests (inquire and pay bills) 24/7, process the data, and make decisions with greater accuracy[127]. Similarly, Dubai's Road and Transportation authority (RTA) uses **Mahboub**[128], a chatbot that provides interactive services and transactional services (e.g., renewal of driving licenses or vehicle registration)[129].

In Singapore, the city government has launched a **smart waste management program**[130], as part of which smart bins were introduced with sensing monitors attached to the bin lids to collect information on content and location. This information is sent to the waste collection team through the server, helping in better waste collection.

Digital technologies can also help address the citizen's grievances. For instance, **E-wadul**, an innovative service in Indonesia by the Government of Surabaya city, facilitates easy citizen complaint mechanisms. Citizens can log in to the application through their ID cards, report their issues by uploading the images, and can interact actively on public issues. The complaint is directly sent to concerning institutions for a quick resolution. The application can be used 24 hours a day, seven days a week, without having to wait in long queues without hassles[131].

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[126] 'Dubai Electricity & Water Authority (DEWA) | DEWA's Rammas Service Uses Artificial Intelligence to Respond to Customer Enquiries' <https://www.dewa.gov.ae/en/about-us/media-publications/latest-news/2017/03/dewas-rammas-service-uses-artificial-intelligence-to-respond-to-customer-enquiries> [accessed 28 October 2020].

[127] 'DEWA Announces New Version of Rammas Chatbot', *ITP.Net* <https://www.itp.net/616732-dewa-announces-new-version-of-rammas-chatbot> [accessed 11 November 2020].

[128] 'Chatbot "Mahboub" Wins IBM Award for AI Applications , News Release', 2019 <https://www.rta.ae/wps/portal/rta/ae/home/news-and-media/all-news/NewsDetails/chatbot-mahboub-wins-ibm-award-for-ai-applications> [accessed 11 November 2020].

[129] Mehrdad Mohasses, *How AI-Chatbots Can Make Dubai Smarter?*, 2019, p. 446 <https://doi.org/10.1109/AICAI.2019.8701413>.

[130] Bangkok Post Public Company Limited, 'Singapore "Smart" Waste Bins Alert Cleaners When Full', *Bangkok Post* <https://www.bangkokpost.com/world/1411235/singapore-smart-waste-bins-alert-cleaners-when-full> [accessed 11 November 2020].

[131] Shinta Happy Yustiari, 'E-Government Innovation: E-Wadul Application for Better Public Service of Surabaya City', 2019 <https://doi.org/10.2991/aicobpa-18.2019.47>.

4.1.2 Law enforcement

Digital Technologies in law enforcement can help establish an environment where the police force is Strict and Sensitive, Modern and Mobile, Alert and Accountable, Reliable and Responsive, Techno-savvy, and Trained[132]. Law enforcement agencies have been using digital technologies in many areas of their operation, such as digitization of crime records, real-time information sharing, surveillance, and crowd management through CCTV technology and drones, citizen engagement in community policing, dynamic traffic management, efficient resource deployment through predictive policing, e-filing of citizen complaints and e-ticket for traffic violations.

In Punjab, a province of Pakistan, the Government has developed a web and android-based application that enables police officials or witnesses to report crime-related data with photos/videos, location, date, and type of crime with a first information report (FIR). The recorded information is stored at a central data warehouse for further processing, record-keeping to determine the frequency of crime in an area and identify similar crime clusters. The application is available in Urdu, the local language, for ease of use and for better understanding. The data collected at the data warehouse can help identify crime patterns, hotspots, and offenders in certain areas. As of October 2020, details of 319,978 crimes with geotags have been made available in Lahore for better policing[133].

In the Netherlands, **'Virtual Agent Wout'** enables citizens to participate in the investigation process to report crimes with the help of AI-driven robots. Citizens can report non-emergency crimes through chat, and if applicable, Wout also provides them directly with advice. Wout is accessible through major social media platforms (Facebook, WhatsApp, Snapchat, etc.) and is directly connected to the Police Command & Control Centre. Once the case is reported, members of the public are provided with a link to an online file that is used to track progress, see all information on their case, and engage with the Police. Wout even supports participatory investigation with police, allowing users to directly upload new information concerning a particular case in the file. Furthermore, the file can also be shared with their friends and family on social media to get extra support[134].

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[132] Suparna Jain and Aparajita Gupta, 'BUILDING SMART POLICE IN INDIA: BACKGROUND INTO THE NEEDED POLICE FORCE REFORMS', 53.

[133] '"Crime Mapping | PITB." Https://Www.Pitb.Gov.Pk/Cirs <https://www.google.com/search?q=%22Crime+Mapping+%7C+PITB.%22+https%3A%2F%2Fwww.pitb.gov.pk%2Fcirs&rlz=1C1SQJL_enIN856IN856&oq=%22Crime+Mapping+%7C+PITB.%22+https%3A%2F%2Fwww.pitb.gov.pk%2Fcirs&aqs=chrome..69i57.336j0j7&sourceid=chrome&ie=UTF-8> [accessed 11 November 2020].

[134] 'Digital Policing', *Deloitte* <https://www2.deloitte.com/ye/en/pages/public-sector/articles/digital-policing.html> [accessed 11 November 2020].

4.1.3 Judicial system

The use of ICT in the courtrooms can free the legal system of "historical inefficiencies" by reducing the duplicity of the paper world and make courts more green through electronic case filing and video conferencing[135]. Online case filing systems can increase the speed with which citizens can have their cases heard. Real-time access to online repositories of legal information can create more accountable and efficient judicial systems. **Singapore's state courts[136]** provide electronic filing services that facilitate the citizens with online filing of court documents. To streamline the litigation process, the Court also has an Integrated Electronic Litigation System (iELS) or e-Litigation system, which introduced intelligent e-court forms with built-in automated checks and validation instead of standard PDF forms, reducing submission errors and failures.

The e-Litigation system[137] also provides access to a Case Information Repository that allows individual law firms to have virtual storage of all the relevant files and documents so that they can update and retrieve them for future reference. The system also provides notification updates about current cases handled by the firm, modifications in the hearing dates, and information about financial transactions on a particular case. The state courts portal provides services like online court fine payment, e-assessment, e-negotiation, thereby helping to improve efficiency and enhance access to justice.

4.1.4 Education

ICT can complement, enrich and transform education by facilitating universal access to education, bridge learning divides, support the development of teachers, enhance the quality and relevance of learning, strengthen inclusion, and improve education administration and governance[138]. With the help of ICT, the teaching-learning process can be made more interactive and efficient using presentations and similar tools. The digitization of notes and other vital documents will facilitate better transmission. Books can easily be converted to e-books, thus becoming handier and easier to carry and use its contents. By using various software, Evaluation of online tests can be done accurately, efficiently, and quickly. The administration of any educational organization

[135] 'The Role of ICT in Judicial Reform- An Exploration — The Centre for Internet and Society' <https://cis-india.org/internet-governance/blog/what-will-be-the-role-of-ict-in-indias-judical-reform-process> [accessed 11 November 2020].
[136] 'State Courts | Home' <https://www.statecourts.gov.sg/cws/pages/default.aspx> [accessed 28 October 2020].
[137] 'CJTS' <https://www.statecourts.gov.sg/CJTS/#!/index1> [accessed 28 October 2020].
[138] 'ICT in Education', *UNESCO*, 2013 <https://en.unesco.org/themes/ict-education> [accessed 11 November 2020].

can be handled more efficiently with the information stored in a central database, which is crucial for sustaining a school.

For instance, the Philippines promote open education resources focusing on ICT-enabled learning and teaching. **TV UP**[139], a webcast network operated by the University of the Philippines, delivers free content OER (Open Educational Resources) for information and educational purpose on subjects ranging from art and culture to STEM education. Other initiatives include **OER Commons**[140] (Public digital library) of open educational resources. OER Commons platforms provide a single point of access to search, browse, and collaborate with other educators around the world to assist them with improved curriculum, pedagogy, and no constraints of "all rights reserved". The **SEA** (Southeast Asian) **MOOC** (Massive Online Open Course)[141] initiative addresses the issue of limited education institution capacity, poor education quality by providing courses that can be accessed, shared, and re-used, encouraging trans-national capacity building.

4.1.5 Healthcare

Governments continue to play a significant role in the provision, facilitation, and regulation of healthcare services. Despite substantial strides achieved in recent years, affordable and quality Healthcare continues to remain a challenge in underserved areas, especially for the socially and economically marginalized sections of the population. Governments are increasingly adopting ICTs applications such as telemedicine, hospital information management system, and Health Information management system to address these challenges.

Telemedicine helps deliver Healthcare to unserved and underserved remote areas. For example, the **National Telemedicine Network of Kazakhstan**[142] helps to provide smart medical services to overcome geographical challenges and the shortage of healthcare personnel. The network is also used by specialists in medical universities, scientific research institutes, and national centers to provide seminars on diseases for the training of health workers in regional and district hospitals.

Hospital Management systems help hospitals streamline Patient care, Hospital administration, Ancillary Services, and Clinical support activities. It enhances administration control, improved response to patient care, Cost control, and Improved productivity with a significant reduction in the patient waiting time for seeking health

[139] 'TVUP | University of the Philippines' Internet TV Network' <https://tvup.ph/> [accessed 11 November 2020].
[140] 'OER Commons' <https://www.oercommons.org/> [accessed 11 November 2020].
[141] 'SEA-MOOC Portal Registration' <http://regmooc.seameo.org/> [accessed 11 November 2020].
[142] 'WHO/Europe | Telemedicine in Kazakhstan: Smart Health Services Delivery' <https://www.euro.who.int/en/countries/kazakhstan/news/news/2019/02/telemedicine-in-kazakhstan-smart-health-services-delivery> [accessed 11 November 2020].

services. Similarly, electronic health records (EHR) enable hospitals to store, share, and access digitized patient health records through a networked, enterprise-wide information system. Such availability of health records also enables analytics across patients as well as overtime providing newer insights to service providers, as well as improving the quality of care, especially to high-risk patients.

Sri Lanka's **District Nutrition Management System** (DNMS) is an example of using ICTs for information sharing to address malnutrition among children. The system consists of three components. The first component is a smartphone app used by midwives to track and monitor children in their areas. The second component is a web application allowing healthcare managers to monitor the nutrition status of children across the country. The third component alerts different government agencies in the health sector, social services sector, and agriculture sector to take personalized interventions aimed at households that are malnourished housing children using risk factor data gathered by public health midwives[143].

The COVID-19 pandemic has further highlighted the role of ICTs in public health management and epidemiology. Governments are using a wide range of ICTs in Contact-tracing applications, algorithmic models for predicting spatial and temporal trends, and information dissemination to citizens. For instance, **Stay Safe PH** is the Philippines' community-driven contact-tracing application to prevent the spread of the COVID-19 pandemic. The citizens can register through a mobile application or web portal with their mobile number, age, and name. The application allows the users to update their health condition data as positive, probable, and suspected. The data is linked to a centralized database notifying the user if there are any suspected cases in the vicinity via heat maps and digital logbooks. It also provides health tips by registered medical practitioners[144].

Similar contact-tracing applications were developed and adopted by governments across the globe, which raised concerns about user data privacy and surveillance. For example, the Indian government made it mandatory for its citizens to use the **Arogya Setu[145]** application (COVID contact-tracing application), implying mandated sharing of citizen's personal data, but there were no laws put in place to ensure that the data ownership lies with the user himself or herself. Instead, the data fiduciaries (government) had a wholesome control on user data which even led to third-party sharing of non-anonymized data and privacy breaches[146].

[143] Digital Health in Sri Lanka ,'Sustainable Implementation of Digital Health Solutions Through Local Capacity Building' <https://www.cwcdh.org/documents/DH_in_SL_1998-2018.pdf> [accessed 11 November 2020].
[144] 'Stay Safe — Stay Healthy. Stay Safe.' <http://staysafe.ph/> [accessed 11 November 2020].
[145] 'Aarogya Setu Mobile App', *MyGov.In* <https://mygov.in/aarogya-Setu-app/> [accessed 11 November 2020].
[146] 'Aarogya Setu: Govt Must Take Responsibility for Protection of Personal Information Collected', *The Financial Express*, 2020 <https://www.financialexpress.com/opinion/aarogya-setu-govt-must-take-responsibility-for-protection-of-personal-information-collected/1958185/> [accessed 11 November 2020].

To build a data-intensive and algorithmically governed society[147] , data collection is inevitable, but concurrently, the individual user data privacy must be safeguarded.

4.1.6 Agriculture

ICT can be used to enable services to help disseminate timely information on agricultural advisories, financial services, agricultural marketing, and risk transfer to the farmers. This would empower them to access markets, negotiate prices, increase their productivity, improve their capacity, and mitigate risks. The agricultural advisory can help farmers with accurate local weather forecasts, crop-specific advisory sequenced according to the stage in the crop cycle, and price information.

With the help of ICT, the information can be timely disseminated as localized and personalized updates on weather, commodity prices, and crop cultivation to registered farmers through Short Messaging Service (SMS) and Interactive Voice Response (IVR), the mobile communication channel. Farmers can use various ICT platforms such as mobiles, web-portals, information kiosks, e-markets for marketing their produce. It not only enhances their ability to control production and manage supply chains but also helps farmers to deal directly with large wholesalers or traders, removing all the intermediaries[148]

Indonesia launched **"e-Petani"** to make agriculture-related information, such as agricultural statistics database, database on agricultural export-import, and agriculture price information available to the public. The e-Petani system is accessible through the web portal, mobile application, and via phone call. The customers can also share ideas with other users and also file e-complaints. The system popularized faster with more than 50,000 visitors in a week to seek information that helped them minimize crop losses due to a lack of awareness[149]. The workforce engagement also decreased by 9.86 per cent without compromising the production by adopting sustainable and scientific agricultural practices.

In 2019, the meteorological department started offering timely, short, and specific weather forecasts along with customized guidelines for farmers to maximize crop production in 64 districts. Weather forecasts are made accessible to the farmers via text messages, messages via mobile applications, at the agriculture extension office, an electronic kiosk, and are even displayed at the old-fashioned display board to view the latest three-day forecasts at the community centres. Until November 2019, 30,000

[147] Northlines, 'Corona's Privacy Concerns', *Northlines*, 2020 <http://www.thenorthlines.com/coronas-privacy-concerns/> [accessed 14 November 2020].
[148] NAVEEN MATHUR, 'How ICT Innovations Can Help Farmers', *@businessline* <https://www.thehindubusinessline.com/markets/commodities/how-ict-innovations-can-help-farmers/article7126710.ece> [accessed 11 November 2020].
[149] 'Selamat Datang Di E-Petani - Portal Pertanian Indonesia' <http://epetani.pertanian.go.id/> [accessed 11 November 2020].

farmers benefited from the initiative, including 7,000 women. The initiative is not only helping to strengthen early warning systems in Bangladesh but will also help farmers adapt to climate change in the longer run[150].

4.1.7 Procurement

e-Procurement means procurement of goods and services online using the Internet. Ideally, it covers the full 'life cycle of procurement.' The objective is to automate, possibly, the entire procurement process, along with tender bid submission and payments by suppliers, in an online web-based real-time environment. e-Procurement could resolve many of the constraints of traditional procurement. E-procurement reduces cycle time, and the cost of procurement increases supplier participation access to ensure broader participation, enhance transparency and efficiency of the process to bring about procurement reform across the Government.

