GOVERNANCE

GovTech Maturity Index: The State of Public Sector Digital Transformation

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Preface

The World Bank Group's Development Committee Paper on "Disruptive Technologies and the World Bank Group – Creating Opportunities – Mitigating Risks" (prepared for the October 2018 Development Committee Meeting) acknowledged that fast-diffusing technologies are converging to disrupt traditional development pathways, and that economic and societal transformations brought about by disruptive technologies can dramatically accelerate progress toward the Sustainable Development Goals and the twin goals of the World Bank Group (WBG) – ending extreme poverty and boosting shared prosperity. It stated, amongst other things, the World Bank Group's commitment to providing technical and financial support to enable client countries to harness the benefits of technological advancement and use technologies to deliver services to citizens. The launch of the World Bank's GovTech Partnership Initiative in 2019 was part of this agenda to help clients harness technology for development.

So, what is GovTech? It is a whole-of-government approach to public sector modernization that promotes simple, efficient, and transparent government with the citizen at the center of reforms. The GovTech Initiative provides support to client countries on how to design and/or implement digital transformation solutions in the public sector. As part of our efforts to attain our twin goals, the WBG provides substantial financial and technical assistance to developing countries all over the globe for the implementation of GovTech solutions. As the demand for GovTech solutions grows, so has our portfolio of GovTech investments which support the modernization and integration of government systems such as financial and human resource management information systems, public procurement portals, and public investment management systems, as well as the enhancement and digitization of public services and government-citizens interactions.

The GovTech Maturity Index (GTMI) presented in this report has been developed as part of our GovTech Initiative. The rationale for the GTMI is to introduce a measure of GovTech maturity in four focus areas – core government systems, service delivery, citizen engagement, and GovTech enablers. This Index is the most comprehensive measure of digital transformation in the public sector and has been constructed for 198 economies using consistent data sources.

The key findings are delineated in several categories to highlight: the important characteristics of the GovTech focal areas; the existence or lack thereof of an enabling environment to foster the implementation of GovTech solutions; the relationship between the GTMI and existing GovTech indices; and best practices from around the world.

This is a crucial time for GovTech. The onset of the COVID-19 pandemic has laid bare both the need and urgency for some client countries to quickly develop the ability to use foundational and frontier digital technologies to transform how they operate and deliver services. The GTMI, I believe, will serve as an important tool to help client countries

understand where they are on their GovTech maturity trajectory, areas they could focus on to advance, and help policy makers and their advisers make informed decisions on how to tackle the specific country constraints to advancing public sector modernization using technology.

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Acknowledgments

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Abbreviations

AFR	Africa Region
AI	Artificial Intelligence
API	Application Program Interface
CAF	Corporacion Andina de Fomento/Development Bank of Latin America
CEI	Citizen Engagement Index
CGSI	Core Government Systems Index
CSO	Civil Society Organizations
DAI	Digital Adoption Index
DCE	Digital Citizen Engagement
DG	Digital Government
DGRA	Digital Government Rapid Assessment (toolkit)
DGSS	Digital Government/GovTech Systems and Services (GovTech dataset)
EAP	East Asia and Pacific Region
ECA	Europe and Central Asia Region
e-Gov	Electronic Government (e-Government)
EGDI	E-Government Development Index
EPI	E-Participation Index
FMIS	Financial management information system(s)
GEA	Government Enterprise Architecture
GGP	Governance Global Practice
GIF	Government Interoperability Framework
GSB	Government Service Bus
GTE	GTMI calculated by using weights based on expert opinion
GTEI	GovTech Enablers Index
GTMI	GovTech Maturity Index
HIC	High-income country
IoT	Internet of Things
ICT	Information and communication technology
ID4D	Identification for Development
LCR	Latin America and Caribbean Region
LIC	Low-income country
LMIC	Lower-middle-income country
MIC	Middle-income country
MNA	Middle East and North Africa Region
OECD	Organization for Economic Cooperation and Development
OSI	Online Service Index
OSS	Open source software
PFM	Public financial management
PSDI	Public Service Delivery Index
SAR	South Asia Region
TII	Telecommunication Infrastructure Index

UMIC	Upper-middle-income country
WBG	World Bank Group
WCAG	Web Content Accessibility Guidelines
WDR	World Development Report
WGI	Worldwide Governance Indicators
WWW	World Wide Web

Executive Summary

GovTech Maturity Index Report:

The State of Public Sector Digital Transformation

GovTech has great potential to improve core government systems and enhance citizen-centric services and citizen engagement to deliver on the promises of the digital age. However, turning the promises of digital solutions into tangible, measurable, and consistent outcomes remains a challenge in most countries. Governments must ensure that the appropriate enabling environment exists to facilitate digital transformation while also adapting to changing societal demands that stem from digital advancements and other phenomena such as the coronavirus pandemic.

Although existing digital government surveys and indices are very useful to monitor progress in digital government initiatives and good practices in general, currently, no single index captures progress in all key GovTech areas based on a reliable global dataset. The GovTech Maturity Index addresses this gap. GovTech is a whole-of-government approach to public sector modernization that promotes simple, efficient and transparent government with the citizen at the center of reforms.

The GovTech Maturity Index (GTMI) measures the key aspects of *four GovTech focus areas:* supporting core government systems, enhancing service delivery, mainstreaming citizen engagement, and GovTech enablers, based on the World Bank's definition of GovTech, and assists practitioners in the design of new digital transformation projects.

The development of the GTMI was guided by the following key questions:

1. Which key indicators can be used to measure the important characteristics of the four GovTech focus areas?
2. Is there any reliable data to measure the specific aspects of the four GovTech focus areas?
3. How does the GTMI correlate with relevant digital government and GovTech indices?
4. Are there good practice examples that demonstrate the maturity of GovTech focus areas?
5. How can the conclusions and recommendations based on the GTMI assist practitioners and policymakers involved in designing and implementing GovTech solutions?

The target audience of the GTMI report is government officials (policymakers and technical specialists), World Bank task teams, and other practitioners involved in the design and implementation of GovTech solutions.

The approach of this study is informed by:

- Several decades of experience in the development of digital government solutions globally.
- Availability of reliable global datasets (developed and expanded since 2014) to present the state of digital government in 198 economies.
- Growing demand from citizens for improved online service delivery, transparency, accountability, and participation.
- Widespread use of the Internet and new/disruptive technologies for transforming the public sector.

Methodology

The GTMI is a composite index based on 48 key indicators defined to collect data from 198 economies in four categories: the Core Government Systems Index (CGSI) based on 15 indicators; the Public Service Delivery Index (PSDI) based on six composite indicators; the Citizen Engagement Index (CEI) based on 12 indicators; and the GovTech Enablers Index (GTEI) based on 15 indicators. The GTEI measures the presence of several cross-cutting enablers relevant to advancing GovTech; however, it does not quantify their effectiveness or performance.[1] The key indicators of the GTMI are explained in Table 2.1 and Appendix A.

In order to find the best fit for the calculation of the key component indices, four index construction options were examined: no weights; weights based on expert opinion; weights based on correlation analysis; and weights based on factor analysis. The GTMI scores were calculated by using "weights based on expert opinion" for data analysis, since this approach was found to be the best fit to measure the maturity of four GovTech focus areas consistently. All 198 economies are grouped from A (GovTech leaders) to D (minimal focus on GovTech) based on their GTMI score.

Based on the comparative analyses with relevant indices, it can be concluded that the indicators defined for the GTMI produce consistent results when compared to other relevant indicators of GovTech and measure the less known dimensions related to GovTech foundations adequately.

The construction of the GTMI is primarily based on the World Bank's GovTech dataset.[2] The dataset presents comprehensive information collected from the government websites of 198 economies about the maturity of GovTech focus areas from two perspectives: (i) an international outlook based on the data available on 198 economies; and (ii) a regional outlook based on a subset of data with a focus on 168 WBG client countries benefiting from financial and technical assistance**.** Other datasets used in the construction of the GTMI include the 2020 UN e-Government Survey, the 2018 Identification for Development (ID4D) dataset and the 2019 Worldwide Governance Indicators (WGI). The GovTech dataset contains the evidence collected for 42 GovTech key indicators defined by the Bank team and the six additional key indicators extracted from other relevant datasets.

[1] The meaning of *enablers* in this context may be different from the use of enablers and foundations in other World Bank reports or tools, including World Development Reports and the Digital Government Readiness Assessment, and any other use of the term enabler within the GovTech context.

[2] The Digital Government/GovTech Systems and Services (DGSS), hereinafter called the "GovTech dataset."

Main Findings

The GTMI results revealed that there is growing interest in GovTech initiatives around the world. Government entities leading the GovTech agenda exist in 80 economies out of 198 reviewed, and mature digital government and good practices are highly visible in 43 economies.

Key findings include:

- **Focus on GovTech:** Despite increasing investments in ICT infrastructure and the availability of Digital Government (DG)/GovTech institutions and strategy/policy documents, the maturity of GovTech foundations is lower than expected in most countries.
- **Visibility of results:** Investments in GovTech initiatives and results achieved as well as challenges are not documented and reported transparently by most governments.
- **Core government systems:** Most countries already have developed core government systems such as back- and front-office solutions, online service portals, and open data platforms, but these systems are often fragmented and disconnected. There is room to improve interconnectivity, data exchange, and interoperability in most countries.
- **Shared platforms and standards:** There is growing interest in many countries in developing shared GovTech platforms such as cloud-based solutions, unified mobile apps, and a government service bus, to support operational and service delivery requirements of public entities and preferences of citizens.
- **Online services:** Integrated national portals are available in many countries to enable online service delivery. However, two-way information flow between government and citizens/businesses, universally accessible user-centric transactional services supported by mobile apps, and quality of service metrics are visible in only a limited number of countries – mainly in Groups A and B.
- **Digital citizen engagement:** The governments and civil society organizations (CSOs) have launched various technology solutions to improve digital citizen engagement (DCE), but it is difficult to find information about the impact of these tools, and government disclosures of service quality standards are not readily available. Also, multifunctional citizen participation portals that provide capabilities to submit a petition, publish citizen's inputs, allow the provision of anonymous feedback, or post the government's response are visible only in a relatively small group of countries.
- **GovTech enablers:** Most of the digital government strategies and action plans approved within the last five years include the establishment of enabling and safeguarding institutions to support the GovTech agenda, with more focus on a whole-of-government approach, data-driven public sector, digital skill development, and innovation labs.
- **Disruptive technologies:** The potential of new and disruptive technologies has been recognized and used by some high- and middle-income countries. National strategies/plans for artificial intelligence, blockchain and other emerging technologies

are visible, and some GovTech government leaders are already using these solutions in various sectors.

The findings and good practice cases presented in this study demonstrate that the GovTech focus areas identified by the WBG are highly relevant to the digital transformation agendas in most countries.

Key messages

- **Commitment at high government levels and the allocation of necessary resources are crucial for the sustainability of GovTech initiatives**.
- **Large-scale GovTech challenges are more visible in the Africa and South Asia regions** and more substantial resources are needed to address the digital divide, infrastructure, and governance issues compared to other regions.
- **Countries could focus more on improving the interconnectivity and interoperability of existing systems and portals**, benefiting from government cloud, service bus, and Application Program Interfaces (APIs) as cost-effective shared platforms in future GovTech initiatives.
- **Next-generation online service portals could expand transactional services** to save substantial time, reduce cost, and improve the quality of services for citizens and businesses.
- **GovTech initiatives could focus more on multifunction citizen participation platforms** to deepen the citizen-government relationship through effective CivicTech[3] solutions, improve accountability, and build public trust in government.
- **Further investments in digital skill development and innovation in the public sector** are crucial to supporting the transition to data-driven culture and building strong technical skills.
- **Governments could promote the use of public data to create added economic value** by establishing public data platforms that individuals and firms can access. Government and other players in the public policy-making process can also harness the data for better evidence-based policies and program adaptation.
- **The *World Development Report (WDR) 2021: Data for Better Lives* highlights the importance of data governance which is highly relevant to the GovTech agenda.** The report puts forward five high-level recommendations: (i) forge a new social contract for data that (ii) increases data use and reuse to realize greater value; (iii) creates more equitable access to the benefits of data; (iv) fosters trust through safeguards that protect people from the harm of data misuse; and (v) paves the way for an integrated national data system.

[3] CivicTech broadly relates to ICT-based technologies that enhance engagement, participation, and the relationship between citizens and government.

- **Governments could increase citizen trust in data-driven societies and promote GovTech more effectively** by adopting solid legal frameworks and establishing strong agencies for data protection.
- **Interconnectivity between traditional and new (digital) data is necessary to advance digital transformation**.
- **Governments could better promote the development of local GovTech ecosystems** by supporting local entrepreneurs and start-ups to develop new products and services.
- **The use of frontier and disruptive digital technologies can greatly improve core government operations and online service delivery**. For example, using AI and Big Data, government agencies can mine data to offer predictive and customized services to citizens and businesses.
- **Future GovTech initiatives could also consider six dimensions that characterize a fully digital government:**[4] (i) digital by design; (ii) data-driven public sector; (iii) government as a platform; (iv) open by default; (v) user-driven; (vi) proactiveness. These important aspects are defined in detail in the Digital Government Policy Framework (DGPF) of the Organization for Economic Cooperation and Development (OECD) published in October 2020.

The coronavirus pandemic has shed light on how critical GovTech solutions can be in difficult times to ensure the continuity of core government operations, secure remote access to online services, and support vulnerable people and businesses. Governments should allocate the necessary resources to improve the maturity of digital government during the COVID-19 recovery and resilience phase and adapt to the "new normal" through effective partnerships with all stakeholders.

This study is divided into five chapters. Chapter 1 presents the rationale and aims of the study, and definitions used, along with a summary of relevant digital government indices. Chapter 2 explains the methodology used to identify the important aspects of four GovTech focus areas, including the key indicators, and the weight calculations, and the scoring scheme. Chapter 3 presents the key aspects of government practices in the GovTech domain, together with the key findings of the study and some of the good practices visible in four GovTech focus areas. Chapter 4 summarizes the conclusions of this study. Appendixes A-E present the details of key indicators, the description of the GovTech dataset, results based on selected key indicators, and weight calculation options. The GovTech references are presented at the end of the study.

[4] OECD Digital Government Policy Framework (DGPF); October 2020

Chapter 1. Introduction

Governments have been using technology to modernize the public sector for decades. The World Bank Group (WBG) has been a partner providing both financing and technical support to support countries' digital transformation journeys since the 1980s. The WBG launched the GovTech Initiative in 2019 to support the latest generation of these reforms.[5] Over the last five years, developing countries have more frequently been requesting WBG support to design more advanced digital transformation programs to increase government efficiency and quality of service delivery, improve government-citizen communication, reduce corruption, improve governance and oversight, and modernize core government operations.[6] The Bank's GovTech Initiative appropriately responds to this growing demand.

The GovTech Initiative is a collaborative effort to modernize the public sector, leveraging digital advances. It is led by the Governance Global Practice (GGP) in partnership with other Global Practices, including Digital Development, Finance, Competitiveness and Investment, and other sectoral practices such as Health, Nutrition and Population, Education, and Energy, through a whole-of-World Bank approach.

The GovTech Maturity Index (GTMI) measures the key aspects of *four GovTech focus areas:* supporting core government systems, enhancing service delivery, mainstreaming citizen engagement and GovTech enablers for public sector modernization, and aims to assists practitioners in the design of new digital transformation projects.

While several indices and indicators are available in the public domain to measure the specific aspects of digital government, including the United Nations (UN) e-Government Development Index, the WBG's Digital Adoption Index, and the OECD Digital Government Index, these indices do not fully capture key indicators related to the four focus areas of GovTech to assess the maturity of digital transformation in the public sector. Thus, governments assessing their GovTech based on existing indices may overlook some of the critical focus areas and miss the opportunity to develop robust GovTech solutions. Hence, there is a need to create a comprehensive GovTech indicator to measure GovTech maturity in countries, covering systems, strategies, interoperability, and other aspects that are not covered in the existing global datasets.