For instance, India's **Government e-Marketplace** (GeM)[151] is a one-stop National Public Procurement Portal to facilitate online procurement of common use goods & services required by various Central and State Government Departments / Organizations /Public Sector Undertakings (PSUs). GeM aims to enhance transparency, efficiency, and speed in public procurement, integrating tools such as e-bidding, reverse e-auction, and demand aggregation, ensuring government users achieve the best value for their money. It acts as a public procurement platform between suppliers and buyers by providing a common, unified, and transparent Government to Business (G2B) portal for supply and procurement of goods and services registered with GeM. It also houses a chatbot (GeMmy) User Interface, which significantly increased customer engagement by 75 per cent. The initiative is claimed to be a success with 15 lakh products, around 20,000 services, and more than 40,000 Government buyer organizations so far[152].

4.1.8 Tax administration

The use of manual paper-based recording systems by revenue administration often leads to revenue leakages, corruption, and under-collection. The adoption of

[150] 'Bangladeshi Farmers Reap the Benefits of New Weather Forecasts' <https://blogs.worldbank.org/endpovertyinsouthasia/bangladeshi-farmers-reap-benefits-new-weather-forecasts> [accessed 11 November 2020].
[151] 'Government E-Marketplace - Procurement Reimagined', *Government E-Marketplace - Procurement Reimagined* <https://gem.gov.in/> [accessed 11 November 2020].
[152] 'Government E-Marketplace : Procurement Made Smart | National Portal of India' <https://www.india.gov.in/spotlight/government-e-marketplace-procurement-made-smart#tab=tab-1> [accessed 11 November 2020].

information technology can potentially improve efficiency and fairness in tax collection and other associated activities by the following means[153]:

- E-Registration: Taxpayers & Tax Practitioners are required to register electronically.
- E-Filing: Taxpayers are required to submit their tax returns electronically.
- E-Accounting: Taxpayers are required to submit accounting data to support their tax returns.
- E-Matching: Additional source data is matched with the data available with tax authorities across all taxpayers.
- E-Audit: Data submitted by the taxpayers is analyzed by the tax authorities to prevent tax fraud or unintentional errors.
- E-Assessment: Tax Authorities make the assessment of taxpayers based on the data submitted.

The Republic of Korea's **ETAX** is an internet-based, one-stop service channel for filing returns, paying taxes, requesting certification documents, and viewing past returns and payment history. It has enabled citizens to pay by cash or by credit cards, the local taxes and bills imposed by Seoul, its affiliated agencies, and district offices to remove the inconvenience of visiting banks for tax payment. At the ETAX website or mobile S-Tax, taxpayers can view taxes and arrears, tax receipts and payments, accumulate tax mileage, access taxes including services Motor vehicle tax, property taxes, water rates, parking fines, and 400 other types of taxes[154]. ETAX succeeded to cater to the citizens' needs by deploying a citizen-centric E-TAX system with an increase in online payments by 79.6 per cent.

4.1.9 Disaster management[155]

Digital technologies can play an effective role in every phase of disaster management-prevention, mitigation, response, and recovery. The International Telecommunication Union (ITU) prescribes four principles to ensure timely, predictable, and effective communication when using ICTs for Disaster Management[156] :

1. **Multi-hazard**: Natural hazards include earthquakes, cyclones, floods, mud slides, droughts, tsunamis, volcanic eruptions, and fires. For all disasters that

[153] David Tansey, *Tax Administration Information Systems: Concept, Design, and Implementation*, Governance Briefs, 0 edn (Manila, Philippines: Asian Development Bank, June 2019) <https://doi.org/10.22617/BRF190225>.

[154] 'Electronic Tax System | 서울정책아카이브 Seoul Solution' <https://www.seoulsolution.kr/en/node/7286> [accessed 11 November 2020].

[155] For a detailed discussion on the role of ICTs for disaster management, please refer to UNAPCICT module - https://www.unapcict.org/resources/publications/academy-module-ict-disaster-risk-management-0

[156] ITU, 'ICTs 4 Disaster Management', *ITU* <https://www.itu.int:443/en/ITU-D/Emergency-Telecommunications/Pages/ICTs-4-DM.aspx> [accessed 26 March 2021].

follow natural hazards, ICTs play a critical role in facilitating the flow of vital information in a timely manner.

2. **Multi-technology**: In mitigating disastrous effects of hazards, ITU promotes the use of different information and communication technologies and networks, including satellite, radio, mobile networks, and the Internet, that can contribute to enhance capacity and reduce the vulnerability of people.
3. **Multi-phased**: Telecommunications are critical at all stages of disaster management: mitigation, preparedness, response and relief, recovery, and rehabilitation.
4. **Multi-stakeholder**: The local community, the government, the private sector, disaster management agencies, meteorological organizations, civil society, humanitarian agencies, and international organizations should ensure access to ICTs to better coordinate disaster management activities. Partnerships are the best way to achieve this task.

The use of digital technologies for disaster management is highly relevant to many Small Island Developing States (SIDS) in the pacific region, one of the most disaster-prone regions in the world.

Fiji has developed the **geoBingAn** app to mitigate the consequences of natural calamities effectively. The open-source mobile application allows the citizens to share information on disasters such as floods, landslides, and tsunamis, as well as their personal needs during emergencies via smartphone or text. The application operates in both online and offline environments ensuring smooth connectivity even in conditions of telecommunication breakdown. The data collected is automatically transferred to an online database that relies on an open-source map database called OpenStreetMap. The data can be viewed by authorities, communities, and relevant stakeholders on a website connected through Geographical Information Systems (GIS) to help co-ordinate the response in case of a natural calamity. The app also allows sharing geotagged data and images which are then assessed at Emergency Operation Centers before first responders are mobilized.

While digital technologies can be used to mitigate the impact of disasters, ICT infrastructures themselves face threats of disruption. Therefore, it is important to ensure that an e-resilience plan is implemented (see Box 15).

4.2 Digital government project lifecycle

As the above examples illustrate, digital technologies are being widely deployed in government business concerning multiple sectors. Most governments now recognize the advantages of digital technologies in reducing costs, accelerating the delivery of services, enhancing transparency, simplifying processes for doing business, and potentially reducing corruption. However, these advantages are not always achieved in digital government projects, and many continue to fail, either partially or fully. Governments need to realize this gap between the promises that digital technologies hold and reality.

IEEE lists 12 key reasons why software projects often fail (see Box 22), which are applicable to digital government projects as well. The single underlying reason for such failures is the overemphasis of technological elements at the cost of other social, economic, and organizational factors. This is more so in the context of the Digital Government, where the objective is not merely efficiency but also other governance values of effectiveness, inclusiveness, and accountability. Thus, developing a digital government application requires much more than creating software or an app. Governments have increasingly begun to articulate Digital Service Standards (DSS), which are a set of best principles to be considered in a digital government project (see Box 23).

BOX 22. Why software projects fail?

According to IEEE, some of the key reasons why software projects fail are:

- Unrealistic or unarticulated project goals
- Inaccurate estimates of needed resources
- Badly defined system requirements
- Poor reporting of the project's status
- Unmanaged risks
- Poor communication among customers, developers, and users
- Use of immature technology
- Inability to handle the project's complexity
- Sloppy development practices
- Poor project management
- Stakeholder politics
- Commercial pressures

Source: Posted 02 Sep 2005 | 03:18 GMT, 'Why Software Fails - IEEE Spectrum', *IEEE Spectrum: Technology, Engineering, and Science News* <https://spectrum.ieee.org/computing/software/why-software-fails> [accessed 28 October 2020].

BOX 23. Digital service standard criteria

The Digital Service Standard is made up of 13 criteria to help government agencies design and deliver services that are simple, clear and fast. To successfully apply it, government agencies must meet the criteria.

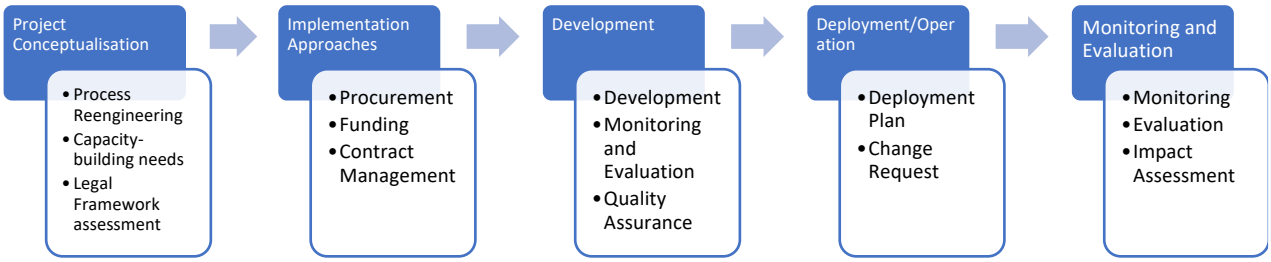
1. Understand user needs**:** Research to develop a deep knowledge of the users and their context for using the service.
2. Have a multidisciplinary team**:** Establish a sustainable multidisciplinary team to design, build, operate and iterate the service, led by an experienced product manager with decision-making responsibility.
3. Agile and user-centred process: Design and build the service using the service design and delivery process, taking an agile and user-centred approach.
4. Understand tools and systems Understand the tools and systems required to build, host, operate and measure the service and how to adopt, adapt or procure them.
5. Make it secure: Identify the data and information the service will use or create. Put appropriate legal, privacy and security measures in place.
6. Consistent and responsive design: Build the service with responsive design methods using common design patterns and the style guide for digital content.
7. Use open standards and common platforms**:** Build using open standards and common government platforms where appropriate.
8. Make source code open: Make all new source code open by default.
9. Make it accessible Ensure the service is accessible and inclusive of all users regardless of their ability and environment.
10. Test the service: Test the service from end to end, in an environment that replicates the live version.
11. Measure performance: Measure performance against KPIs set out in the guides. Report on public dashboard.
12. Take into account the non-digital experience: Ensure that people who use the digital service can also use the other available channels if needed, without repetition or confusion.
13. Encourage everyone to use the digital service: Encourage users to choose the digital service and consolidate or phase out existing alternative channels where appropriate.

Source: Digital Transformation Agency, 'Digital Service Standard Criteria' (Commonwealth of Australia, 2020), Australia <https://www.dta.gov.au/help-and-advice/digital-service-standard/digital-service-standard-criteria> [accessed 12 November 2020].

A digital government project requires consideration of process reengineering, financing, procurement, change management, contract management, application development, deployment, operationalization, maintenance, Monitoring, Evaluation, and impact assessment. It must be guided by the overarching digital government strategy discussed in chapter 3, including the whole-of-government and collaborative government approaches. Most of all, it must be guided in every activity by the governance principles of inclusiveness, accountability, and effectiveness.

A useful approach to think of a digital government implementation is through a lifecycle approach consisting of five distinct phases.

Figure 17. Digital Government Phases



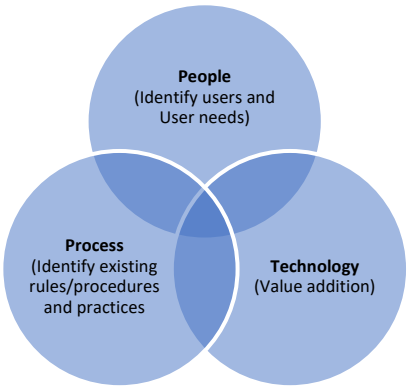
The first phase is that of Project Conceptualization, where a detailed analysis of the current state and the future desired state of government service is to be carried out. The key outcome from this phase is the process reengineering, which maps the process flow once the digital government service is available. This is followed by the Implementation Approach phase, where the critical decisions of the project concerning procurement, funding, and contract management are made. Following this, the Development phase is where the actual development of the software application and the commissioning of the digital infrastructure are done. Software development is actively monitored to ensure compliance with time, cost, and quality attributes. Following the Development phase, the project goes "live" in the Deployment phase. The deployment might take either an incremental piloted approach or a big bang approach. This is a more sustained phase where issues of maintenance and change requests are made. User feedback, while important at all phases, has the utmost significance here. Finally, Monitoring and Evaluation take the form of outcome and impact assessment and are to be measured against not merely the functionality of the software application but its overall impact on public service delivery and its contribution to the achievement of SDG.

An alternative approach to the above-phased model of software development is the Agile model, which adopts an incremental and iterative approach to project management. The Agile approach to Digital Government is increasingly gaining importance. Such an approach involves a similar activity of requirement analysis, software development, and deployment. However, rather than one phase commencing after the conclusion of the other, there are multiple iterations of these phases. Such an approach brings in flexibility in project implementation and the ability to continuously reduce the gap between what the digital service provides and what the user wants. However, such an approach also has implications for different phases of a digital government project, requiring greater flexibility from the project implementers (See section 4.3).

4.2.1 Project conceptualization

The most important consideration in a digital government project is identifying the problem or the opportunity for the users that digital technology seeks to address. Project champions need first to identify who the stakeholders are rather than starting with what they perceive to be the problem that digital technology can solve. Although identifying the stakeholders and their needs seem very trivial, it is far from intuitive. Stakeholder groups might be a heterogeneous set of actors such as citizens, officials, and elected members. Further, each of these groups might be heterogeneous. For instance, the officials might be from different line departments having different needs. Similarly, citizens might belong to different age groups, gender, literacy levels, and socio-economic backgrounds.

Figure 18. People, Process, Technology Framework



Examining the right set of processes requires coming up with process maps based on a process study. The actual practices might diverge significantly with the laid down official rules and procedures. Thus, the process map should account for these tacit elements. Surveys, Focus Group Discussions (FGD), and ethnographic approaches (see Box 24) might help understand the actual practices as they exist.

BOX 24. Ethnography

Ethnography is observational research where researchers spend time with users in their environments. It is a useful way to get a detailed understanding of users' behaviour. Ethnography highlights the differences between what people say and what they do. Customers also often reveal more during informal conversation throughout the day with a researcher than they would in a survey or focus group.

Ethnography also shifts the balance of power: you are entering their world, rather than asking them to come to you, which can often be intimidating.

Ethnography provides rich insights into the complexity of peoples' lives. Observing how people go about their daily lives can reveal insights in unexpected places.

Source: 'Ethnography', *New Zealand Digital Government* <https://www.digital.govt.nz/standards-and-guidance/design-and-ux/service-design/service-design-tools/ethnography/> [accessed 12 November 2020].

For instance, developing an Android app for agricultural market information might seem to be a very effective solution at the outset. However, a thorough understanding of existing practices might suggest that a very small number of small and marginal farmers use smartphones. Thus, a localized Interactive Voice Response System (IVRS) might seem more appropriate to match the user context.

Finally, digital technology should be used to re-engineer the processes to improve service quality. Thus, project champions need to move from user contexts to the technology design. The outcome of this phase is the "Government Process Reengineering," which provides more information about the desired future state of the process. This, in turn, acts as the requirement specification for the procurement phase of the project lifecycle.

The re-engineered process should lead to an improvement in the quality of service across these parameters[157]:

1. **Time:** time taken for completion of service by the citizen/business, time taken for delivery of service by the Government.
2. **Cost:** Cost incurred in receiving the service by the citizen/business, cost incurred by the Government in delivery of service.

[157] National Institute for Smart Government, 'E-Governance Project Lifecycle' (National Institute for Smart Government, 2012). NISG is an advisory and consulting body setup under public-private partnership mode by the Government of India. NISG has played a key role in the design and implementation of various digital government initiatives in India.

3. **Complexity (illustrative):** Number of forms to be filled, amount of information to be provided, number of offices to be approached, etc. by the citizen/business
4. **Transparency:** Knowledge of the process for delivery of service, delivery timelines, the status of a service request to citizen and business.
5. **Citizen Experience:** Quality of interactions (courtesy, politeness, treatment) with the Government during service delivery.