The GTMI is not intended to be an assessment of readiness or performance of GovTech in a country; rather, it is intended to be used to complement existing tools and diagnostics by providing a baseline and benchmark for GovTech maturity and identifying areas for improvement. The Index is designed to be used by practitioners, policymakers, and task teams involved in the design of digital transformation projects, and by client countries to identify possible improvements in the four focus areas of GovTech.

[5] For more information on the GovTech approach, see the Launch Report and the Guidance Note 1, *GovTech: The New Frontier*.

[6] The use of the term government refers mainly to the executive body of the state.

This study also addresses several key questions, including:

1. Which key indicators can be used to measure the important characteristics of the four GovTech focus areas?
2. Is there visible evidence on government websites to measure the state of four GovTech focus areas?
3. How does the GTMI correlate with relevant digital government indices?
4. Are there good practice examples that demonstrate the maturity of GovTech focus areas?
5. What are the conclusions and recommendations based on the GTMI to assist practitioners and policymakers involved in digital transformation initiatives and GovTech solutions?

The findings of this study were shared with relevant specialists within the Bank to validate the evidence collected, reflect other perspectives, and improve the accuracy of observations. The coronavirus pandemic which emerged in early 2020, created a difficulty in receiving detailed inputs from government officials involved in GovTech initiatives. However, the GovTech dataset and this Report will be publicly available, and comments from government officials involved in GovTech initiatives will be requested through the GovTech website and other channels to reflect developments and update relevant parts of the dataset and GTMI components, as necessary.

What is GovTech?

GovTech is a whole-of-government approach to public sector modernization that promotes simple, efficient, and transparent government with the citizen at the center of reforms.

The GovTech approach represents the current frontier of government digital transformation as presented in Figure 1.1. It is distinct from previous phases, as it emphasizes three aspects of public sector modernization:

- Citizen-centric public services[7] that are universally accessible.[8]
- A whole-of-government approach[9] to public sector digital transformation.
- Simple, efficient, and transparent government systems.

The GovTech agenda also encompasses the effective use of disruptive technologies, including: artificial intelligence and machine learning, cloud computing, the Internet of Things (IoT); public data platforms facilitating the use of open public data by individuals and firms to create value; local GovTech ecosystems supporting local entrepreneurs and start-ups to develop new products and services for government; and greater use of public-private

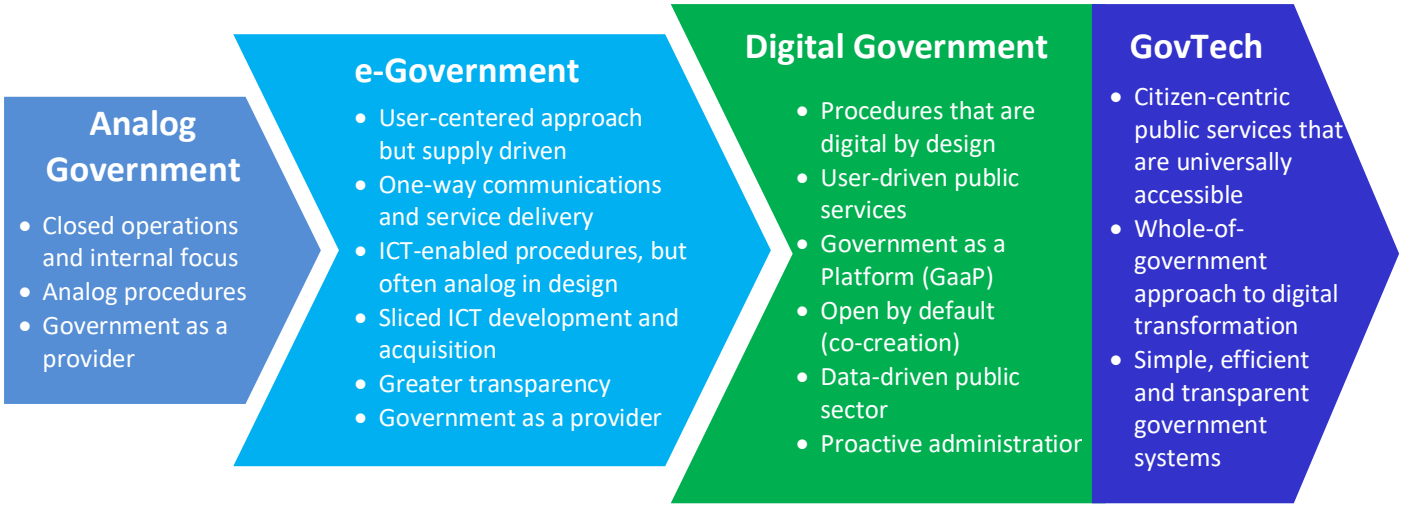
[7] Citizen-centric (or human-centered) public services incorporate citizens' needs and concerns at every stage of the service design and delivery by interacting and communicating with the people involved.

[8] Universal accessibility enables people with disabilities and vulnerable groups to gain access to all services and participate fully in all aspects of life in an inclusive society.

[9] The whole-of-government approach emphasizes integration in terms of joint activities, plans, and platforms across governmental units instead of fragmentation and departmentalism. GovTech envisions a whole-of-government approach with interoperable government systems, seamlessly connected e-service solutions, and citizen service centers providing access to all public services to foster easily accessible, efficient, and transparent government with the citizen at the center of reforms.

partnerships to draw upon private sector skills, innovations, and investments to address public sector challenges.

Figure 1.1: Digital Transformation of the Public Sector



Source: World Bank, based on the OECD's presentation of digital transformation in Digital Government Studies (2019).[10]

GovTech Focus Areas

The WBG's vision of GovTech reflects an integrated approach to digital government and covers the following four focus areas, which are being implemented through different projects, assessments, and policy dialogue.

1. **Supporting core government systems**: There is growing demand for modernization and integration of government systems for strengthening the GovTech approach. For example, GGP is focused on better systems for public financial management, human resource management, tax administration, public procurement, and public investment management. These interventions also include the development of an overarching digital transformation strategy and a set of principles to foster effective use of digital platforms and data that are interoperable and secure, as part of the whole-of-government approach.

2. **Activities to enhance public service delivery**: The GovTech projects support the design of human-centered online services that are simple, transparent, and universally accessible. Special attention is paid to services that are accessible by low-cost digital solutions such as mobile phones and free open source applications, tailored to digital literacy and reaching all intended beneficiaries and users.

3. **Mainstreaming citizen engagement:** Developing and deploying CivicTech tools, including citizen feedback and complaint-handling mechanisms can be done in high and low connectivity countries, using simple technology and free open source applications. Activities focus on accountability tools such as service charters and service standards with enforcement and monitoring mechanisms, and the use of technology to advance governments' efforts for achieving greater transparency.

[10] OECD Digital Government Studies, Digital Government Review of Sweden: Towards a Data-driven Public Sector (2019).

4. **GovTech enablers:** These refer to the cross-cutting drivers of the digital transformation agenda such as digital skills in the public sector, an appropriate and conducive legal and regulatory regime, strong enabling and safeguarding institutions, and an environment that fosters innovation in the public sector. Effective regulations, improved technical skills, and accountable institutions are the *analog complements* of digital investments as highlighted in the World Development Report, WDR 2016. The key foundations of internet connectivity, robust identification systems, digital signature, and other important dimensions are also included in this component.

These focus areas are fully explained in Guidance Note 1: *GovTech: The New Frontier*

An Overview of Existing Digital Government Indices

Several digital government indices have been developed by international organizations, academia, and the private sector over the years to measure the state of play in digital government from different perspectives (see Table 1.1). They measure the state of online services, telecommunications infrastructure, human capital, citizen participation, research infrastructure, innovation, government regulations and institutions, and private sector involvement in GovTech programs in different ways. Several new indices emerged in 2020, including the OECD Digital Government Index and the CAF (Development Bank of Latin America) GovTech Index with a smaller geographic coverage to measure the progress in the adoption of digital government solutions, and the maturity of GovTech ecosystems, respectively.

Table 1.1: A Summary of Digital Government/GovTech Indices

#	Digital Government Surveys and Indices	# of economies	Launched	Last update
	WBG GovTech Maturity Index (new)	198	2020	2020
1	UN e-Government Development Index (EGDI)	193	2003	2020
2	Global Innovation Index (GII)/a	131	2007	2020
3	EU e-Government Benchmark	36	2012	2020
4	WBG Identification for Development (ID4D) Index	198	2015	2018
5	WBG Digital Adoption Index (DAI)	180	2016	2018
6	CAF GovTech Index (new)	16	2020	2020
7	OECD Digital Government Index (new)	33	2020	2020

Source: World Bank data.

Note: CAF = Development Bank of Latin America; EU = European Union; OECD = Organization for Economic Cooperation and Development; UN = United Nations; a/ Developed by Cornell University, INSEAD and the World Intellectual Property Organization (WIPO), a specialized agency of the United Nations.

These indices are summarized below:

1. The 2020 UN e-Government Development Index (EGDI) captures the scope and quality of government online services, the status of telecommunication infrastructure, and existing human capacity in 193 UN member states. It is updated every two years. One of the chapters of the EGDI report is dedicated to the capacity for digital transformation in the public sector, highlighting relevant GovTech initiatives using selected country cases.

2. The Global Innovation Index (GII), published jointly by Cornell University, Institut Européen d'Administration des Affairs (INSEAD), and the World Intellectual Property Organization (WIPO), examines the framework conditions and innovative capacity of 131

economies around the world. In its 13th edition released in 2020, the GII uses 80 indicators for its assessment and considers the effects of the coronavirus pandemic on innovation.

3. The EU's eGovernment Benchmark 2020 presents the improvements in digital delivery of public services according to the four benchmarks considered in the assessment: user centricity, transparency, key technology enablers, and cross-border mobility.

4. The WBG Identification for Development (ID4D) Index 2018 provides an estimate for the number of individuals without proof of legal identity in 198 economies and presents data on the entities responsible for identification and civil registration, the status of enabling legal and regulatory frameworks, and the digital ID solutions for identification and services.

5. The WBG Digital Adoption Index (DAI) measures the progress in digital adoption across three dimensions of the economy: people, government, and business. The index covers 180 economies on a 0–1 scale and emphasizes the "supply-side" of digital adoption to maximize coverage and simplify theoretical linkages. The overall DAI is the simple average of three sub-indexes. The Digital Government Systems and Services global dataset was used as an input to the calculation of the government sub-index on systems and services in the DAI. This index is updated every two years, and DAI 2020 is expected to be published in 2021.

6. The CAF, together with Oxford Insights, has published the first Ibero-American GovTech Index 2020 to measure the degree of maturity of GovTech ecosystems, the dynamism of tech-for-good startup markets, and the degree of innovation of public institutions.

7. The OECD's Digital Government Index (DGI) was first published in 2020 to translate the OECD's DGPF into a measurement tool to assess the implementation of the OECD's Recommendation on Digital Government Strategies. It covers 33 economies, comprising 29 OECD Member countries and 4 non-Member countries—Argentina, Brazil, Panama, and Uruguay. This index measures the maturity of digital government with a focus on six key aspects: digital by design; data-driven public sector; government as a platform; open by default; user-driven approach; and proactiveness.

The following databases and toolkits can also help in measuring the level of government's digital maturity:

The Open Government Partnership (OGP) database is another useful resource presenting the status of commitments from 99 countries on publishing open government data. Core eligibility metrics measure a government's performance across four key areas of open government: access to information, citizen engagement, fiscal transparency, and asset disclosure of public officials.

The World Bank's Digital Government Readiness Assessment (DGRA) toolkit can be used to assess a country's current status and aspirations in digital development and public sector transformation. It assesses a country's readiness with regards to its enabling environment, and can be used to track progress in its trajectory through repeat assessments to ensure that the legal, regulatory, human capital, technology, and safety aspects of government digitalization are addressed at any given time. The DGRA is currently being updated to include sections on COVID-19 resilience and remote work and business continuity. The tool

has proved useful in the policy dialogue with client countries in more than 15 countries and has been used by WBG task teams in project preparation since 2019.

The World Bank launched the Global Public Procurement Database (GPPD) in March 2020 as the first dataset dedicated to the collection of country-specific public procurement information from 218 countries and territories. The GPPD's objective is to meet the increasing demand, from both the public and the private sectors, for a comprehensive global knowledge product that captures data about country procurement systems and country eProcurement implementations at a global level. The GTMI includes a specific indicator measuring the presence of eProcurement platforms, and the GPPD can be used as a complementary dataset to further explore the details of country-specific platforms.

How is the GovTech Maturity Index Different?

Although existing digital government surveys and indices are useful to monitor the progress in digital government initiatives and good practices in general, none of them is assessing progress in all the four GovTech focus areas defined earlier. The GTMI addresses this gap.

The GTMI has four components covering each GovTech focus area: core government systems; public service delivery, citizen engagement, and GovTech enablers. The GTMI is not intended to create a ranking of countries. Instead, the Index measures a country's position on the GovTech trajectory by measuring progress in the four GovTech focus areas.

The Index is expected to assist practitioners in benchmarking countries to highlight gaps in terms of how far those countries are from the leaders at a specific time. The benchmarking approach used in GTMI is more informative than a ranking.

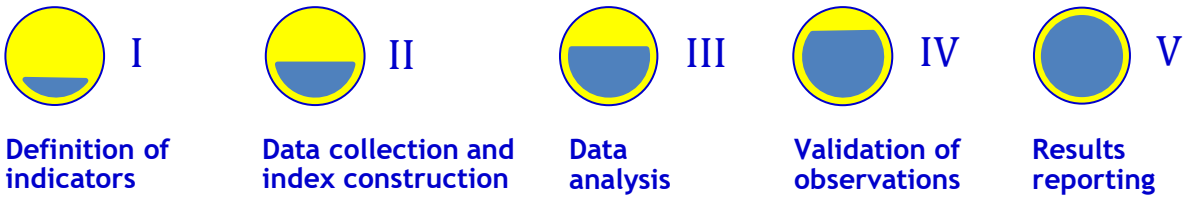
The GTMI draws upon an updated and expanded version of the WBG GovTech dataset[11] that includes 48 GovTech key indicators defined by the World Bank team, including six external indices – four key indicators extracted from the 2020 UN eGovernment Development Index and e-Participation Index, and two indicators from the 2018 Identification for Development dataset – to provide a composite GTMI.

The scope of the GovTech dataset will be expanded to capture other relevant dimensions in future versions. For instance, there was minimal information on government websites about the strength and effectiveness of data governance or GovTech institutional arrangements. However, related annual reports or assessments/audits may emerge in the coming years. As GovTech initiatives evolve, it may also be possible to expand the dataset to measure the effectiveness of GovTech institutions and/or services.

[11] GovTech dataset is available in the WBG Data Catalog as: Digital Government/GovTech Systems and Services (DGSS) dataset.

Chapter 2. Methodology

To measure and analyze key aspects of the four GovTech focus areas, a five-step approach was used:



Definition of Indicators

The first step was the identification of the key indicators, based on the *questions* the GTMI is addressing, for collecting data on the characteristics of the four GovTech focus areas. Specific metrics (*points*) were defined for each indicator to measure government practices in GovTech focus areas. The GTMI key indicators were determined by considering the coverage and quality of existing and new data in the WBG global datasets, and in consultation with the experts involved in GovTech activities. The indicators measure specific aspects of focus areas only at the central government level, given the limited availability of data at the subnational level. The data collected for key indicators are from publicly accessible sources – mostly websites of ministries and other relevant governmental bodies – that are comparable and available across 198 countries and can be tracked over time. While some indicators capture the operational status of existing activities, none captures outcomes. A list of 48 GTMI indicators used for the calculation of four component scores is presented in Table 2.1. The details of all 48 key indicators, relevant questions, and subcomponents are provided in Appendix A.

Future versions of the index may aim to cover subnational governments and showcase good practices, which sometimes may be more visible at the subnational levels in federal countries —for example, Brazil, India, Indonesia, Mexico, and U.S.A. Furthermore, outcome measures across 198 economies guided by the most recent literature will also be considered in future updates of the GovTech dataset and GTMI report.