Governments also need to consider change management practices while redesigning the processes. The proposed system is likely to influence organizational roles and responsibilities of many individuals. Thus, a change management strategy should involve communicating with them in advance about impending changes and building their capacities to carry on with their new roles and functions. However, communication is not a one-way flow of information. All stakeholders need to be listened to by creating an active feedback loop. Furthermore, creating a peer support group of functionaries for horizontal communication helps in adapting to change (see Box 25).

BOX 25. Requirement specification

The following characterize strong requirements documents. They should be:

1. Specific and not conjugate two distinct requirements
2. Complete and well thought out
3. Consistent with and prioritized based on the objectives outlined in governance documents and charters
4. Able to be verified during testing

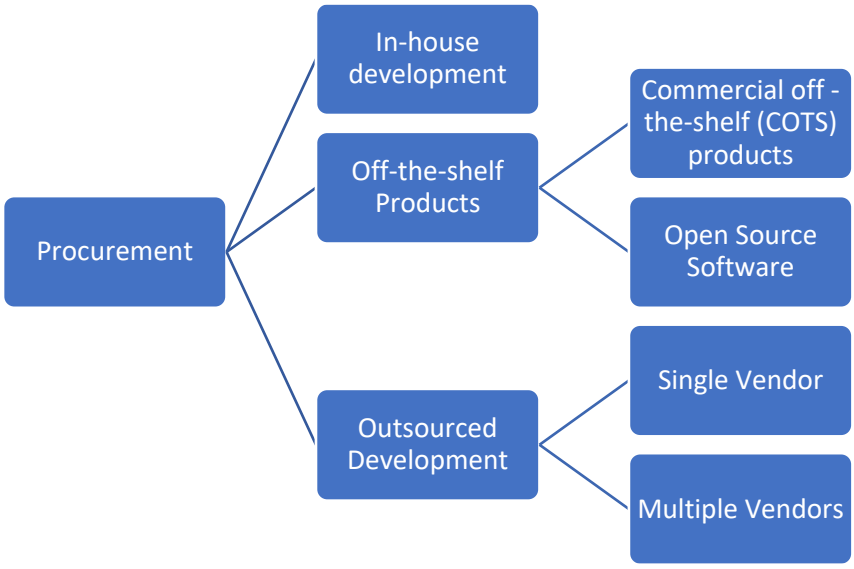
Source: Assistant Secretary for Public Affairs, 'Website Requirements' (Department of Health and Human Services, 2013) <requirements.html> [accessed 12 November 2020].

4.2.2 Implementation approaches

4.2.2.1 Procurement

Once the high-level requirements have been identified, the Government needs to procure the ICT goods and services required for the digital government project. Rather than a one-off procurement, governments need to have a long-term procurement strategy. There are three broad procurement options available with governments. They could develop digital services in-house through a specialized agency. The key advantage of in-house development is greater control over the software development process. Further, when adequate care is taken, security threats are minimized. Such security risks are exceptionally high for critical information infrastructures, defense, and law enforcement agencies.

Figure 19. Procurement options



The Commercial off-the-shelf (COTS) products are readily available software that meets the existing requirements. A key advantage with such software is the potentially short timeline from procurement to usage, minimal maintenance requirements, and sometimes minimal or no hosting concerns (if the COTS is cloud-based)[158]. COTS products are suitable if the same solution is successfully in use elsewhere in the Government or if there is an urgent need to acquire these products, especially in times of crisis. However, the potential disadvantages include vendor lock-in and lack of suitability in the longer-term.

Vendor lock-in can, however, be avoided by using off-the-shelf open-source software products where appropriate. Open-Source products release the software code, which can be modified, often without any copyright restrictions. This freedom to modify the software allows for customization of the software without any dependency on a vendor. Open-Source products also have significantly lower costs of procurement and maintenance in comparison to proprietary products. Further, since the source code is available in the public domain, they face substantially fewer security risks while also allowing for customization.

Often, they are developed collaboratively by a community of developers and users. Some governments have actively promoted free and open software as they contribute to the public good (see case study 9).

[158] 'Digital Service Delivery | When to Use Commercial Off-the-Shelf (COTS) Technology' <https://18f.gsa.gov/2019/03/26/when-to-use-COTS/> [accessed 12 November 2020].

CASE STUDY 9: Free and open software in government schools, India

Kerala has become the World's first State to undertake the largest deployment of FOSS in Education Sector, as part of the ICT enabled education being implemented by KITE. In August 2008, Government had instructed all institutions under General Education Department to strictly use Free Software alone in all future teaching and training activities and a Government Order in this regard is in effect. Similarly, the Information Technology Department has also released a Circular in July 2016, directing all departments to cease the usage of proprietary software and to use FOSS.

Since its inception, KITE has revolutionized the impact of Free Software in educational sector in the State. All the computers currently installed in the schools run Free Software based Operating System, Digital Contents and Educational Resources which are custom made, mostly by the teacher communities themselves. Besides having Zero financial liability, the use of Free Software based applications also facilitates unrestricted sharing of educational contents among the learning and teaching populace. While ICT hardware such as Computers and Laptops form as a tool for strengthening the learning process, the support provided by Free Software is invaluable. Teachers have been trained in various Free Software tools which help in digital content development process involving classroom interactions and learning process.

Source: Kerala Infrastructure and Technology for Education, 'KITE' <https://kite.kerala.gov.in/KITE/index.php/welcome/wedo/1> [accessed 12 November 2020].

NISG Project Lifecycle (p.152)

Most of the software development, however, takes the form of outsourced development. The key advantage of outsourced software development is the specialization that the outsourced agency can bring in developing customized applications to suit the needs of the Government. A Request for Proposal (RFP) is published, which is an invitation for suppliers, often through a bidding process, to submit a proposal on a specific commodity or service. The RFP will have to specify in great detail the following requirements of the Buyer:

- Technical and Functional Requirements
- Bid Process and Commercial Specifications
- Contractual and Legal Specifications[159]

The proposals are evaluated based on the technical solution proposed by the vendor, past credentials, and the financial proposal. Governments need to consider if they are outsourcing the entire requirement to a single vendor or multiple vendors.

[159] National Institute for Smart Government.

Table 5. Implications of Single vs. Multiple vendors

Single Vendor	Multiple Vendors
Suited for smaller agencies and agencies in which ICT is not highly strategic or customized	Better suited for large agencies with highly specific and strategic ICT functions
Subcontracting and Consortium arrangements may be used to bring in diverse capabilities with one single entity taking overall responsibility	Provides greater control over vendor performance
More cost-effective than managing multiple vendors	Allows for best of the breed solutions in each component

Increasingly, many countries (see Box 26) have begun to follow a set of principles guiding the strategic procurement policy. They include encouraging competition by allowing many SMEs to compete, ensuring open standards and cloud-first policy, and ensuring an iterative approach to co-development rather than a one-time procurement.

BOX 26. Digital procurement principles

Some of the best principles to be followed in procurement are:

1. Encourage competition
2. Be innovative and iterate often
3. Be structured in a way that lets small and medium enterprises (SMEs) compete fairly to provide components of large ICT projects
4. Be outcomes-focused
5. Use open standards and cloud first
6. Minimise cyber-security risks
7. Avoid duplication by not building platforms other agencies have already built

Source: Digital Transformation Agency, 'Digital Sourcing Framework for ICT Procurement' (Commonwealth of Australia, 2019), Australia <https://www.dta.gov.au/help-and-advice/ict-procurement/digital-sourcing-framework-ict-procurement> [accessed 12 November 2020].

A cloud-first policy requires government agencies to evaluate cloud computing options before making any new investments. Cloud computing allows for on-demand delivery of computing power, database storage, applications, and other IT services through a cloud services platform via the Internet[160]. Rather than procuring the hardware and software infrastructure upfront, governments procure these services from a service provider. It also provides greater agility to governments as they can procure additional computing power, storage space, or specialized software services based on the demand.

Governments have often been innovating with the procurement policy to ensure that the application development is innovative, user-centric, and competitive. Many countries, such as the United Kingdom, Australia, and New Zealand, have a Government e-marketplace, platforms where the competing vendors and the different agencies can interact and do business together. Furthermore, Singapore has innovated with dynamic contracting, which provides flexibility and agility to react to changes and disruptions in technology[161]. While ICT contracts had only one point of entry in the past, dynamic contracts allow suppliers to update prices and offer new products and services to the Government — without waiting for their contracts to expire. Singapore has also been innovating with an agile approach to procurement. The prospective vendor co-develops the software solutions from the early phases rather than waiting for a detailed and specific contract document following the bidding process.

4.2.2.2 Financing

Digital government projects require significant financial investment over IT hardware, software, and consultancy. However, financial expenditure, both capital and operational - is a matter of concern for most Governments, which run substantial fiscal deficits. Thus, it is vital to have a clear understanding of the financial management of digital government projects. Governments often estimate and budget for the one-time capital expenditure while ignoring the operational expenditure recurring throughout the lifecycle of the project. This results in an imbalance with overspending at the initial procurement phase while having little budgetary support for the operational phase of the digital government project. Instead, governments must account for the "total cost of ownership" upfront, which accounts for the initial costs of acquisition and operational costs over time.

[160] 'Deloitte-Au-Economics-Value-Public-Cloud-Services-Australia-220319.Pdf' <https://www2.deloitte.com/content/dam/Deloitte/au/Documents/Economics/deloitte-au-economics-value-public-cloud-services-australia-220319.pdf> [accessed 12 November 2020].
[161] 'Govt to Award up to $3.5b in ICT Contracts, 80% Open to SMEs This Year' <https://www.tech.gov.sg/media/technews/govt-award-up-ict-contracts> [accessed 12 November 2020].

Table 6. Types of Expenditure

Types of Expenditure	
Capital Expenditure	• Consulting services on project conceptualization, procurement management, capacity-building, and change management • Program and Project Management • Data Digitization • System software (or cloud services) for application service, database server, and security • Hardware including devices, network infrastructure
Operational Expenditure	• Annual costs of software licenses (and cloud services) • Software maintenance and support • Change Management costs • Personnel costs • Periodic impact assessment

In terms of revenue generation, digital government services often levy transaction/usage charges. Opportunities also exist for generating revenue from advertising, especially since many of the services attract significant user traffic. Digital government services, if implemented well, also contribute indirectly through enhancing the ease of doing business by reducing red tape. For instance, digitization of Income Tax collection can widen the tax base while reducing the transaction cost for Government, thereby increasing the net revenue collection. A total cost of ownership analysis should account for such indirect sources of revenue generation as well.

Project champions need to consider financing the expenditures, both capital and operational, incurred in a digital government project. The key options available are[162]

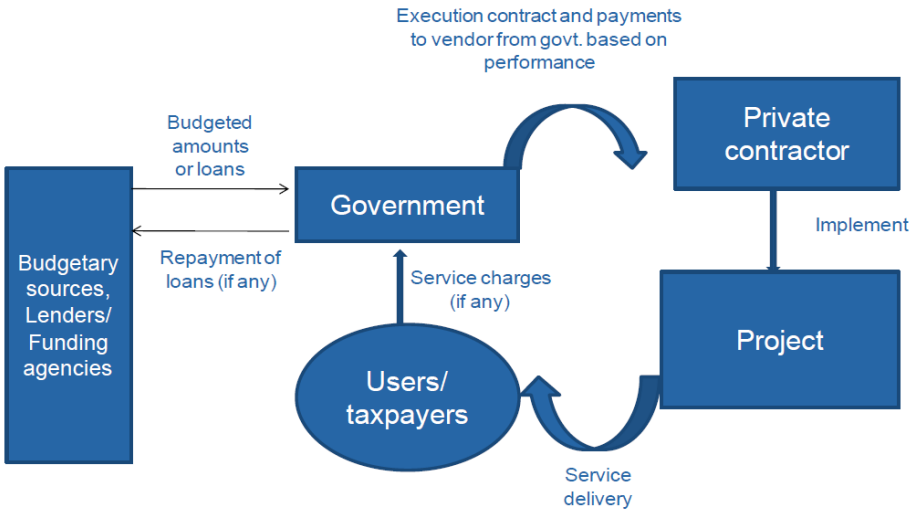
1. Public financing
2. Private financing
3. Public-Private Partnership financing

1. Public financing

[162] National Institute for Smart Government.

This is the most conventional mode of financing a project whereby the expenditure is made from the budgetary outlays. The payments are made to the implementing agency (depending on the nature of procurement), often a private contractor. When applicable, service charges are levied. However, not all government services have the potential to generate revenue. A variant of this mode of financing is where the financing happens from international donor agencies.

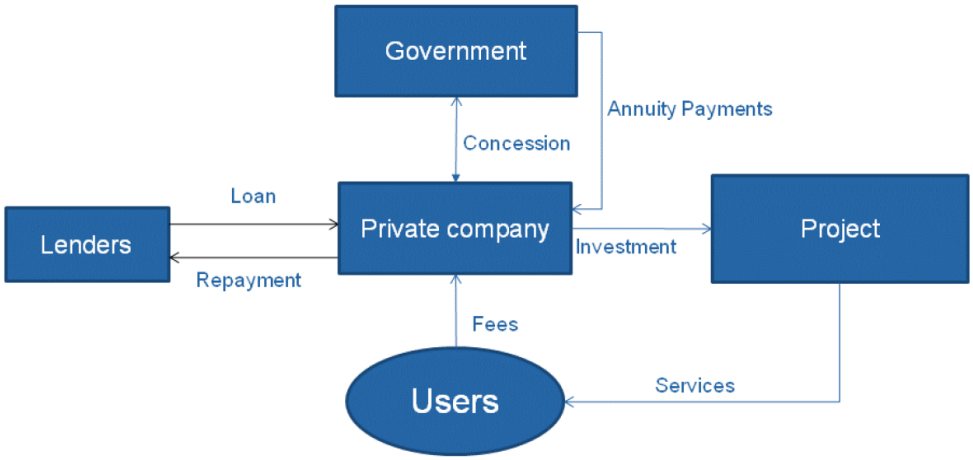
Figure 20. Steps Involved in Public Financing



2. *Private Financing*

In this mode, the project is financed by a private body through equity and debt. The revenue is generated for the private body through the user charges and/or annuity payments by the Government. The Government enters into an agreement with the private partner stipulating rights and responsibilities for the use of public assets and the right to levy user charges.

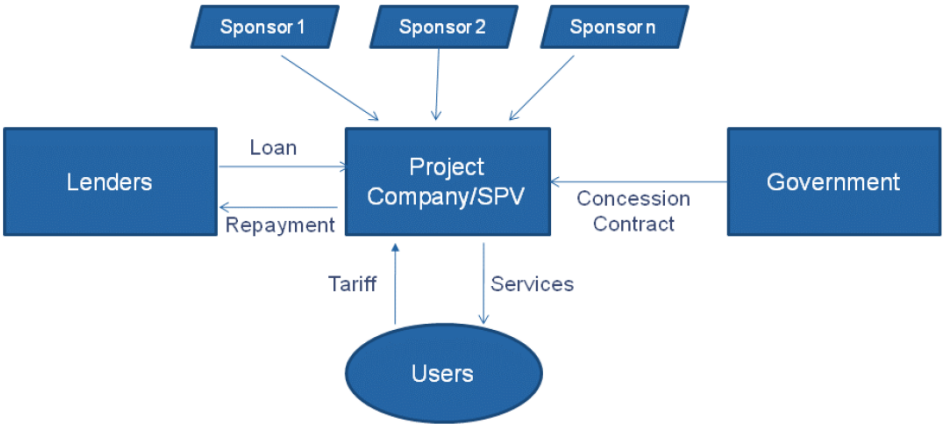
Figure 21. Steps Involved in Private Financing



3. *Project financing*

The project assets and its potential future earnings finance the project. In this model, generally, a Special Purpose Vehicle is created, which is legally independent, and Debt financing is the primary source of funding for such projects. The risks are shared by the participation of multiple complementing partners in the SPV, and the concession agreement is signed with the SPV, or the Project Company so formed for the project.