The GTMI is the simple average of the normalized scores of four components[12] measuring the maturity of GovTech focus areas based on 48 key indicators, as explained below. The four GTMI components are complementary; improving one aspect of the GovTech focus areas complements the other parts.

[12] Four components of the GTMI are: CGSI = Core Government Systems Index; PSDI = Public Service Delivery Index; CEI = Citizen Engagement Index; GTEI = GovTech Enablers Index.

Core Government Systems Index (CGSI):

The CGSI is based on 15 key indicators measuring the key aspects of a whole-of-government approach, including government cloud, interoperability platforms, enterprise architecture, open source solutions and disruptive technologies, as well as the core government systems visible in most of the countries as captured in the latest version of WBG GovTech dataset. Additionally, the UN's composite Telecommunication Infrastructure Index (TII) is included as one of the key CGSI indicators to measure the state of other important dimensions. The TII is composed of four indicators: (i) estimated Internet users per 100 inhabitants; (ii) number of mobile subscribers per 100 inhabitants; (iii) active mobile-broadband subscription; and (iv) number of fixed broadband subscribers per 100 inhabitants.

Public Service Delivery Index (PSDI):

The PSDI is based on six composite indicators that measure the existence of national online service portals and the maturity of services – informational or transactional – as well as the online services of the revenue administrations. The UN Online Service Index (OSI)[13] is included in the PSDI, as it addresses many issues related to citizen-centric services and the accessibility of government websites. Although it was not possible to find relevant data on more advanced features such as human-centric services that are universally accessible, in most of the 198 economies these indicators nevertheless present a useful overview of the current status of service delivery channels, and highlight possible improvements.

Citizen Engagement Index (CEI):

The CEI is based on 12 indicators. Nine of these indicators related to citizen participation and feedback and government responsiveness, and are captured in the GovTech dataset. Among these, three key questions call for binary responses, and positive answers generate six more in-depth questions to present the details of multifunctional participation platforms. Two key indicators measure the existence of open government and open data portals, with a focus on the contents – whether there are regular updates to justify an active portal or not. Additionally, the UN e-Participation Index is used as another key indicator for other important dimensions, including government use of online services in providing information to citizens (e-information sharing), interacting with stakeholders (e-consultation), and engaging in decision-making processes (e-decision-making).

[13] The 2020 UN Online Service Questionnaire (OSQ) consists of a list of 148 questions covering a broad range of indicators, including "information about" laws, policies, legislation or expenditures; the "existence of" social networking and other tools; and "ability to do something" on government websites. These questions have been answered by government officials from 193 countries, and the responses have been reviewed by at least two researchers. The researchers have assessed each country's national website in the native language, including the national, e-services and e-participation portals, and the websites of the ministries of education, labor, social services, health, finance, and environment, as applicable. Responses have generally been based on whether the relevant features could be found and accessed easily, not whether they actually exist but are hidden somewhere on the site.

Table 2.1: GTMI Key Indicators

Ind	GTMI Key indicators	Points	Weight
	Core Government Systems Index (CGSI)		
I-1	Is there a government cloud available for all government entities?	0 - 2	4
I-2	Is there a government enterprise architecture?	0 - 3	4
I-3	Is there a government service bus or interoperability platform in place?	0 - 3	4
I-4	Is there an operational FMIS to support central gov PFM functions?	0 - 3	1
I-5	Is there a TSA linked with FMIS to automate payments and bank reconciliation?	0 - 3	1
I-6	Is there an operational Tax Management System?	0 - 3	1
I-7	Is there an operational Customs System?	0 - 3	1
I-8	Is there a Human Resources Management Information System with an online service portal?	0 - 3	1
I-9	Is there an operational Payroll System linked with HRMIS?	0 - 3	1
I-10	Is there an e-Procurement portal supporting public procurement?	0 - 3	2
I-11	Is there an operational Debt Management System (foreign and domestic debt)?	0 - 3	1
I-12	Is there an operational Public Investment Management System?	0 - 3	2
I-13	Is there a government Open Source Software policy/action plan for the public sector?	0 - 3	2
I-14	UN Telecommunication Infrastructure Index (TII) (four indicators)	0 - 1	6
I-15	Does the government have a specific national strategy for new/disruptive technologies?	0 - 2	4
	Public Service Delivery Index (PSDI)		
I-16	UN Online Service Index (OSI) (three indicators based on 148 questions)	0 - 1	6
I-17	Is there an online public service portal for citizens, businesses, and government entities?	0 - 2	2
I-18	Is there an operational Tax System online service portal?	0 - 3	1
I-19	Is there an operational e-Filing service portal for citizens and businesses?	0 - 3	1
I-20	Is there an online e-Payment portal providing support for various e-Services?	0 - 2	1
I-21	Is there an operational Customs System online service portal?	0 - 3	1
	Citizen Engagement Index (CEI)		
I-22	UN E-Participation Index (EPI) (three indicators)	0 - 1	6
I-23	Is there an Open Government portal?	0 / 1	2
I-24	Is there an Open Data portal?	0 - 2	2
I-25	Are there national platforms that allow citizens to participate in policy decision-making?	0 / 1	4
I-26	If Yes > Is it for submitting petitions?	0 / 1	0.5
I-27	If Yes > Are citizens' inputs publicly available on the platform?	0 / 1	0.5
I-28	If Yes > Does the platform allow citizens to provide feedback anonymously?	0 / 1	0.5
I-29	If Yes > Is government response publicly available on the platform?	0 / 1	0.5
I-30	Are there government platforms that allow citizens or businesses to provide feedback?	0 / 1	4
I-31	If Yes > Does the government make the service standards available to the public?	0 / 1	0.5
I-32	If Yes > Are these universally accessible or provides support for users with disabilities?	0 / 1	0.5
I-33	Does the government publish its engagement statistics and performance regularly?	0 / 1	1
	GovTech Enablers Index (GTEI)		
I-34	Is there a government body focused on GovTech / digital transformation?	0 / 1	4
I-35	Is there a government entity in charge of data governance or data management?	0 - 2	3
I-36	Is there a specific national GovTech / digital transformation strategy?	0 - 3	2
I-37	Is there a whole-of-government approach to implement data governance?	0 - 2	4
I-38	Are there national right to information laws to make data available to the public online?	0 - 2	1
I-39	Is there a data protection/privacy law?	0 - 2	1
I-40	Is there a data protection authority?	0 - 2	1
I-41	Is there a foundational unique national ID system in place?	0 / 1	2
I-42	Is there a Digital ID that can be used for identification and services?	0 / 1	2
I-43	Is there a digital signature regulation and PKI to support operations and service delivery?	0 - 3	1
I-44	Is there a cybersecurity emergency response team (CERT/CSIRT)?	0 - 2	1
I-45	UN Human Capital Index (HCI) (four indicators)	0 - 1	6
I-46	Is there a government strategy/program to improve digital skills/data literacy?	0 - 2	2
I-47	Is there a program to improve digital skills/data literacy and innovation in the public sector?	0 / 1	4
I-48	Is there a gov entity/strategy focused on public sector innovation?	0 - 2	4

Source: World Bank data.

GovTech Enablers Index (GTEI):

The GTEI is based on 15 indicators. Twelve of these indicators measure the enabling environment for digital government and GovTech and include the whole-of-government approach as one of the priorities of the digital agenda. They also include digital skills, enabling and safeguarding institutions, laws and regulations, strategy, cybersecurity, digital signature, and innovation in the public sector. The UN Human Capital Index (HCI)[14] is used as an additional key index to measure: (i) adult literacy rate; (ii) the combined primary, secondary and tertiary gross enrolment ratio; (iii) expected years of schooling; and (iv) average years of schooling. Moreover, two indicators are added from the WBG Identification for Development (ID4D) global dataset to highlight the countries having a foundational unique national ID system in place and a digital ID that can be used for identification and services online.

The data governance indicators, I-35, 38, 39, 40 in Table 2.1, were defined jointly with the World Development Report (WDR) team and used in the WDR 2021: Data for Better Lives report. The WDR 2021 aims to answer two fundamental questions. First, how can data better advance development objectives? Second, what kind of governance arrangements are needed to support the generation and use of data in a safe, ethical and secure way, while also delivering value equitably? The GovTech enablers and other GTMI components are also linked to the data value chain to drive innovation and capability growth as presented below:

- Data use: Indicators that capture the demand side of GovTech. Capacity gaps such as data literacy among decision-makers, media or the general population may affect the demand for and use of data.
- Data services: The data-driven public services component is as important as universal access, since it captures the interaction between supply and demand that meets needs/entitlements and drives innovation.
- Data products: The data products used as part of public service provision need to be relevant, timely, comprehensive, and granular, if they are to meet user needs.
- Data infrastructure: For sustainable performance to be assured, the foundations need to be strong, with effective "hard wiring" through law/policy on independence, data sharing, privacy, openness, etc., governance and planning, and "soft wiring" through skills, reputation and system maturity.

Based on the availability of data, specific indicators that capture the above aspects of the data value chain may be included in future versions of the dataset and report.

The description of the GovTech dataset and the observations based on 12 selected key GovTech indicators related to less known aspects of the focus areas, for which there is limited or no data in other global datasets, are presented in Appendix B. Additionally, a comparison of the GovTech Maturity Index with several other relevant GovTech indices is included in Appendix C to demonstrate the consistency of findings and observations.

[14] The UN HCI, which is a sub-component of the UN EGDI, is not the same as the World Bank's Human Capital Index (released in 2018, updated in 2020, covering 174 economies) which *"quantifies the contribution of health and education to the productivity of the next generation of workers"*. The UN HCI embodies both current and expected education measures.

The GovTech dataset presents comprehensive information about the maturity of GovTech focus areas from two perspectives: (i) an *international outlook* based on the data available on 198 economies; and (ii) a *regional outlook* as a subset of data with a focus on 168 WBG client countries benefiting from financial and technical assistance. The detailed information on how the dataset is compiled and validated is presented in the next section and Appendix B. The dataset of 198 economies presents the largest possible set of data available on the web and includes all 188 of the World Bank member countries, together with some of the large economies from the Asia-Pacific Economic Cooperation (APEC) member states, EU, and OECD covering a broader spectrum of GovTech systems, services and enabling environment.

Selected key indicators and the GTMI scores are presented for 198 economies – an international outlook based on income level distribution – and 168 WBG client countries – a regional outlook – to be able to compare the two perspectives explained above. The GovTech dataset includes several sections for the visualization of data and results on all 48 key indicators. The list of 198 economies, including the 168 WBG client countries in the Regions, is presented in Appendix B.

Data Collection and Index Construction

The construction of the GovTech Maturity Index (GTMI) is primarily based on the 2020 GovTech dataset, which includes key indicators covering 198 economies. The dataset comprehensively accounts for the recent transition of governments from e-Government to digital government and further to GovTech, consistent with the UN,[15] EU[16] and OECD[17] definitions and indices.

The GovTech dataset detailed in Appendix B is an extended version of a global dataset on government systems and services, originally developed in 2014 and updated every two years during the preparation of several WBG studies and flagship reports. The dataset contains a rich set of data covering important aspects of GovTech initiatives. It includes web links to relevant institutions and systems, coupled with the basic information on the operational status and capabilities of government systems, online services, and portals. The dataset was updated and expanded in 2020 to include new indicators for the calculation of the GTMI.

The approach followed for expanding and validating the GovTech dataset is summarized below:

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[15] According to the UN, e-Government is the use of ICTs to more effectively and efficiently deliver government services to citizens and businesses. It is the application of ICT in government operations, achieving public ends by digital means. More recently, digital government definition is focused on the transformation of public institutions, and the public-sector landscape more broadly, and their service delivery capabilities using new technologies.

[16] According to the EU (2019), digital government transformation within the last twenty years covers four different phases from e-Government (1.0) (focused on the applications of World Wide Web technology in the public sector), to open (2.0), smart (3.0), and eventually transformed (4.0) government, which is a citizen-driven government that uses cognitive systems and advanced analytics.

[17] The OECD's Digital government (2014) definition is "the use of digital technologies, as an integrated part of governments' modernization strategies, to create public value. It relies on a digital gov ecosystem comprised of gov actors, non-gov organizations, businesses, citizens' associations, and individuals which supports the production of and access to data, services and content through interactions with the government."

- The data on all GTMI indicators were collected by the Bank team visiting government, CSO, and other relevant websites. It was noted that there are already 170+ digital government websites presenting the institutional framework, policy/strategy, online service platforms, and systems/services. This approach led to a comprehensive dataset since all countries have a substantial web presence and relevant information on existing systems and services is visible on the web.
- The data collected from government websites mostly reflects *de jure* practices. Generally, it was possible to verify the existence of an approved policy or strategy document, effective law, established institution, or existing system/services, but ascertaining the actual implementation status or progress of these platforms over the years was challenging. As noted in Table 4.1 in Appendix A, only a few indicators captured the implementation status of the program or GovTech component of interest. Also, it was not possible to account for the results and outcomes of these government platforms, strategies, or programs. Hence, countries may not be implementing some practices or using existing systems effectively, as there is minimal reporting of results and outcomes on the Web, and this should be taken into consideration when interpreting the dataset. The next update of the dataset and report may be based on surveys and interactions with country officials to verify evidence and gather information about the implementation status and outcomes of GovTech activities.
- In addition to the indicators on relevant institutions, strategy, and online service delivery platforms, the dataset presents the status of the core public financial management (PFM) systems, including Financial Management Information Systems (FMIS), Tax, Customs, Human Resources Management Information Systems (HRMIS), Payroll, e-Procurement, Debt Management, Public Investment Management Systems (PIMS), and related services such as digital signature, e-Filing, and e-Payments. The existing WBG global dataset captures the details of Management Information System (MIS) solutions funded by the Bank mainly in the PFM domain since 1995. The data on other MIS solutions used in health, education, social protection, transport, agriculture, land management, trade, and other sectors are limited. Therefore, the CGSI and PSDI are mainly based on the data available on core PFM systems and services in 198 economies.
- It was not possible to interact with government officials through an online survey or other channels for the validation of results due to the coronavirus pandemic and other constraints. Nevertheless, the Bank team managed to collect relevant information on all 48 indicators and constructed the GTMI based on a rich set of data covering 198 economies. The GovTech dataset was shared with the experts working on DG/GovTech projects within the WBG for the validation of GTMI scores, key findings, good practice cases, and conclusions. The dataset was also shared with government officials through the GovTech website and Community of Practice distribution groups that include 1400+ officials from 143 countries, and their comments on various GovTech indicators were considered.
- The GTMI is not intended as another DG index for ranking 198 economies. Based on the GovTech dataset, the GTMI provides a snapshot of the current status of digital government institutions, strategy documents, online service delivery channels, core

government systems, and other relevant dimensions using remotely measurable indicators.[18]

- The GovTech dataset will be updated every two years to reflect progress in the GovTech domain globally. The latest version of the GovTech dataset includes new data on GovTech initiatives that have emerged mostly within the last five years, together with new indicators on public sector use of disruptive technologies and data governance initiatives, in addition to digital skills and innovation strategies and programs in the public sector. The dataset includes a "Metadata" sheet presenting a detailed description of all data fields and sources of information. The definitions of key indicators are also visible as comments on the header row of the dataset ("DGSS" sheet). Graphical presentations of all indicators are visible in the "DGSS Stats" and "GT Stats" sheets with linked formulas for automatic updates.

Other datasets used in the construction of the GTMI include the 2020 UN e-Government Survey (193 economies)[19], and the 2018 Identification for Development (ID4D) dataset (198 economies). Specifically, indicators from the UN e-Government Development Index (EGDI), including the Online Service Index (OSI), Telecommunication Infrastructure Index (TII), and Human Capital Index (HCI) were used in the calculation of the GTMI, together with the e-Participation Index (EPI). Since all three components of the EGDI and EPI are highly relevant to the GovTech domain, these indices were used in the calculation of the composite GTMI, in addition to 42 specific indicators included in the GovTech dataset.