Figure 22. Steps Involved in Public Project Financing



Governments have also begun to look at innovative ways of managing expenditure to reduce the overall project costs. One fundamental approach is for the Government to prioritize the areas of digital transformation based on the value it brings to governance.

Governments often fall prey to "fetishism of technology"[163] which refers to "endowing technologies—mere things—with powers they do not have (e.g., the ability to solve social problems, or keep the economy vibrant)." Governments need to be realistic about the promises that digital transformation can contribute towards, rather than set unrealistic goals. Further, as already discussed, the usage of Free and Open-Source software (FOSS) can contribute significantly to a reduction in expenditure. Some governments have begun to adopt a whole-of-government approach concerning bulk negotiations with service providers to manage costs better (see Box 27).

BOX 27. Whole-of-Government volume sourcing

In the technology space, some suppliers are providing goods and services that are commonly used across government. As a result, the government ends up with many contractual arrangements covering the same goods and services, but with different terms, conditions and pricing structures, resulting in extra costs, complexity and delays for both buyers and sellers.

The government seeks to reduce the amount of money and effort spent by entities procuring goods and services by aggregating the volumes purchased across the whole of the government to secure substantial savings and significantly better contractual terms from suppliers and gain efficiencies in the procurement process.

When the government selects a supplier to be part of a whole-of-government deal, both parties engage in a negotiation process that can be long and complex in order to secure the best possible outcomes for the whole of government. Historical government expenditure with that supplier, along with other commercial and legal reference points are used in this rigorous process in order to ensure the best outcome for the government and taxpayers.

The supplier will not be able to engage with the government unless it is under the new agreement. At the same time, whole-of-government deals do not guarantee suppliers any new business, since individual agencies are responsible for their technology decisions.

Source: Digital Transformation Agency, 'More about Procurement and Whole-of-Government Arrangements' (Commonwealth of Australia, 2019), Australia <https://www.dta.gov.au/news/more-about-procurement-and-whole-government-arrangements> [accessed 12 November 2020].

[163] David Harvey, 'The Fetish of Technology: Causes and Consequences', 13, 29.

4.2.3 Development[164]

Project implementation forms the core of a digital government project lifecycle whereby the technical and functional design is translated into a detailed system design and further into an application. The key activities carried out in this phase are time management, cost management, and quality management.

Ensuring the development of the application on time requires a project schedule which presents linked activities with planned dates, durations, milestones, and resources[165]. At a minimum, the project schedule includes a planned start date and planned finish date for each activity. Tools such as the Gantt chart, Critical Path Method (CPM), and Project Evaluation and Review Technique (PERT) also help manage time efficiently.

Quality management refers to those processes that ensure completeness, compliance, and fitness for the use of a product or service. This is done by measuring all steps, attributes, and variables used to verify conformance or compliance to the specifications stated during the planning stage.

4.2.4 Deployment

Deployment refers to the project going "live" into the user environment. Governments need to decide on how they intend to roll out the digital intervention into the existing systems. The following approaches exist[166]:

1. Big Bang approach: The digital government project is launched across the locations for all the functions at the same time. All users move to the new system on a given date. However, this approach has certain risks in terms of not testing for unanticipated failures, lack of fallback options, and lesser time for users to adapt.
2. Phased rollout: Changeover occurs in phases over an extended time. Users move onto a new system in a phased manner. Initially, only a few functions might be affected by the digital intervention. The learnings from this experience are used in the adaptation of other phases.
3. Parallel adoption - Both the legacy and new system run at the same time. Users learn the new system while working on the old. This is considered to be the least risky option. However, the disadvantage of this approach is the high cost in maintaining both the old and the new systems.

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[164] 'For More Details, Refer ICT Project Management in Theory and Practice Maria Juanita R. Macapagal and John J. Macasio' <https://www.unapcict.org/sites/default/files/inline-files/Academy%202.0%20Module%207.pdf> [accessed 14 November 2020].
[165] 'PMBOK Guide | Project Management Institute' <https://www.pmi.org/pmbok-guide-standards/foundational/pmbok> [accessed 14 November 2020].
[166] National Institute for Smart Government.

4. Pilot and rollout – A small (sample) part of the project is implemented for testing purposes before the complete project rollout is done[167]. This approach aligns with the principles of agile methodology as it helps in bridging the gaps between user needs and technology design through multiple iterations of deployment.

Since the objective of a digital government project is to make government services citizen-centric, the role of Governments does not end with designing and deploying technology applications. They also need to ensure that the stakeholders are aware of the project and proactively facilitate the usage. Project champions need to widely publicize the features of the digital government project and set up communication channels such as helpdesks and helplines to facilitate usage (see Case Study 10).

CASE STUDY 10: Digital ambassadors, Singapore

Anybody who faces difficulties with their digital devices will soon be able to get help at almost 50 new SG Digital community hubs island-wide. The hubs, one-stop help centres will be conveniently located in community centres and public libraries. Government intends to reach out and go deeper into every community to better understand concerns on the ground. That way, it seeks to ensure that every individual, especially seniors and hawkers, is well-supported at each step of their digitalisation journey, and that everyone, young or old, will have a place in Singapore's digital future. At these hubs, seniors can get help with their digital devices and pick up practical skills, such using common applications like WhatsApp and SingPass mobile, and making e-payments. Meanwhile, stallholders can find out how to use e-payment tools to better serve their customers' needs. In addition, seniors and stallholders who are keen to learn new digital skills can participate in small group classes and learning journeys at the hub.

Source:https://www.imda.gov.sg/news-and-events/Media-Room/Media-Releases/2020/SG-Digital-Community-Hubs-to-be-Launched-Islandwide--to-Boost-Nationwide-Digitalisation-Movement

Despite extensive testing during pre-deployment, there might be multiple issues with the design and development of the digital projects, which come to light only in the deployment phase. Thus, this phase requires a change management system whereby the issues are resolved as and when they are reported. Change management systems also aid in adding new features and functionalities that might make the application more citizen-centric.

[167] National Institute for Smart Government.

4.2.5 Monitoring & Evaluation[168]

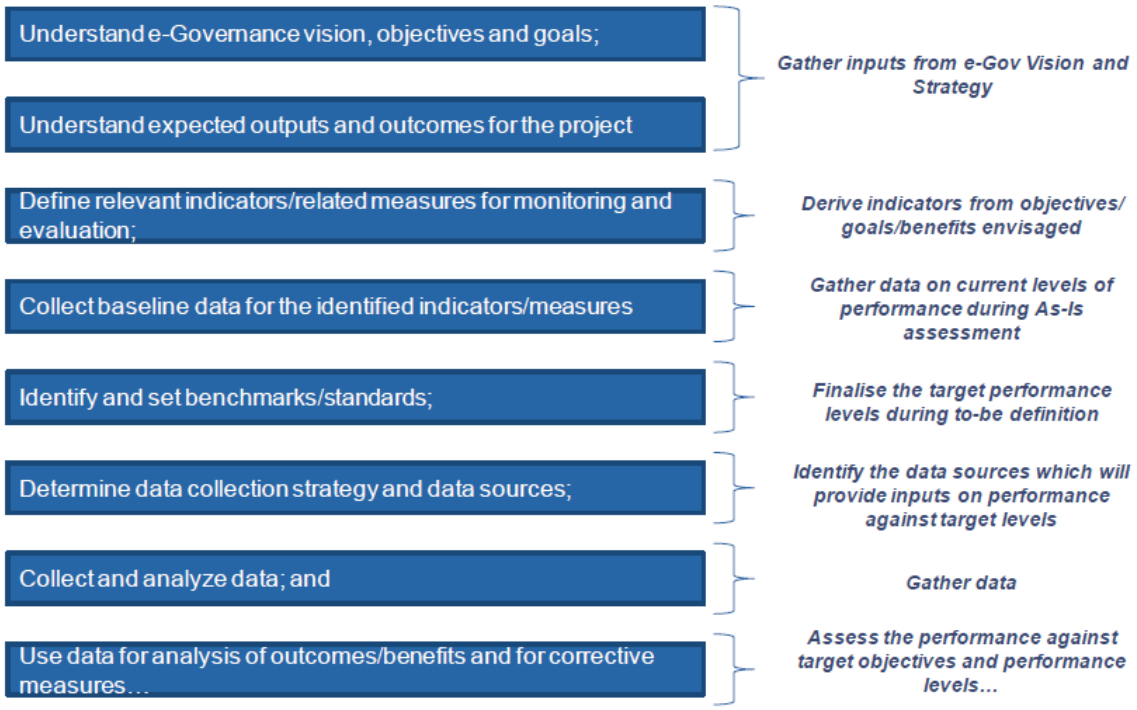
Digital government projects are carried out with a clear vision, objectives, and expected benefits for the stakeholders. Hence, the project managers must track the performance of an intervention and make corrections towards improving it. Monitoring and Evaluation activities play a central role in contributing towards improving the performance.

Monitoring and Evaluation are closely interrelated yet distinct activities. According to the UNDP Evaluation office, "*Monitoring can be defined as a continuing function that aims primarily to provide the management and main stakeholders of an ongoing intervention with early indications of progress, or lack thereof, in the achievement of results*.". Evaluation, on the other hand, refers to *"a selective exercise that attempts to systematically and objectively assess progress towards and the achievement of an outcome".* Evaluations also look at why and how the results are achieved (or not achieved). They may also help to clarify underlying factors affecting the performance as well as unearth any unintended consequences (positive and negative) and recommend actions to improve performance in future projects/programs. While Monitoring is a continuous activity, Evaluation involves a periodic and in-depth assessment, often framed as a "before and after" exercise.

There has been a shift in recent years on the focus of a Monitoring and Evaluation (M&E) exercise. Traditionally, the object of M & E has been program inputs, activities, and outputs. However, under the Results-Based Management framework, the focus has shifted to Monitoring and evaluating outcomes rather than outputs. Outputs refer to the deliverables of a project, such as IT infrastructure, number of visitors, etc. Outcomes, on the other hand, refer to changes in development conditions such as livelihood, health, and Education. In the case of outcomes, the performance indicators could be user satisfaction, time taken to avail a service, etc.

[168] For a detailed discussion, please refer to APCICT Academy module on “M&E Toolkit : Monitoring and Evaluation Toolkit”

Figure 23. Monitoring and Evaluation Framework for a e-governance project

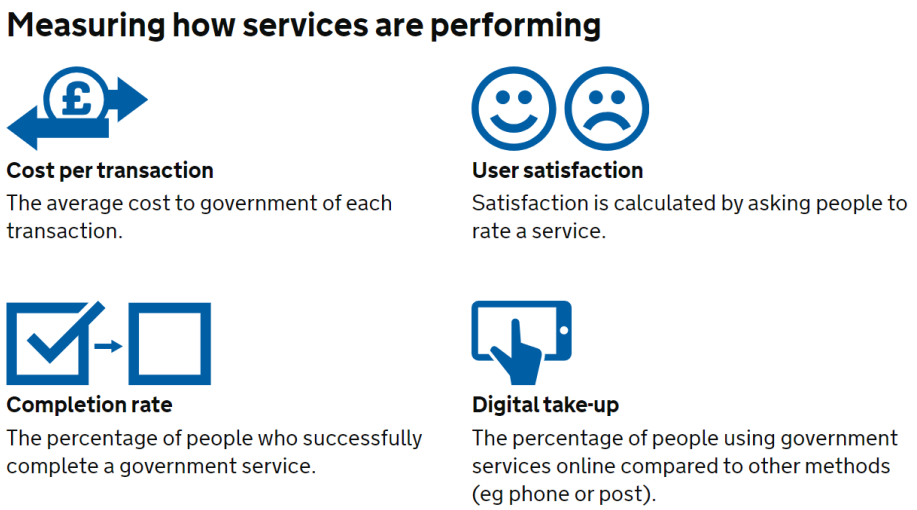


A Monitoring and Evaluation Framework is as shown above[169]. A starting point in developing KPIs is the broader digital government vision, strategy, and values (discussed in the previous section). These values are applied to the specific digital government project (e-health, e-procurement, etc.) to be monitored and evaluated. Specific measurable indicators are derived from these overarching governance values and project objectives.

Before the commencement of the digital government project, the baseline data for these identified indicators must be collected. Following this data collection exercise, the project managers must define the performance levels that are expected to be achieved after the project is implemented. They must also identify the data collection sources and strategies which will be monitored throughout the project. Once the project is deployed, data can be collected and compared with the target set in the initial phase. Suitable corrective measures can be taken based on the data analysis. An emerging best practice is to publish the monitoring data online as a performance dashboard to enable transparency and accountability. For instance, the United Kingdom uses the four KPIs - cost per transaction, user satisfaction, digital take-up, and completion rate of a government transaction.

[169] National Institute for Smart Government.

Figure 24. United Kingdom's Digital government services performance dashboard



Source: https://www.gov.uk/performance

The above KPIs are very useful for evaluating digital services as well. However, Evaluation is an in-depth and periodic exercise. If the above monitoring data tells us how a digital service is performing, an evaluation exercise answers the questions of why and how.

The World Bank defines the following three core principles that can help ensure the quality and effectiveness of Evaluation[170]:

1. Utility: Evaluation utility refers to the relevance and timeliness of evaluation processes and findings to organizational learning, decision making, and accountability for results. The utility can be enhanced throughout the evaluation process by reflecting on what to evaluate, when, how, with whom, and for what purposes. Credibility is a prerequisite for utility.
2. Credibility: Evaluation credibility is grounded in expertise, objectivity, transparency, and rigorous methodology. Ensuring credibility requires that evaluations be conducted ethically and be managed by evaluators who exhibit professional and technical competence in working toward agreed dimensions of quality. Independence is a prerequisite for credibility.
3. Independence: Evaluation independence is in place when the evaluation process is free from undue political influence and organizational pressure.

[170] 'WORLD BANK GROUP EVALUATION PRINCIPLES, April 2019' <https://ieg.worldbankgroup.org/sites/default/files/Data/reports/WorldBankEvaluationPrinciples.pdf> [accessed 12 November 2020].

Evaluations to be credible and of utility must also engage stakeholders. Evaluation can be undertaken in a participatory manner, borrowing from the widespread practice of participatory governance experiments such as social audit and participatory budgeting (see Box 28).

BOX 28. Participatory evaluation

Using participatory approaches in impact evaluation means involving stakeholders, particularly the participants in a programme, or those affected by a given policy, in specific aspects of the evaluation process. By asking the question, 'Who should be involved, why and how?' for each step of an impact evaluation, an appropriate and context-specific participatory approach can be developed. Is the purpose to ensure that the voices of those whose lives should have been improved by the programme or policy are central to the findings? Is it to ensure a relevant evaluation focus? Is it to hear people's own versions of change rather than obtain an external evaluator's set of indicators? These, and other considerations, would lead to different forms of participation by different combinations of stakeholders in the impact evaluation.

Participatory approaches can be used in any impact evaluation design – they are not exclusive to specific evaluation methods or restricted to quantitative or qualitative data collection and analysis. Participation by stakeholders can occur at any stage of the impact evaluation process: in its design, in data collection, in analysis, in reporting and in managing the study.

Source: Guijt, I. (2014). Participatory Approaches, Methodological Briefs: Impact Evaluation 5, UNICEF Office of Research, Florence.

4.3 Emerging trends

The last few years have seen three trends emerging in the digital government project implementation. These are the use of agile methodology, a user-centered design approach, and the use of social media.

4.3.1 Agile Methodology

The sequential method of project implementation described above works well for scenarios where with high certainty and control. This model is often known as the waterfall model since the activities of a particular phase commence only after the completion of the previous phases. However, many of the development challenges are complex, multi-dimensional, and fast-evolving. In such scenarios, a sequential

approach to application development might not be best suited. Thus, governments are increasingly adopting agile methodology in many digital government projects.

The agile methodology brings about a shift in how the project management team engages with external stakeholders and within. This approach expresses the belief that interactions amongst project team members and the external stakeholders should underpin efforts to create working software flexibly [171]. It also emphasizes the continuous delivery of a working application through multiple iterations done incrementally. Agility is as much a cultural stance on the process of software development as it is a set of practices and values[172] best articulated through the Agile Principles (see Box 29).

BOX 29. Agile principles

1. Our highest priority is to satisfy the customer through early and continuous delivery of valuable software.
2. Welcome changing requirements, even late in development. Agile processes harness change for the customer's competitive advantage.
3. Deliver working software frequently, from a couple of weeks to a couple of months, with a preference for the shorter timescale.
4. Business, people and developers must work together daily throughout the project.
5. Build projects around motivated individuals. Give them the environment and support they need, and trust them to get the job done.
6. The most efficient and effective method of conveying information to and within a development team is face-to-face conversation.
7. Working software is the primary measure of progress.
8. Agile processes promote sustainable development. The sponsors, developers, and users should be able to maintain a constant pace indefinitely.
9. Continuous attention to technical excellence and good design enhances agility.
10. Simplicity--the art of maximizing the amount of work not done--is essential.
11. The best architectures, requirements, and designs emerge from self-organizing teams.
12. At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behavior accordingly.

Source: 'Principles behind the Agile Manifesto' <http://agilemanifesto.org/principles.html> [accessed 12 November 2020].

[171] Alan Moran, *Agile Risk Management*, SpringerBriefs in Computer Science (Springer International Publishing, 2014) <https://doi.org/10.1007/978-3-319-05008-9>.
[172] Moran.

According to recent studies by the Standish group, software projects based on agile principles are twice more likely to succeed than those based on the traditional waterfall model[173]. Success here is defined in terms of the projects following the constraints of schedule, cost, and scope. Considering the success of this methodology, it is now the preferred approach in a number of digital government strategies, including that of the United Kingdom, Australia, United States of America and New Zealand.

Countries need to review their processes to adopt the agile methodology. For instance, procurement and costing in the conventional waterfall model is rigid on the specifications and pricing. An agile methodology requires newer and innovative practices towards procurement, application development, deployment, and maintenance (see Box 30).

[173] '[2019 UPDATE] Agile Project Success Rates 2X Higher Than Waterfall', *Vitality Chicago Inc.*, 2018 <https://vitalitychicago.com/blog/agile-projects-are-more-successful-traditional-projects/> [accessed 12 November 2020].

BOX 30. Going Agile: The new mind-set for procurement officials

Shift 1: From contract-centered to project-centered

Traditionally, a well-written, detailed contract has always been a cornerstone of public software procurement. However, there is increased realisation that the software "is what they asked for, just not what they really needed.". Governments need to be focussed on deriving value from the project rather than merely enforce contract.

Shift 2: The vendor doesn't run the project, the agency does

Agile approach blurs the boundaries between the vendor and the government agency. The government agency actively participates, throughout the process helping to ensure that the final result will meet its needs.

Shift 3: You are not just buying software, you are entering a relationship

The agency is no longer looking to buy a "thing"—in this case a new software system. Instead, the agency is entering a relationship to jointly *design and build* a new software system. The contract does not primarily define the software, its main purpose is to define the expectations of the relationship.

Shift 4: From "lump sum, fixed price" to incremental pricing

Because Agile doesn't provide precise specifications up front, it is somewhere between difficult and impossible to calculate an accurate fixed price in advance. This means that there will likely need to be some form of incremental pricing, which could entail a time and materials approach, breaking the project into smaller chunks, or paying for "development points.

Shift 5: From contract management to performance monitoring

Traditional contract management focused on the terms of the contract: Are the correct number of people on the task and are their hours properly documented? However, in agile, Working software is the primary measure of progress. Bye-bye, Gantt charts. Hello, demos.

Source: Agile in Government, A playbook from the Deloitte Center for Government Insights

4.3.2 User/Human centered design

Human-centered design (HCD) is "an approach to interactive systems development that aims to make systems usable and useful by focusing on the users, their needs and requirements, and by applying human factors/ergonomics and usability

knowledge and techniques." This approach has multiple advantages, such as enhancing the effectiveness and efficiency, improving human well-being, user satisfaction, accessibility, and sustainability, and counteracting possible adverse effects of use on human health, safety and performance. Closely related to HCD is the User-centered design (UCD) approach, which emphasizes the need to understand the user of the digital government service throughout the design and development life cycle[174]While the UCD approach overlaps significantly with Human-centered Design, UCD focuses on the specific user groups for whom the application is built.

Some of the related fields contributing to a user-centered design are User experience (UX), Information architecture (IA), Interaction design (IxD), User Interface (UI), Visual Design, and Accessibility (See Table 7). These approaches are oriented towards designing technologies that are appreciative of the user's context, skills, and behavior to ensure greater adoption.

Table 7. Related fields of User-Centred Design

User experience (UX)	UX focuses on having a deep understanding of users, what they need, what they value, their abilities, and their limitations.
Information architecture (IA)	Information architecture (IA) focuses on organizing, structuring, and labeling content effectively and sustainably. The goal is to help users find information and complete tasks.
Interaction design (IxD)	Interaction design focuses on creating engaging interfaces with well-thought-out behaviors. Understanding how users and technology communicate with each other is fundamental to this field.
User Interface (UI)	UI Design focuses on anticipating what users might need to do and ensuring that the interface has elements that are easy to access, understand, and use to facilitate those actions.
Visual design	Visual design focuses on the aesthetics of a site and its related materials by strategically implementing images, colors, fonts, and other elements. The successful visual design does not take away from the content on the page or function. Instead, it enhances it by engaging users and helping to build trust and interest in the brand.
Accessibility	Accessibility focuses on how a disabled person accesses or benefits from a site, system, or application. Accessibility is an important part of designing your site and should be considered throughout the development process.

Source: Adapted from https://www.usability.gov/what-and-why/user-experience.html

[174] 'User-Centered Design Basics | Usability.Gov' (Department of Health and Human Services, 2017) <user-centered-design.html> [accessed 12 November 2020].

Following the widespread adoption of the user-centered design approach the commercial enterprises, governments have also begun to use this approach in digital government services. The Sustainable Development Goal of inclusiveness and effectiveness requires that the governments make the digital services user-centric. Inclusiveness requires that the applications be accessible to everyone, including the Persons with Disabilities, senior citizens, and non-literate citizens. The Web Content Accessibility Guideline (WCAG) provides a technical standard, which is the basis for many laws and regulations worldwide (see Box 31).

BOX 31. Web content accessibility guidelines (WCAG)

Web Content Accessibility Guidelines (WCAG) 2.1 covers a wide range of recommendations for making Web content more accessible. Following these guidelines will make content more accessible to a wider range of people with disabilities, including accommodations for blindness and low vision, deafness and hearing loss, limited movement, speech disabilities, photosensitivity, and combinations of these, and some accommodation for learning disabilities and cognitive limitations; These guidelines address accessibility of web content on desktops, laptops, tablets, and mobile devices. Following these guidelines will also often make Web content more usable to users in general.

The guidelines and Success Criteria are organized around the following four principles, which lay the foundation necessary for anyone to access and use Web content. Anyone who wants to use the Web must have content that is:

- Perceivable - Information and user interface components must be presentable to users in ways they can perceive. This means that users must be able to perceive the information being presented (it can't be invisible to all of their senses)
- Operable - User interface components and navigation must be operable. This means that users must be able to operate the interface (the interface cannot require interaction that a user cannot perform)
- Understandable - Information and the operation of user interface must be understandable. This means that users must be able to understand the information as well as the operation of the user interface (the content or operation cannot be beyond their understanding)
- Robust - Content must be robust enough that it can be interpreted reliably by a wide variety of user agents, including assistive technologies.

This means that users must be able to access the content as technologies advance (as technologies and user agents evolve, the content should remain accessible). If any of these are not true, users with disabilities will not be able to use the Web.

4.3.3 Social Media Usage[175]

Social media applications characterize web 2.0, whereby users can not only passively consume information but also communicate, engage, and interact. Social media enables simultaneous many-to-many communication between users. This networked nature of social media platforms provides a distinct advantage of widespread reach to many users in a short time. Since users are already familiar with many social media applications, their use by governments requires a significantly low investment in training and capacity-building. Further, the deployment costs are remarkably low as the applications already exist. Due to these advantages, governments have begun to use social media platforms to engage with citizens. Social media is widely used to address citizen grievances, especially when there are delays in the delivery of services. City governments have been particularly successful in using social media to address citizen grievances. Further, governments have often used social media to crowdsource innovative ideas to improve the quality of public services.

The issue of fake news in social media has often been a challenge for governments. To address this, governments usually ensure that social media platforms provide authentic information and fact-check news. Social media is also widely used to create peer networks of knowledge sharing among government staff. For instance, WhatsApp or Telegram groups facilitate knowledge sharing on best practices among officials with similar roles and responsibilities.

The use of social media also poses many new challenges for governments. Social media blurs the boundaries between personal and professional roles. Thus, governments must consciously have official accounts to ensure this separation as well as ensure continuity. Since using social media is a resource-intensive exercise, it is important to ensure that resources and responsibilities are marked very early[176]. Governments often might have to set up dedicated teams to handle social media usage. Furthermore, while social media enhances transparency, government agencies must also address privacy and data security concerns. Most of all, social media usage must adopt a strategic approach that addresses the objective of social media presence, choice of social media platform, dedicated team, and resources as well as periodic Evaluation of a social media strategy.

[175] 'For a detailed discussion please refer to APCICT Academy Module on "Social Media, Development and Governance"

[176] 'Social Media Framework and Guidelines _2_.Pdf' <https://www.meity.gov.in/writereaddata/files/Approved%20Social%20Media%20Framework%20and%20Guidelines%20_2_.pdf> [accessed 12 November 2020].

4.4 Key Points

- Digital government applications have been widely used in multiple domains such as urban governance, law enforcement, judicial system, education, healthcare, agriculture, tax administration, and government procurement.
- Digital government projects often fail due to poor planning and project management. To prevent such failures, governments need to adopt sound project management practices.
- **Project conceptualization:** The most important consideration in a digital government project is identifying the problem or the opportunity for the users that digital technology seeks to address. Mapping the current state and the future desired state, as well as the anticipated performance improvements, is vital to the success of a digital government project.
- **Project implementation**
    - **Procurement:** Project implementers can either develop the application in-house or procure it from an external vendor. Further, off-the-shelf products can be procured when appropriate as this saves the project costs and time. If the requirements do not match, then bespoke development can be procured. Governments must prioritize open-source software to prevent vendor lock-in.
    - **Financing:** Governments must budget for the "total cost of ownership" upfront, which accounts for the initial costs of acquisition and operational costs over time. The key options available are public financing, private financing, and Public-Private Partnership financing.
- **Project development:** The key activities carried out in this phase are time management, cost management, and quality management.
- **Project deployment:** refers to the project going "live" into the user environment. Deployments tend to disrupt the existing process flows. Thus, governments can either choose to adopt an incremental approach to deployment (ex-phased rollout) or they can adopt a big bang approach and deploy the digital government applications at once.
- **Monitoring and Evaluation(M&E):**
    - M&E help to clarify underlying factors affecting the performance as well as unearth any unintended consequences (positive and negative) and recommend actions to improve performance in future projects/programs.
    - This is done by establishing Key Performance Indicators (KPIs).
    - Participatory evaluations require deep engagement with the stakeholders.
- Some of the emerging approaches to digital government implementation include the use of agile methodology, user-centric design, and integration of social media.

5. Emerging Technologies

Outline: This chapter aims to:

- Discuss key emerging digital government trends.
- Explores the potential of Artificial Intelligence technologies in digital government and highlights the ethical concerns associated with artificial intelligence.
- Discusses about the need and importance of robust data governance and digital identity systems.

The fast-paced digitization of government functions and our daily lives has led to "datafication[177]," which refers to a technological trend turning many aspects of our life into data, often in machine-readable formats. Datafication and the associated "Big Data" are perceived as a disruptive force in all spheres of our everyday life. Digital data is thus often referred to as the new oil of the Fourth Industrial Revolution. An integral part of this emergent industry 4.0 is the pervasive use of Artificial Intelligence by the government and the industry. These trends have implications for governments as well. Governments have the role of producers, consumers, custodians, and regulators of digital data. In this chapter, we discuss some of these emerging trends in digital governance, much of which is still in a state of flux.

We discuss three emerging and interrelated digital government trends concerning digital data – Artificial Intelligence, data governance, and digital identities.

We begin by discussing the potential for the use of AI technologies in digital governments. We also discuss the ethical concerns of AI and ethical principles that must guide AI to ensure inclusiveness, effectiveness, and accountability in governance. Following this, we discuss the need for a data governance framework. Data governance has implications not just for AI, which is based on data, but also wider aspects of governance. Yet another specific type of data is the digital identity of individuals and organization. As governments and citizens increasingly engage in the digital medium, there is a need to identify, authenticate, and authorize citizens digitally. Thus, governments are investing in providing digital identities to citizens to ensure seamless interaction between citizens and different government entities. We discuss the potential as well as safeguards to be put in place in a digital identity system.

5.1 Artificial Intelligence

There have been rapid advances in computing power and the development of a new class of algorithms leading to breakthroughs in the field of AI, promising to transform

[177] Kenneth Cukier and Viktor Mayer-Schoenberger, 'The Rise of Big Data: How It's Changing the Way We Think About the World', *Foreign Affairs*, 92.3 (2013), 28–40.

our societies, economic systems and impacting citizens, industry, and governments alike[178]. AI refers to "systems that display intelligent behavior by analyzing their environment and taking actions – with some degree of autonomy – to achieve specific goals[179]".

There are difficulties in defining AI, partly because "intelligence" itself is a contested term. However, there is a consensus that AI systems do more than automation. They are learning systems that have some degree of autonomy. This autonomy separates them from traditional software applications. Unlike the traditional rule-based software algorithms, AI systems are self-learning, where decision-making is not hard-coded into the software. Instead, AI systems express a statistical relationship between different input and output variables, which adjusts itself based on the nature of data fed into it[180] (See Box 32).

BOX 32. General AI VS Narrow AI

General AI refers more to ICT systems having similar forms of intelligence as humans, and the debate here is more focused on duplicating the inner workings of the human brain and applying this to a machine. General AI is far from being real and might take decades (or longer) to manifest.

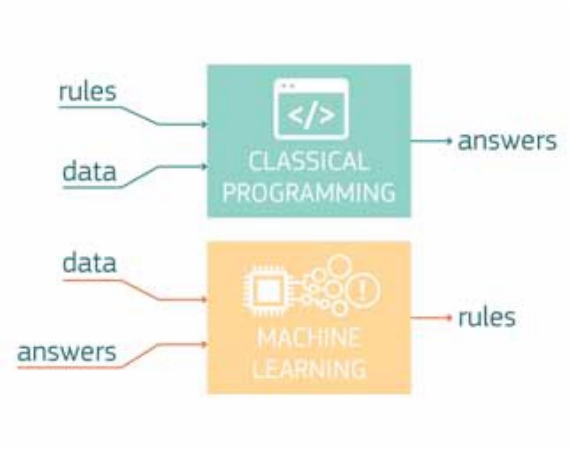
Narrow AI comprises robotized systems and applications that are considered to be 'intelligent', not because they imitate human behaviour, but more modestly because they are capable of carrying out tasks that would otherwise require human intelligence, effort and time to an unsustainable extent. Much of the contemporary discussion on AI refers to Narrow AI.