Construction of the GTMI

The GTMI is the simple average of the four components measuring the maturity of GovTech focus areas, which are computed as the normalized weighted averages of relevant indicator scores. The GTMI satisfies four main axioms to ensure consistency and meet its objectives. First, the index satisfies monotonicity, meaning that, all else being equal, an increase in the score of one indicator increases the overall score of the index. Second, the index satisfies subgroup decomposability, implying that it can be decomposed into subgroups for further analysis. Third, the index satisfies the replication axiom such that if a set of indicator scores is formed by replicating the existing set and order of scores an arbitrary number of times, the GTMI score would remain the same. Fourth, the index is non-negative and equal to zero if and only if all indicators record zero scores.

Furthermore, the GTMI is a transparent index that is also easy to understand and use during the design of new GovTech activities since gaps can be readily noted and the indicators are

[18] Due to the lack of resources and time, the GovTech dataset was originally developed by using publicly available data/reports on government websites. Collecting data through survey forms or interactions with government officials were not possible due to the broad spectrum of systems/services covered. Some of the capabilities related to the citizen participation and feedback were only accessible when a citizen actually signs into the portal, and these embedded features may have been missed while collecting data. Also, the dataset may not capture the presence of a national citizen participation portal in some of the federal countries, although such platforms may exist for different ministries and agencies or at the provincial/state level.

[19] The UN EGDI and the WGI dataset are available for 193 and 196 economies, respectively. The GTMI scores of seven economies - Hong Kong, Kosovo, Macao, Monaco, Palestine, San Marino, and Chinese Taipei - not included in the UN or WGI dataset were calculated without including missing dimensions (and by reducing the sum of max scores accordingly). The details of these specific calculations can be found in the GovTech dataset.

actionable. Besides, the index is flexible and could incorporate outcome measures in future versions. The composite GTMI is calculated as follows:[20]

$$\text{GTMI} = (\text{CGSI} + \text{PSDI} + \text{CEI} + \text{GTEI}) / 4$$

Each component index was calculated as the weighted average of relevant key indicator scores as follows:

$$CGSI = \frac{\sum_{i=1}^{15} X(i) * W(i)}{\sum_{i=1}^{15} Xmax(i) * W(i)} \qquad PSDI = \frac{\sum_{i=16}^{21} X(i) * W(i)}{\sum_{i=16}^{21} Xmax(i) * W(i)}$$

$$CEI = \frac{\sum_{i=22}^{33} X(i) * W(i)}{\sum_{i=22}^{33} Xmax(i) * W(i)} \qquad GTEI = \frac{\sum_{i=34}^{48} X(i) * W(i)}{\sum_{i=34}^{48} Xmax(i) * W(i)}$$

Note: *X(i)* denotes the score of each key indicator *(i) (from 1 to 48)* used for the calculation of four component indices. *W(i)* is the weight of each key indicator, and *Xmax(i)* is the maximum score of each key indicator.

Calculation of Weights

In order to find the best fit for the calculation of four key component indices, the following options were examined:

1. **GT0** – No weights: Simple arithmetic average of four component index scores (CGSI, PSDI, CEI, GTEI).
2. **GTE** – Using weights based on *expert opinion*: Average of four weighted component index scores using specific weights identified for selected key indicators, which are not measured in well-known surveys/indices, by the authors and other experts involved in DG/GovTech projects.
3. **GTC** – Weights based on *correlation analysis* with standardized scores:[21] Average of four weighted component scores using correlation analysis applied to all key indicators.
4. **GTF** – Weights based on *factor analysis* with standardized scores: Arithmetic average of four weighted component scores, using factor analysis applied to all key indicators.

[20] CGSI = Core Government Systems Index; PSDI = Public Service Delivery Index; CEI = Citizen Engagement Index; GTEI = GovTech Enablers Index.

[21] The Z-score standardization procedure is implemented for each component indicator to ensure that the overall GTMI is equally decided by the four component indices, that is, each component index presents comparable variance after the Z-score standardization - similar to UN EGDI calculations.

GT0 (No weights):

The GT0 option was used to calculate the GTMI for 198 economies based on a simple arithmetic average of four normalized component index scores.

$$CGSI = \frac{\sum_{i=1}^{15} X(i)}{\sum_{i=1}^{15} Xmax(i)} \qquad PSDI = \frac{\sum_{i=16}^{21} X(i)}{\sum_{i=16}^{21} Xmax(i)}$$

$$CEI = \frac{\sum_{i=22}^{33} X(i)}{\sum_{i=22}^{33} Xmax(i)} \qquad GTEI = \frac{\sum_{i=34}^{48} X(i)}{\sum_{i=34}^{48} Xmax(i)}$$

Note: *W(i)* is equal to 1 for all indicators. Sum of *Xmax(i)* is 41 for 15 CGSI indicators, 14 for 6 PSDI indicators, 13 for 12 CEI indicators and 27 for 15 GTEI indicators.

GTE (Using weights based on *expert opinion*):

The GTE option relies on specific weights identified for selected key indicators to emphasize their importance in improving four GovTech focus areas.

$$CGSI = \frac{\sum_{i=1}^{15} X(i) * We(i)}{\sum_{i=1}^{15} Xmax(i) * We(i)} \qquad PSDI = \frac{\sum_{i=16}^{21} X(i) * We(i)}{\sum_{i=16}^{21} Xmax(i) * We(i)}$$

$$CEI = \frac{\sum_{i=22}^{33} X(i) * We(i)}{\sum_{i=22}^{33} Xmax(i) * We(i)} \qquad GTEI = \frac{\sum_{i=34}^{48} X(i) * We(i)}{\sum_{i=34}^{48} Xmax(i) * We(i)}$$

Note: *X(i)* denotes the score of each key indicator *(i) (from 1 to 48)* used for the calculation of four component indices. *We(i)* is the weight of each key indicator based on expert opinion, and *Xmax(i)* is the maximum score of each key indicator. Sum of *Xmax(i)*We(i)* is 85 for 15 CGSI indicators, 21 for 6 PSDI indicators, 24 for 12 CEI indicators and 61 for 15 GTEI indicators.

The following weights were given to selected key indicators (31 out of 48 indicators). The default weight for all remaining indicators is 1.

CGSI: Government cloud (*We(1) = 4*); Government enterprise architecture (*We(2) = 4*); Government Interoperability Framework / Government Service Bus (*We(3) = 4*); Government Procurement (e-GP) portal (*We(10) = 2*); Public Investment Management System (*We(12) = 2*); Open Source Software in the public sector (*We(13) = 2*); UN Telecommunication Infrastructure Index (*We(14) = 6*); National strategy on disruptive technologies (*We(15) = 4*).

PSDI: UN Online Service Index (*We(16) = 6*); Online public service delivery portal (*We(17) = 2*).

CEI: UN E-Participation Index (*We(22) = 6*); Open Government Portal (*We(23) = 2*); Open Data portal (*We(24) = 2*); National website for citizen participation (*We(25) = 4*); Four sub-indices related to citizen participation website (*We(26-29) = 0.5 each*); National website for citizen and business feedback (*We(30) = 4*); Two sub-indices related to citizen feedback website (*We(31-32) = 0.5 each*).

GTEI: GovTech institutions (*We(34) = 4*); Data governance institutions (*We(35) = 3*); National digital government / GovTech strategy (*We(36) = 2*); Whole-of-government approach

as a part of national DG strategy (*We(37) = 4*); National identification system (*We(41) = 2*); Digital ID for services (*We(42) = 2*); UN Human Capital Index (*We(45) = 6*); Strategy on digital skills development in the public sector (*We(46) = 2*); Programs for digital skills & innovation (*We(47) = 4*); Strategy/entity focused on public sector innovation (*We(48) = 4*).

The authors identified the above weights of selected new indicators based on their operational experiences to: (i) amplify the effects of specific indicators highly relevant to the improvement of four focus areas; (ii) reflect their observations from the existing studies; and (iii) present a more realistic view of GovTech maturity compared to quantitively generated weights. In this way, the Bank team placed greater emphasis on more recent GovTech activities which are essential to digital transformation. Relatively lower weights were used for some of the new indicators – for example, I-31 and 32 in Table 2.1 – when it was not possible to find comprehensive information on the web. This was also the case when several relevant dimensions are measured using the same indicator such as I-17, which measures both the existence of a portal and the level of services available. Also, an indicator measuring the existence of a new strategy document has a lower weight (weight=2) compared to an indicator measuring the existence of a digital skills program or public sector innovation lab launched to implement the new strategy (weight=4). As explained in Appendix C, specific weights based on expert opinions have also been used in the calculation of the CAF GovTech Index published in 2020.