[178] FPFIS team, 'AI Watch - Artificial Intelligence in Public Services', *EU Science Hub - European Commission*, 2020 <https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/ai-watch-artificial-intelligence-public-services> [accessed 12 November 2020].

[179] 'EUR-Lex - 52018DC0237 - EN - EUR-Lex' <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2018%3A237%3AFIN> [accessed 12 November 2020].

[180] 'Public Scrutiny of Automated Decisions: Early Lessons and Emerging Methods', *Omidyar Network*, 2018 <https://omidyar.com/public-scrutiny-of-automated-decisions-early-lessons-and-emerging-methods/> [accessed 12 November 2020].

Figure 25. Artificial Intelligence - a Europe perspective



Source : 'Craglia et al. - 2018 - Artificial Intelligence a European Perspective.Pdf' <https://publications.jrc.ec.europa.eu/repository/bitstream/JRC113826/ai-flagship-report-online.pdf> [accessed 12 November 2020].

The above figure depicts the paradigm shift between traditional rule-based programming and AI[181]. Traditionally, a programmer would write computer code setting the rules needed to process data inputs to generate output. In machine learning, a subfield of AI, the computer receives input data and answers expected from the data. The AI system needs to produce the rules, which are then applied to new data to produce the original answer.

AI systems are commonly being deployed in our everyday lives. For instance, search engine algorithms help us access the information we want by rapidly interrogating data on the World Wide Web. The search results tend to be personalized based on a user's location, gender, language, search history, and other data trails[182]. Similarly, digital assistants such as Apple's Siri, Google Now, Amazon's Alexa, and Microsoft's Cortana use AI systems to help users perform various tasks, from checking their schedules and searching for something on the web to sending commands to another app[183].

Governments, too, are beginning to adopt AI systems in decision-making and interaction with citizens in various domains such as health, education, law enforcement, and urban governance. Governance is a highly complex problem, exacerbated due to issues of scale. Governments believe that AI can address many of the issues such as efficient resource allocation, analysis of large datasets, and

[181] 'Craglia et al. - 2018 - Artificial Intelligence a European Perspective.Pdf' <https://publications.jrc.ec.europa.eu/repository/bitstream/JRC113826/ai-flagship-report-online.pdf> [accessed 12 November 2020].
[182] https://plus.google.com/+UNESCO, 'Steering AI and Advanced ICTs for Knowledge Societies: A ROAM Perspective Launched in Russian and Chinese', *UNESCO*, 2020 <https://en.unesco.org/news/steering-ai-and-advanced-icts-knowledge-societies-roam-perspective-launched-russian-and-chinese> [accessed 12 November 2020].
[183] '5 Examples Of AI In Our Everyday Lives', *Adobe Blog*, 2018 <https://blog.adobe.com/en/publish/2018/01/07/5-examples-of-ai-in-our-everyday-lives.html> [accessed 12 November 2020].

shortage of experts in niche areas (for example, air quality, traffic management, and health) can be addressed through AI systems. (See Figure 21)

Figure 26. AI appropriate Government Applications

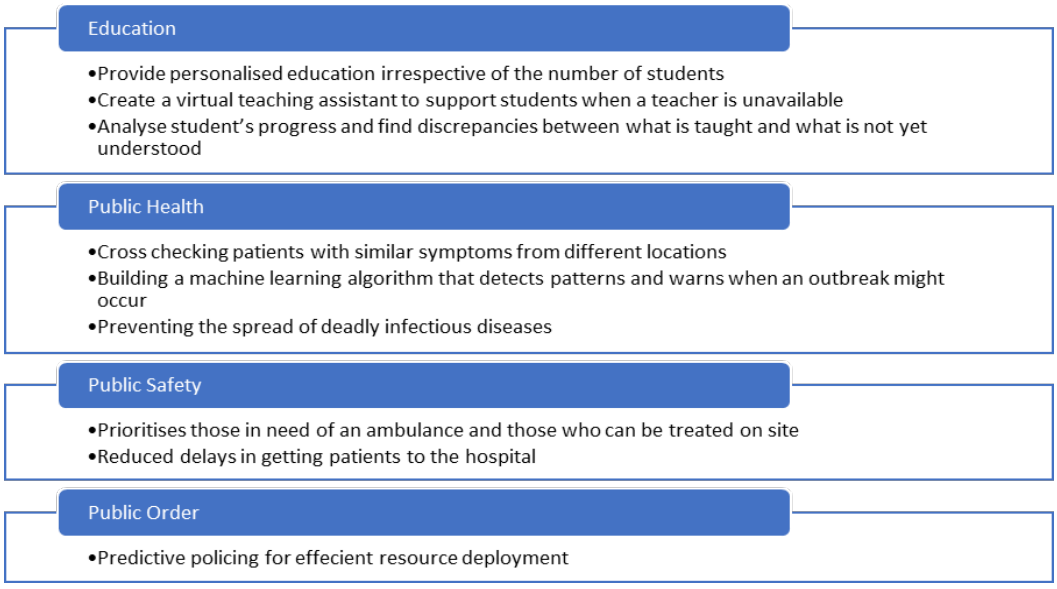
Types of Government Problems Appropriate for AI Applications

Resource Allocation	• Administrative support is needed to speed up task completion • Inquiry response times are long due to insufficient support
Large Datasets	• Dataset is too large for employees to work with efficiently • Internal and external datasets can be combined to enhance outputs and insights • Data is highly structured with years of history
Experts Shortage	• Basic questions can be answered, freeing up time for experts • Niche issues can be learned to support experts in research
Predictable Scenario	• Situation is predictable based on historical data • Prediction will help with time-sensitive responses
Procedural	• Task is repetitive in nature • Inputs/outputs have binary answer
Diverse Data	• Data includes visual/spatial and auditory/linguistic information • Qualitative and quantitative data needs to be summarized regularly

Source: https://ash.harvard.edu/files/ash/files/artificial_intelligence_for_citizen_services.pdf

Governments are considering AI systems to address the above kinds of problems in different domains such as health, education, public safety, and public order (see Figure 22).

Figure 27. Applications of AI in Public Sector



Source:https://www.capgemini.com/consulting/wp-content/uploads/sites/30/2017/10/ai-in-public-sector.pdf

Many countries are beginning to adopt a national strategy on AI, highlighting the promise that governments see in using AI in government.

5.1.1 AI and governance

Notwithstanding these promises, AI systems have their fair share of risks and concerns, especially when evaluated from the principles of inclusiveness, effectiveness, and accountability (discussed in Chapter 1). These challenges are not only for the use of AI by governments but also for the use of AI outside the government in the digital economy. For instance, organizations use AI systems for shortlisting candidates for recruitment. Similarly, banks use AI systems to ensure the creditworthiness of borrowers. In the healthcare sector, companies collect large amounts of health data to discern patterns to predict the occurrence of certain diseases in individuals. Insurance companies use AI systems fed with big data to calculate premiums efficiently.

Thus, there is a dual dimension of governance **'with and of' AI** that needs to be considered[184]. On the one side, it is important to explore and assess the effective use and value-added of AI to redesign internal government operations and public services. On the other side, it is also crucial to better understand the potential benefits and risks of the use of AI, not only in the public sector but also in the private sector, where services are delivered to citizens. There is a need for governance mechanisms and regulatory frameworks to safeguard human rights and ensure the ethical deployment of AI[185].

5.1.1.1 Effectiveness

The principle of effectiveness requires policymakers and implementers to have sound competency with sufficient resources and expertise to fulfill their mandates adequately. However, much of the expertise on AI currently rests with a few experts in the private sector. Due to the complexity involved in AI systems that rely on big data and advanced statistical techniques, government agencies might not be sufficiently equipped to understand the design of AI systems and evaluate different AI systems prior to procurement and deployment in different policy domains.

Another concern is the persistence of the "automation bias"(see Box 33) among policymakers, which refers to a tendency to believe that the decisions that originate from a machine are more "correct" than decisions taken by humans. Such trust in AI

[184] team, 'AI Watch - Artificial Intelligence in Public Services'.
[185] team, 'AI Watch - Artificial Intelligence in Public Services'.

systems means that these systems could be subject to less scrutiny, both in terms of a priori assessment of competence and measuring ultimate performance[186].

BOX 33. Automation bias

Automation bias refers to the phenomenon in which humans are more likely to believe in answers that originate from a machine. Rather than vigilant information seeking and processing, decision-makers tend to give considerable weight to outcomes of automated decision-making systems, often leading to erroneous decisions.

Automation bias might lead to two kinds of errors. Automation commission errors, are errors made when decision makers take inappropriate action because they over-attend to automated information or directives. Automation omission errors refer to errors made when decision makers do not take appropriate action because they are not informed of an imminent problem or situation by automated aids, can result from this tendency.

Source: Skitka, Linda J., Kathleen L. Mosier, and Mark Burdick. "Does automation bias decision-making?." *International Journal of Human-Computer Studies* 51.5 (1999): 991-1006.

5.1.1.2 Inclusiveness

Inclusiveness is a key governance principle as part of sustainable development goals. Inclusiveness requires that we do not "leave anyone behind." Moreover, governments need to ensure that no one is discriminated against based on race, ethnicity, gender, or sex. Instead, all groups should have an opportunity to participate in matters that directly affect their daily live.

AI systems pose multiple challenges to ensure inclusiveness in governance. AI systems, as discussed earlier, are learning systems with a degree of autonomy. AI systems depend on the data they are given and may reflect the characteristics of such data, including any biases, in the models of the world they create[187]. The data available might not be an accurate reflection of reality. For instance, crime reports against minorities might be overreported, while those against elites might be underreported (see Box 34). AI systems are only as good (or as bad) as the data given to them.

[186] 'AI_Now_2016_Report.Pdf' <https://ainowinstitute.org/AI_Now_2016_Report.pdf> [accessed 12 November 2020].
[187] AI Now 2016 : The Social and Economic Implications of Artificial Intelligence Technologies in the Near-Term

BOX 34. Non inclusiveness and AI

AI systems tend to be non-inclusive due to

- Biases in data on which they are modelled.
- Exclusion of potential users in design.
- Lack of diverse and multidisciplinary perspectives.
- Centralised design and deployment.

AI systems also tend to exclude people in its design phase itself. For instance, those directly impacted by the deployment of AI systems within core social and economic domains rarely have a role in their design or a means to alter their assumptions and uses. Even within the AI systems development team, there is very little contribution from disciplines that prioritize human contexts, experience, and sociopolitical issues, such as the social sciences and humanities. Further, the computer science subfield of AI is heavily dominated by men with largely homogeneous racial and ethnic backgrounds. This can limit the perspectives and experiences of AI's creators[188] , leading to the design of exclusionary AI systems.

Inclusiveness is often achieved in governance through a decentralized approach. The principle of subsidiarity states that central authorities should perform only those tasks which cannot be performed effectively at a more intermediate or local level. Local governments often promote more avenues for citizens' participation and lead to inclusive governance. However, AI systems tend to be procured and deployed centrally. This is because AI systems require considerable resources such as computing power, storage, and large datasets. Thus, AI systems tend to centralize decision-making within government, constraining avenues for citizens' participation.

AI systems are exclusionary, not merely within the digital government applications but also in the digital economy having society-wide impacts. Low-skill jobs are at significant risk of replacement from automation and AI. For instance, chatbots are beginning to replace customer service executives. Thus, there are fears that AI will lead to greater unemployment, excluding many from the benefits of economic growth. However, AI systems tend to disrupt not just workers but also small and medium enterprises. Developing AI requires a significant up-front investment, including sizeable computational resources, along with large amounts of data, both of which are costly.

Further, the platform economy's nature is such that a few companies have a huge competitive advantage due to access to huge user data. Lack of competition can result in monopoly power exacerbating harms. Competition laws need to be amended to prevent the "winner takes all" phenomenon, resulting from the network effect towards ensuring a level playing field.

[188] 'AI_Now_2016_Report.Pdf'.

5.1.1.3 Accountability

AI systems often display characteristics of a "black box" model, i.e., we know what goes in and comes out of the algorithm, but we do not fully understand its inner working[189]. Adding to this lack of transparency is the fact that many AI systems are procured from private vendors who view their software, algorithms, and datasets as valuable trade secrets. Thus, they often do not divulge how they address a particular problem[190] as it undermines their position in a competitive market.

Such lack of transparency might lead to trust deficits among those impacted by AI-based decision-making. Without transparency, the users are unsure if the decisions taken are fair and effective. Further, such opacity also makes it very difficult to ensure the accountability of the decision-makers. The use of AI systems thus threatens the fundamental principle of democratic governance.

5.1.2 Towards an ethical AI

Recognizing these challenges of AI, there has been much discussion in academic and policy circles about the need for designing AI systems that address these ethical and governance concerns.

European Union's AI strategy emphasizes the need for trust in designing a **human-centric AI**. The seven key requirements which governments should consider before using AI are as below[191]:

- **Human agency and oversight**

AI systems should support individuals in making better, more informed choices in accordance with their goals. They should act as enablers to a flourishing and equitable society by supporting human agency and fundamental rights and not decrease, limit or misguide human autonomy. The overall wellbeing of the user should be central to the system's functionality.

Human oversight helps to ensure that an AI system does not undermine human autonomy or causes other adverse effects. Oversight may be achieved through

[189] Max Craglia, Europäische Gemeinschaften, and Gemeinsame Forschungsstelle, *Artificial Intelligence a European Perspective*, 2018.
[190] 'The Ethics of Artificial Intelligence: Issues and Initiatives - Think Tank' <https://www.europarl.europa.eu/thinktank/en/document.html?reference=EPRS_STU(2020)634452> [accessed 12 November 2020].
[191] 'COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS Building Trust in Human-Centric Artificial Intelligence', Brussels, 8.4.2019 <https://ec.europa.eu/jrc/communities/sites/jrccties/files/ec_ai_ethics_communication_8_april_2019.pdf> [accessed 12 November 2020].

governance mechanisms such as ensuring a human-in-the-loop, human-on-the-loop, or human-in-command approach (see Box 35).

BOX 35. Approaches to human oversight in AI

Human-in-the-loop (HITL) refers to the human intervention in every decision cycle of the system, which in many cases is neither possible nor desirable.

Human-on-the-loop (HOTL) refers to the capability for human intervention during the design cycle of the system and monitoring the system's operation.

Human-in-command (HIC) refers to the capability to oversee the overall activity of the AI system (including its broader economic, societal, legal and ethical impact) and the ability to decide when and how to use the system in any particular situation. This can include the decision not to use an AI system in a particular situation, to establish levels of human discretion during the use of the system, or to ensure the ability to override a decision made by the system.

- **Technical robustness and safety**

AI systems need to be **reliable**, secure enough to be **resilient** against both overt attacks and more subtle attempts to manipulate data or algorithms themselves, and they must ensure a **fallback plan** in case of problems. Their decisions must be **accurate** or at least correctly reflect their level of accuracy, and their outcomes should be **reproducible**.

In addition, AI systems should integrate safety and security-by-design mechanisms to ensure that they are **verifiably safe** at every step, taking at heart the physical and mental safety of all concerned.

- **Privacy and data governance**

Privacy and **data protection** must be guaranteed at **all stages** of the AI system's life cycle. Digital records of human behavior may allow AI systems to infer not only individuals' preferences, age, and gender but also their sexual orientation, religious or political views. To allow individuals to trust the data processing, it must be ensured that they have full control over their own data and that data concerning them will not be used to harm or discriminate against them.

The quality of the datasets used is paramount to the performance of AI systems. When data is gathered, it may reflect socially constructed biases or contain inaccuracies, errors, and mistakes.

In addition, the **integrity** of the data must be ensured. Processes and data sets used must be tested and documented at each step, such as planning, training, testing, and deployment. This should also apply to AI systems that were not developed in-house but acquired elsewhere. Finally, **access** to data must be adequately governed and controlled.

- **Transparency**

The **traceability** of AI systems should be ensured; it is important to log and document both the decisions made by the systems, as well as the entire process (including a description of data gathering and labelling, and a description of the algorithm used) that yielded the decisions. Linked to this, **explainability** of the algorithmic decision-making process, adapted to the persons involved, should be provided to the extent possible.

Finally, it is important to adequately **communicate** the AI system's capabilities and limitations to the different stakeholders involved in a manner appropriate to the use case at hand.

- **Diversity, non-discrimination, and fairness**

Data sets used by AI systems (both for training and operation) may suffer from the inclusion of inadvertent historical bias, incompleteness, and bad governance models. The way in which AI systems are developed (e.g., the way in which the programming code of an algorithm is written) may also suffer from bias. Such concerns should be tackled from the beginning of the system's development.

Establishing **diverse design teams** and setting up mechanisms ensuring **participation,** in particular of citizens, in AI development can also help to address these concerns.

- **Societal and environmental well-being**

For AI to be trustworthy, its impact on the **environment and other sentient beings** should be considered. Ideally, all humans, including future generations, should benefit from biodiversity and a habitable environment. Furthermore, the impact of AI systems should be considered not only from an individual perspective but also from the perspective of **society as a whole**. The use of AI systems should be given careful consideration, particularly in situations relating to the democratic process, including opinion-formation, political decision-making, or electoral contexts. Moreover, AI's **social impact** should be considered.

- **Accountability**

Mechanisms should be put in place to ensure responsibility and accountability for AI systems and their outcomes, both before and after their implementation. **Auditability** of AI systems is key in this regard, as the assessment of AI systems by internal and external auditors and the availability of such evaluation reports strongly contributes to the trustworthiness of the technology.

Potential negative impacts of AI systems should be identified, assessed, documented, and minimized. The use of impact assessments facilitates this process.

Trade-offs between the requirements – which are often unavoidable – should be addressed in a rational and methodological manner and should be accounted for. Finally, when unjust adverse impact occurs, accessible mechanisms should be foreseen to ensure **adequate redress**.

Likewise, IEEE has come up with eight general principles of "ethically aligned design" (see Box 36) that should be considered while designing autonomous and intelligent systems (A/IS).

These high-level principles serve as a useful guide towards ethical design, development, deployment, adoption, and decommissioning AI systems.

BOX 36. IEEE :Ethically aligned design of AI

The ethical and values-based design, development, and implementation of autonomous and intelligent systems should be guided by the following General Principles:

1. **Human Rights:** A/IS shall be created and operated to respect, promote, and protect internationally recognized human rights.
2. **Well-being**: A/IS creators shall adopt increased human well-being as a primary success criterion for development.
3. **Data Agency:** A/IS creators shall empower individuals with the ability to access and securely share their data, to maintain people's capacity to have control over their identity.
4. **Effectiveness**: A/IS creators and operators shall provide evidence of the effectiveness and fitness for purpose of A/IS.
5. **Transparency**: The basis of a particular A/IS decision should always be discoverable.
6. **Accountability**: A/IS shall be created and operated to provide an unambiguous rationale for all decisions made.
7. **Awareness of Misuse**: A/IS creators shall guard against all potential misuses and risks of A/IS in operation.
8. **Competence** A/IS creators shall specify and operators shall adhere to the knowledge and skill required for safe and effective operation.

5.2 Data Governance:

The world's most valuable resource is no longer oil but data[192]. The digital age is producing a vast amount of data every second. Data on health, education, finance, weather, market produce, consumption, and so on are highly valued assets. Digital data is fundamental to businesses driving innovation using machine learning, artificial intelligence, and automation. "Data is to AI what food is for humans.[193]"

Individuals and businesses are using data to reduce search and transaction costs and make informed choices. Data is facilitating scientific and medical research, making societies more productive. It helps improve the efficacy of public policy, delivery of public services, transparency, and accountability[194].

Governments have two critical roles in the data economy. One, governments are custodians of large amounts of data. This includes the static data collected periodically, such as census, land records, economic activity, and dynamic data generated due to government digitization, such as payment records, agricultural produce, market transactions, and vehicular movement. Much of this data is of high value to the data economy. Governments thus need to enable innovation and growth by providing access to data. However, data is also an asset, a resource that needs to be regulated to ensure a competitive market and protect individual privacy and national sovereignty. Therefore, governments also have a regulatory role.

Data flows have increased across organizations, sectors (e.g., business-to-government), and borders, adding another complexity level to data governance in a globalized and interconnected world. Data governance is no longer a matter limited to organizational boundaries but a multinational concern resulting from cross-border data sharing[195]. While the data governance frameworks are still emerging, governments recognize the need to balance data sharing with data protection concerns.

Personal and Non-personal data

Digital data can be broadly classified into personal and non-personal data. **Personal data** refers to "any information relating to an identified or identifiable natural person directly or indirectly, in particular by reference to an identifier such as a name, an identification number, location data, an online identifier or to one or more factors

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[192] 'The World's Most Valuable Resource Is No Longer Oil, but Data', *The Economist*, 6 May 2017 <https://www.economist.com/leaders/2017/05/06/the-worlds-most-valuable-resource-is-no-longer-oil-but-data> [accessed 12 November 2020].

[193] 'Data Is to AI as Food Is to Humans' <https://www.predicthq.com/blog/data-is-to-ai-as-food-is-to-humans> [accessed 2 April 2021].

[194] Data Economy: Radical transformation or dystopia?,'FRONTIER TECHNOLOGY QUARTERLY' <https://www.un.org/development/desa/dpad/wp-content/uploads/sites/45/publication/FTQ_1_Jan_2019.pdf> [accessed 12 November 2020].

[195] 'Data Governance in the Public Sector | The Path to Becoming a Data-Driven Public Sector | OECD ILibrary' <https://www.oecd-ilibrary.org/sites/9cada708-en/index.html?itemId=/content/component/9cada708-en> [accessed 12 November 2020].

specific to the physical, physiological, genetic, mental, economic, cultural or social identity of that natural person[196]. " Examples of personal data include bank account details of individuals, voter information, tax filings, credit history, and biometric information. There is now a consensus for the need to protect such personal data through legislation. The European Union's General Data Protection Regulation (GDPR) is an example of personal data protection legislation.

Any data which is not personal data is considered **non-personal data**. This includes data that is not associated with individuals, such as weather, air quality, agricultural produce, and personal data anonymized sufficiently, such as land records, vehicle information, and public health information.

Entities that collect and process data are known as data fiduciaries (or data custodians). Data custodians might be either public (or publicly funded) or private entities. Thus, based on the nature of data and the actors, the following combinations are possible. The data governance framework must address the ownership, rights, and flow of data among these entities.

5.2.1 Personal data governance

Data subject refers to the individual whose data is being collected. The entity collecting the data is called the **data controller.** However, some regulatory frameworks[197] refer to the data subject and data controller as **data principal** and **data fiduciaries** to emphasize individuals' rights and fiduciaries' obligations. The data fiduciaries could be both government and private entities.

Government entities have been traditionally collecting personal data for providing their services in health, education, social security, and so on. The whole-of-government approach advocates data flow across government entities to enable efficient service delivery and integrated policymaking. The emerging trend of governments adopting national digital identity systems further allows data flow and across different entities.

However, the whole-of-government approach is increasingly being extended into a whole-of-economy approach through a seamless flow of data and services between government and private entities. Such a whole-of-economy approach is commonly referred to as "Government-as-a-platform" or a "digital ecosystem" approach. To enable data flow, governments use **digital registries,** which are structured datasets of government information[198]. Each digital register only contains data on a specific subject, is kept up to date by the data controller, and provides APIs to enable access.

However, personal data can also be misused and cause harm to individuals and communities. Thus, there is a need to ensure adequate data protection. EU's General

[196] 'General Data Protection Regulation (GDPR) – Official Legal Text', *General Data Protection Regulation (GDPR)* <https://gdpr-info.eu/> [accessed 12 November 2020].
[197] 'Data_Protection_Committee_Report.Pdf' <https://www.meity.gov.in/writereaddata/files/Data_Protection_Committee_Report.pdf> [accessed 12 November 2020].
[198] 'About Registers - GOV.UK Registers' <https://www.registers.service.gov.uk/about> [accessed 12 November 2020].

Data Protection Regulation (GDPR) serves as a useful framework to emulate. The key principles of personal data protection defined under GDPR are:

Table 8. Principles of GDPR

Lawfulness, fairness, and transparency	Personal Data shall be processed lawfully, fairly, and in a transparent manner in relation to the data subject (data principal).
Purpose limitation	Personal Data shall be collected for specified, explicit, and legitimate purposes and not further processed in a manner that is incompatible with those purposes.
Data minimization	Personal data shall be adequate, relevant, and limited to what is necessary in relation to the purposes for which they are processed.
Accuracy	Every reasonable step must be taken to ensure that personal data that are inaccurate, having regard to the purposes for which they are processed, are erased, or rectified without delay.
Storage limitation	Personal data shall be kept in a form which permits identification of data subjects for no longer than is necessary for the purposes for which the personal data are processed.
Integrity and confidentiality (security)	Personal data shall be processed in a manner that ensures appropriate security of the personal data, including protection against unauthorized or unlawful processing and against accidental loss, destruction, or damage, using appropriate technical or organizational measures.

However, data protection frameworks need to apply not only to the government collected data but also to individuals and businesses. Platform companies are the dominant players in the data economy and collect huge data on individual user behavior over long periods. Such data often includes sensitive information such as gender, sexual orientation, and political and religious beliefs. This sensitive data, especially pertaining to many users, might be misused by social media platforms or other third-party entities. For instance, Facebook admitted that the data of 87 million users was shared with Cambridge Analytica through a third-party application that extracted personal data of Facebook users who had downloaded the application as well as their friends, is demonstrative of several such harms - users did not have effective control over data. Further, they had little knowledge that their activity on

Facebook would be shared with third parties for targeted advertisements around the United States of America's presidential elections[199].

5.2.2 Non-personal data governance

Data governance framework should also cover non-personal data, as they, too, provide significant value to the data economy while even posing certain risks. Questions of ownership, access, and use are relevant for non-personal data as for personal data discussed above.

Non-personal data is collected and processed by both government and private entities. Non-personal data includes two categories[200]

Data which originally did not relate to an identified or identifiable natural person, such as data on weather conditions generated by sensors installed on wind turbines or data on maintenance needs for industrial machines.

Data which were initially personal data but were later made **anonymous.**

The need to regulate non-personal data is due to the following reasons[201]:

There is a need for a level-playing field in the data economy and to improve competitiveness. A few early movers currently dominate the data economy, and the network effect leads to a "winner takes it all" situation.

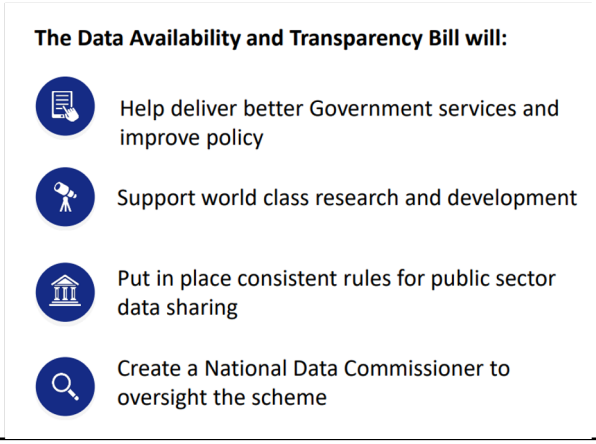
Even when anonymized, sensitive non-personal data might lead to collective harm against communities based on the identification of gender, ethnicity, color, race, etc. Thus, there is a need to develop and enforce standards of anonymization when necessary.

Non-personal data, especially held by governments, is of high value in contributing to research and innovation and can potentially contribute to public value creation.

Recognizing non-personal data's value, governments are coming up with data governance frameworks (see Box 37) on objectives of Australia's Data Availability and Transparency bill.

[199] 'Data_Protection_Committee_Report.Pdf'.
[200] 'Guidance on the Regulation on a Framework for the Free Flow of Non-Personal Data in the European Union | Shaping Europe's Digital Future' <https://ec.europa.eu/digital-single-market/en/news/guidance-regulation-framework-free-flow-non-personal-data-european-union> [accessed 12 November 2020].
[201] 'Data_Protection_Committee_Report.Pdf'.

BOX 37. Australia data availability and transparency bill



5.3 Digital Identity

Interactions between individuals and government agencies require the citizens to identify themselves with the government. Similarly, governments need the means to authenticate individuals based on identity proof. Historically, paper-based systems and physical documentation such as national identity cards, voter cards, and birth certificates issued by the government have served these purposes. However, with the digital transformation, the forms of identification also need to change. Advances in identification technologies have provided the opportunity to migrate paper-based systems to digital identity mechanisms.

Digital identity may be defined as "the digital representation of an entity detailed enough to make the entity (individual or organization) distinguishable within a digital context[202]." The digital identity is based on a specific attribute of the individual. It could be

- Birth-related information (name, place of birth, date of birth, etc.),
- Descriptive information (height, weight, physical traits, etc.),
- Personal identifiers (e.g., social security number),
- Biometric data (fingerprint, DNA, iris scan, etc.)

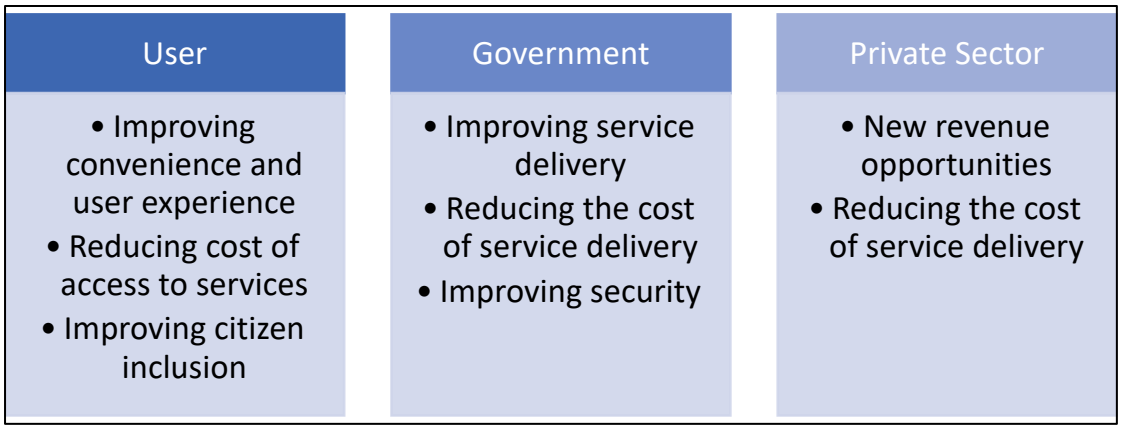
Digital identity systems, if well implemented, can benefit the users, governments, and the private sector[203]. Digital Identity improves the convenience and user experience by removing some of the barriers that make public service complex and hard to access for some users. Users do not have to remember different usernames and passwords for each of their services, easing the authentication with service providers. A digital identity system can also help reduce the amount of paper documentation required.

[202] 'Digital Identity Roadmap Guide' <https://www.itu.int/pub/D-STR-DIGITAL.01-2018> [accessed 12 November 2020].
[203] 'Digital Identity Roadmap Guide'.

Further, people who might not be able to obtain identity documents will be able to participate fully in their communities despite a lack of physical documentation.

A well-designed digital identity system can also help the government deliver its services to less accessible areas and populations. It also helps in reducing leakages by weeding out duplicate and "ghost" beneficiaries in databases. It also reduces the amount of paperwork required in processing and storing applications.

Figure 28. Different Stakeholders in the Digital Identity System



Digital identity can also increase the level of national security. It can serve as a powerful tool for policing and criminal prosecution and significantly increase the effectiveness of combating certain specific crimes (such as identity fraud, tax fraud, etc.). Digital ID systems also help the private sector to develop an innovative revenue stream. It helps in improving their productivity by reducing the amount of paperwork required.

Due to these advantages, Digital ID systems have been widely adopted in many countries, including India, Estonia, Canada, and Australia. Many other countries are in the process of adopting Digital ID systems. However, the design of each of these systems varies widely.

Notwithstanding the various benefits of a Digital ID system, it also poses many risks, some of which include:

1. A centralized Digital ID system has a single point of failure, and it risks joining together data sets that are best kept separate.
2. Non-restorability: When a biometric authentication mechanism is used, it poses high-security risk. Given the unique and singular nature of biometric information, biometric leaks may be irreversible.
3. Surveillance: The authentication mechanism of certain national digital ID systems allows for creating and storing authentication logs. Such metadata, especially done at a scale and over a long time, can be a tool for pervasive profiling and surveillance

To address these concerns, the following best practices must be followed[204]:

1. A digital identity system must be backed by legislation.
2. All the purposes for the use of Digital ID thus must correspond to a legitimate aim identified in the valid law. The legitimate aim could be national security, public safety, or the country's economic well-being, the prevention of disorder or crime, the protection of health or morals, or the protection of others' rights and freedoms. However, the legitimate aim must be clearly specified.
3. The law must specify the actors and the purposes that would flow from the legitimate aim.
4. The law must provide adequate redressal mechanisms against actors who use the Digital ID and govern its use.
    a. Individuals must be notified or at least be able to access information on when their Digital ID is used in any way
    b. Individuals must have the right to access personally identifiable information collected using Digital ID and must be able to seek corrections, amendments, or deletion of such information where it is inaccurate.
    c. A Digital ID law should have a well-designed grievance redress framework that addresses concerns of accountability, transparency, and user-friendliness.
    d. Individuals must be entitled to a fair and public hearing within a reasonable time by an independent, competent, and impartial judicial authority established by law in cases where provisions of law governing the Digital ID are violated.
5. The laws governing Digital ID must provide for systems of accountability for the bodies that implement and operate the Digital ID, regulators, public and private actors that use Digital ID in any way, and other enabling or supporting actors.
6. There must be clear limitations on what data may be collected, how it may be processed, and how long it is retained during Digital ID use.
7. There must be protections to limit access to the digital trail of personally identifiable information created using Digital ID by state and private actors.
8. There must be adequate mechanisms to ensure that the adoption of Digital ID does not lead to exclusion or restriction of access to entitlements or services (see Box 38).

[204] 'Governing ID: A Framework for Evaluation of Digital Identity — The Centre for Internet and Society' <https://cis-india.org/internet-governance/blog/governing-id-a-framework-for-evaluation-of-digital-identity
[accessed 12 November 2020].

BOX 38. Modular and Open Source Identity Platform (MOSIP)

MOSIP is a modular and open-source identity platform that helps user organisations such as Governments implement a digital, foundational ID in a cost-effective way, while embracing the best practices of scalability, security and privacy harnessing the power of open source.

When building their national foundational ID systems, countries face some common challenges. These include:

- Ensuring uniqueness in the system,
- Lack of interoperability among available solutions,
- Ensuring privacy by design,
- Reaching scale,
- Avoiding vendor lock-in,
- Maintaining affordability, and so on.

MOSIP is being built to address these challenges. Being modular in its architecture, MOSIP provides lot of flexibility in how they implement and configure their foundation ID system. It is a unique, universal, and progressive digital identity system which is also an open-source platform that nations can reuse freely and build their own identity systems. MOSIP has the following key features:

- Platform Approach
    - Open Source
    - Security and Privacy as key principles
    - Vendor neutral and standards compliant
- System Integration
    - Designed for easy integration
    - - Configuration based approach
    - - Rollout by System Integrator
- Multiple Use Cases
    - - Foundational
    - - Functional

Source: 'Open Source Platform - National Foundational Id - MOSIP' <https://www.mosip.io/index.php> [accessed 2 April 2021].

5.4 Key points

- Some of the emerging trends in digital government include artificial intelligence, data governance and digital identity systems.
- Artificial intelligence systems are being adopted by governments to improve the effectiveness of policymaking and service delivery. However, the use of AI systems might dilute the values of effectiveness, inclusiveness, and accountability.
- There is a need for ethical, human-centered, trustworthy AI.
- Digital data is a highly valuable resource in the digital economy. The whole-of-economy approach extends the flow of data and services between government and private players through data registries and APIs.
- While digital data flows can contribute to innovation and economic growth, it must be based on data governance frameworks with strong legislation to prevent the misuse of personal data. EU's GDPR serves as a useful guide in this respect.
- Data governance framework must also address concerns around non-personal data. Governments often allow public access to government-held non-personal data through open data initiatives. However, non-personal data held by the private sector must also be regulated to ensure a level-playing field in the data economy and improve competitiveness.
- A digital identity system, if well implemented, can benefit the users, governments, and the private sector. It allows users to identify themselves in the digital ecosystem.
- However, digital identity systems need to have a sound governance framework to address concerns of privacy and surveillance.

6. Digital government reforms: the way forward

We began this module by discussing how digital technologies are now entrenched into our everyday life. Governments are increasingly using digital technologies to improve governance in different areas such as health, education, livelihood, public order, finance, business regulation, tax collection, etc. However, not all Digital Government applications are successful. To understand the barriers to using digital technologies by the government, we reviewed the key assumptions of governance (Chapter 1) and the assumptions on digital technology (Chapter 2). We argued that the values of inclusiveness, accountability, and effectiveness should shape the digital government strategy. These values form the emerging consensus of the global community as articulated in the Sustainable Development Goals.

In Chapter 2, we discussed the assumptions on technology. We argued two predominant fallacies – that technology will automatically lead to better outcomes (technological determinism) and that technology is neutral (tool view). Against these faulty assumptions, we argued for the social shaping of the technology approach, especially in addressing governance challenges that are "complex" and "wicked." Thus, the plurality of views needs to be central to digital technology design. Moreover, we argued for the need to use emerging best practices such as "design thinking," "agile methodologies, and a user-centered approach.

The digital government must not use piecemeal approaches but must be guided through a long-term digital government strategy. In Chapter 3, we discussed the three main components of such as digital government strategy – infrastructure, digital services, and human and institutional capacities. These components of a digital government strategy are now being driven by an overarching "whole-of-government" and "collaborative government" approach.

We further discussed the implementation processes of a digital government strategy in Chapter 4. These include different phases, such as planning, procurement, implementation, deployment, and evaluation. The traditional approach of phased development is challenged by certain newly emerging approaches such as an agile approach to project development, user-centered design practices, and cloud storage and computation services. We discussed these emerging approaches in some detail.

Digital governments are no longer about passive adoption of digital technologies by government, but about keeping pace with technological innovation and often shaping them. The digital government also requires a safe, secure, inclusive, and citizen-centric digital ecosystem, consistent with the Sustainable Development Goals.

We earlier discussed the limitations of technological determinism and the need for the social shaping of technology approach to digital government. Technology design is not value-free and might not automatically lead to better governance. Instead, governance values of inclusiveness, effectiveness, and accountability must be actively embedded within technology design. Further, governments need to move away from the piecemeal implementation of digital government projects and adopt a “whole-of-

government" and "collaborative government" approach. Thus, there is a need for an overarching digital government strategy focusing on digital infrastructure, digital government services, and human and organizational capacity-building. Such a strategy must also focus on regulatory aspects, including privacy and cybersecurity. Further, while implementing digital government projects, governments must, where appropriate, adopt emerging practices such as agile methodology, cloud technology, digital marketplace, human/user-centric design.

We also discussed some of the emerging technological trends relevant to digital governments – artificial intelligence, data governance, and digital identity. We also discussed the evolving policy challenges and the need to regulate them.

These discussions highlight the dynamic nature of the field of digital government. They also highlight how digital government is as much about governance as it is about technology. We discuss below a few aspects that governments should be cognizant of to realize the promises of digital technologies while also proactively responding to some of the challenges. Digital government strategies and practices must also be adequately contextualized to reflect the specificities of a country's socio-economic situation and historical contexts.

6.1 Governments must focus on in-house capacity building

The competitive nature of markets contributes to innovation in the private sector. Thus, it is not surprising that much of digital innovation happens outside the government, leading to more efficient and effective customer-interaction methods. However, as the discussions in the previous chapters make it clear, the use of digital technology must be grounded in concerns of governance, including in the values of inclusiveness, effectiveness, and accountability. Thus, the nature of the relationship between citizens and the government is very distinct from that of a customer and a service provider.

Therefore, governments must make long-term investments in building their capacity to grapple with the complex landscape of digital government. While digital technologies might continue to be procured from the private sector, governments need to ensure that the digital government applications are citizen-centric, reflecting democratic values. Capacity-building, however, must be construed in its broadest sense to include a wide range of actors and diverse knowledge from multiple disciplines.

6.2 Capacity building must be not just technical but socio-technical

Governments need capacities to understand emerging (frontier) technologies such as artificial intelligence and blockchains. Such technological capacities will help them make appropriate choices in the design of digital government applications. However, as discussed in Chapter 2, technology and society are mutually embedded. Thus, for instance, public Wi-Fi systems might not be truly "public" due to the gendered nature

of public spaces. Similarly, an Artificial Intelligence system, while enhancing efficiency, might be opaque and discriminatory.

Understanding the “wicked” nature of governance challenges and the socio-technical nature of digital technologies, governments need to build their capacities and knowledge base, as the digital government requires more than technological capacities.

6.3 Collaborative knowledge production

If the digital government must contribute to good governance, it requires governments’ sustained partnerships within and outside the government. Traditionally, knowledge production has been fragmented between various entities such as:

- Citizen and government
- Policymakers and policy implementers
- Higher bureaucracy and front-line officials
- Academia, government, and industry

Such a fragmented approach is a recipe for failure. If digital governments are to succeed, a multi-stakeholder approach where all these stakeholders are mutually collaborating with each other is mandatory.

6.4 Multidisciplinary research and diversity in project teams

As a body of knowledge, digital government spans multiple disciplines, including computer science, public policy, public administration, law, design science, and public finance. Governments need to encourage multidisciplinary teams to collaborate to generate a comprehensive perspective on digital government challenges. For instance, concerns around privacy are not merely technical but also legal. Similarly, non-personal data regulation, which is a key asset in the digital economy, requires perspectives from economics, law, and technology.

Digital government research and practice can also benefit from a few emerging interdisciplinary fields such as –

- ICT for/and Development / Human-Computer Interaction and Development
- Information Systems
- Digital Sociology
- Critical Data/Information Studies
- Civic Technologies

For instance, the European Union’s Joint Research Centre (JRC) employs scientists to conduct research to provide independent scientific advice and support to EU

policy[205]. JRC plays a central role in creating, managing, and making sense of collective scientific knowledge for better European Union policies. JRC has provided key insights through its digital government research, which informs the European Union's policies and strategies on digital government transformation.

Research insights from diverse disciplines and knowledge domains are thus indispensable to digital government. It is equally critical to ensure that the research and policymaking on digital government involve perspectives from people within diverse social groups.

Women are often underrepresented in research in general and Science, Technology, Engineering, and Mathematics (STEM) research and education in particular. While women make up almost half the world population, globally, only an estimated 30 per cent of researchers in science, technology and innovation are female[206]. Women encounter cultural constraints and discrimination throughout their lives, discouraging them from aspiring to careers and leadership in STEM[207].

For digital government policies to be gender-sensitive, it is very important to ensure that the gender parity within the digital government policymaking and implementations is ensured. Equally, it is important to ensure that the professionals from traditionally ethnic, linguistic, or religious underrepresented social groups are included and given voice in shaping digital government research and practice.

6.5 Regulation and international cooperation

The digital government must also concern itself with evolving a fair and transparent regulatory mechanism backed by appropriate legal frameworks. Some of the emerging areas of regulation include:

- Privacy and personal data protection
- Competition laws in the digital economy
- Digital taxation
- Intellectual Property
- Cybersecurity

However, some of the challenges of digital government are global, and the solutions need to be global as well. Many examples of digital and global cooperation are already emerging, for instance AP-IS cooperation on connectivity (Box 14), and regional cooperation on cybersecurity in the form of Computer Emergency Response Teams (APCERT, Box 21) The United Nations Secretary-General's High-level Panel on

[205] FPFIS team, 'The Joint Research Centre Science and knowledge management at the service of Europe's citizens', *EU Science Hub - European Commission*, 2012 <https://ec.europa.eu/jrc/en/about/jrc-in-brief> [accessed 14 November 2020].
[206] https://bangkok.unesco.org/content/10-facts-about-girls-and-women-stem-asia
[207] USAID, *APEC Women in STEM*, 2016.

Digital Cooperation [208] highlights among others, three areas requiring digital cooperation – digital economy, human rights, and cybercrime (see Box 39).

1. **Digital Economy:** Taxation, trade, consumer protection, and competition are among the areas of economic policy that require new thinking in the digital age: They are the 'guard rails' of the digital economy. Increased cooperation could lead to effective national approaches and experience informing regional and global multilateral cooperation arrangements.
2. **Human rights:** There is an urgent need to examine how time-honored human rights frameworks and conventions – and the obligations that flow from those commitments – can guide actions and policies relating to digital cooperation and digital technology.
3. **Cybercrime:** The pace of cyber-attacks is quickening. Currently, fragmented efforts need rapidly to coalesce into a comprehensive set of common principles to align action and facilitate cooperation that raises the costs for malicious actors.

BOX 39. Declaration of digital interdependence

Humanity is still in the foothills of the digital age.

The peaks are yet uncharted, and their promise still untold. But the risks of losing our foothold are apparent: dangerous adventurism among states, exploitative behaviour by companies, regulation that stifles innovation and trade, and an unforgivable failure to realise vast potential for advancing human development.

How we manage the opportunities and risks of rapid technological change will profoundly impact our future and the future of the planet.

We believe that our aspirations and vulnerabilities are deeply interconnected and interdependent; that no individual, institution, corporation or government alone can or should manage digital developments; and that it is essential that we work through our differences in order to shape our common digital future.

We declare our commitment to building on our shared values and collaborating in new ways to realise a vision of humanity's future in which affordable and accessible digital technologies are used to enable economic growth and social opportunity, lessen inequality, enhance peace and security, promote environmental sustainability, preserve human agency, advance human rights and meet human needs.

Source: UN Secretary-General's High-level Panel on Digital Cooperation

[208] 'Secretary-General's High-Level Panel on Digital Cooperation', 2018 <https://www.un.org/en/digital-cooperation-panel/> [accessed 1 April 2021].

6.6 Key Points

- Governments need to rethink their capacity-building efforts to address these emerging opportunities and challenges.

- Governments need to strengthen their in-house capacities to ensure that democratic values are embedded in their digital government initiatives.

- Capacity-building should focus on socio-technical competencies to address the “wicked” problems of governance.

- Governments must invest in collaborative knowledge production with a diverse set of actors such as academia, industry, different tiers of government, and citizens.

- Such research should be multidisciplinary as the challenges of digital government span across different domains.

- Government must strengthen its regulatory role based on a sound legal framework for digital government.

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