The alternative quantitative indices (GTC and GTF) also provide robustness checks to the subjectively determined weights, as explained in Appendix D. In particular, the weights constructed by correlation and factor analyses are endogenously determined by the variance of the data itself. Consequently, they ensure that the weights based on experts' opinion are not arbitrarily determined since the subjective weights identified by experts are measurable, observable, and guided by the quantitatively constructed weights.

The weighted average for each component index was computed by a variation of the standard weighted average formula to ensure that the values are normalized to fall between 0 and 1. The approach involves dividing the sum of the multiplication of the indicators with their respective weights (the numerator) by the sum of the multiplication of the maximum indicator values with their respective weights (the denominator). The details of GTC and GTF weight calculation options can be found in Appendix D. A summary of these two options is presented below.

Before the calculation of the other two options, the Z-score standardization procedure was implemented for each component indicator to ensure that the overall GTMI is equally decided by the four component indices, that is, each component index presents comparable variance after the Z-score standardization; this method is also used in the calculation of UN EGDI. In the absence of the Z-score standardization treatment, the GTMI would mainly depend on the component index with the greatest dispersion. After the Z-score standardization, the arithmetic average sum becomes a good statistical indicator, where "equal weights" truly means "equal importance."

GTC (Weights based on *correlation analysis* with standardized scores):

In the GTC option, a simple Pearson's correlation analysis was performed to generate the weights. A simple average of GTMI across 198 economies using the raw scores was computed first. Subsequently, these scores were standardized for each indicator using the mean and standard deviation of each indicator (see Appendix B). The correlation coefficients between the unweighted GTMI scores and the standardized indicator Z-scores were computed and used as the weights. The purpose of the standardization is to transform all the scores such that all indicators have the same mean (=0) and variance (=1), which makes them comparable. Another practical advantage of this transformation is that, if outliers (that is, extremely large or small values) are present in the collected data, they can be accounted for; as such, they would not skew the overall composite index.

The standardized scores are multiplied by their respective weights and the weighted average is computed for each GovTech focus area using the standard weighted average formula. The weighted averages of the focus areas (from the Z-scores) are normalized using the min-max approach to fall between 0 and 1. The latter approach subtracts the minimum value of the indicator across countries and from the weighted average score of the country for the focus area in question and divides the outcome by the range of the indicator (the difference between the maximum and minimum values of the indicator across countries). Finally, the weights calculated through the correlation analysis were applied to all raw scores to compute a separate GTMI for comparison purposes.

GTF (Weights based on *factor analysis* with standardized scores):

In the GTF option, a factor analysis closely guided by the proposed approach of OECD (2008)[22] was employed to calculate the indicator weights. The reasoning behind this approach is to assign higher weights to indicators that explain a higher share of the variation in all indicators. This is accomplished by using the observed indicator scores to construct unobserved factors that are common to all the indicators. The highest estimated association between an indicator and the common factors (factor loadings) is used to calculate its weight since it shows the degree of the data that the indicator explains through the common factors. The factors and factor loadings are first estimated by factor analysis – in particular, principal components analysis – based on the indicator scores. After rotating the ensuing matrix to simplify the structure, the maximum factor loading of a given indicator is subsequently identified and squared. The outcome is normalized by the variance explained by its factor – see Appendix B for further discussion. The approach is valuable for endogenously generating weights based on latent relationships among the indicators. These weights are applied separately to the raw data and standardized Z-scores.

The details of weight calculations and comparison of results are presented in Appendix D.

[22] OECD Handbook on Constructing Composite Indicators: Methodology and User Guide, and consistent with current literature (Greco, 2019; UN EGDI, 2020).

Data Analysis

While all GTMI calculation results are shown below for comparison purposes, this report focuses on the GTMI scores computed with specific weights based on expert opinion (GTE), since this approach resulted in a closer fit to the key findings and observations of the authors during data collection and correlated better with well-known DG indices. After calculating normalized GTMI scores that reflect the key aspects of four GovTech focus areas, the 198 economies included in the GovTech dataset were grouped under four categories, A to D, see Table 2.2. The purpose is not to rank countries in terms of performance, but to illustrate the state of GovTech focus areas globally and to identify good practices and areas for possible improvements.

Table 2.2: Definition of GovTech Maturity Index Groups

Group	Score	GTMI	Description of government practices
A	0.75 – 1.00	Very High	GovTech leaders demonstrating advanced/innovative solutions and good practices in all four focus areas.
B	0.50 – 0.74	High	Governments with significant GovTech investments and good practices in most of the focus areas.
C	0.25 – 0.49	Medium	Governments with ongoing activities to improve some of the GovTech focus areas.
D	0 – 0.24	Low	Governments with minimal focus on GovTech initiatives.

Source: World Bank data.

The number of economies falling into each group for the GTMI and its four components, calculated with and without weights, is shown in Tables 2.3a and 2.3b. The average scores for the GTMI and four component indices based on the GTE option are shown in Table 2.4, together with the average scores for all 198 economies.

Table 2.3: Comparison of GTMI Calculations, by Number of Economies in Each Group

Table 2.3a: GT0 (Without Weights)

Group	GTMI	CGSI	PSDI	CEI	GTEI
A	**44**	60	76	26	65
B	**61**	96	58	42	53
C	**74**	27	48	33	49
D	**19**	15	16	97	31
Totals	**198**	198	198	198	198

Table 2.3b: GTE (Weights: Expert Opinion)

Group	GTMI	CGSI	PSDI	CEI	GTEI
A	**43**	34	73	52	56
B	**59**	57	63	31	45
C	**63**	77	43	42	56
D	**33**	30	19	73	41
Totals	**198**	198	198	198	198

Table 2.4: Average GTMI and Component Scores Based on the GTE Option, by Groups

GTE (Weights: Expert Opinion) Average Scores for 198 Economies

Group	GTMI	CGSI	PSDI	CEI	GTEI
A	**0.86**	0.78	0.89	0.86	0.89
B	**0.64**	0.58	0.73	0.58	0.67
C	**0.36**	0.34	0.51	0.24	0.34
D	**0.18**	0.19	0.22	0.13	0.17
198 economies	**0.52**	0.48	0.61	0.46	0.53

Source: World Bank staff calculations.

The GTMI scores were calculated by using the weights based on expert opinion (GTE) for data analysis and presentation of findings and good practices, since this approach was found to be the best fit to measure the maturity of four GovTech focus areas consistently.

Validation of Observations

The observations and findings of the authors were validated by a group of WBG experts involved in the design and implementation of public sector digital transformation activities globally. Early in the development process the team validated the approach to data collection, analytic methodology, and selection of indicators with a multi-disciplinary set of specialists to ensure adequacy of coverage, relevance to key focus areas, and determine expert weighting. Multiple stakeholder consultations were undertaken to present the methodology, data collection, and results. Based on expert feedback, the indicators comprising the four sub-indices were revised to ensure robustness of the resulting index.

The observations and selection of good practices were also validated by the expert group. Further, the 2020 GovTech global dataset was made publicly available through the WBG Data Catalog to benefit from the feedback of interested experts and practitioners involved in digital transformation activities. The publication of the underlying dataset provides opportunities to replicate the study and track changes over time.

Results Reporting

The observations and findings of each key indicator are presented in Chapter 3. To verify whether the findings of the study are consistent with key observations from other Digital Government (DG) indices, the relationships between the GTMI and UN EGDI and other indices were also analyzed. Also, an overview of some of the good practices in GovTech focus areas is included in Chapter 3.

To identify and promote exemplary GovTech initiatives and good practices in four focus areas, the findings of this study are published together with the latest version of the GovTech dataset on the GovTech website. Interested country officials and practitioners are welcome to comment on the contents for possible improvements.

Chapter 3. Findings and Good Practices

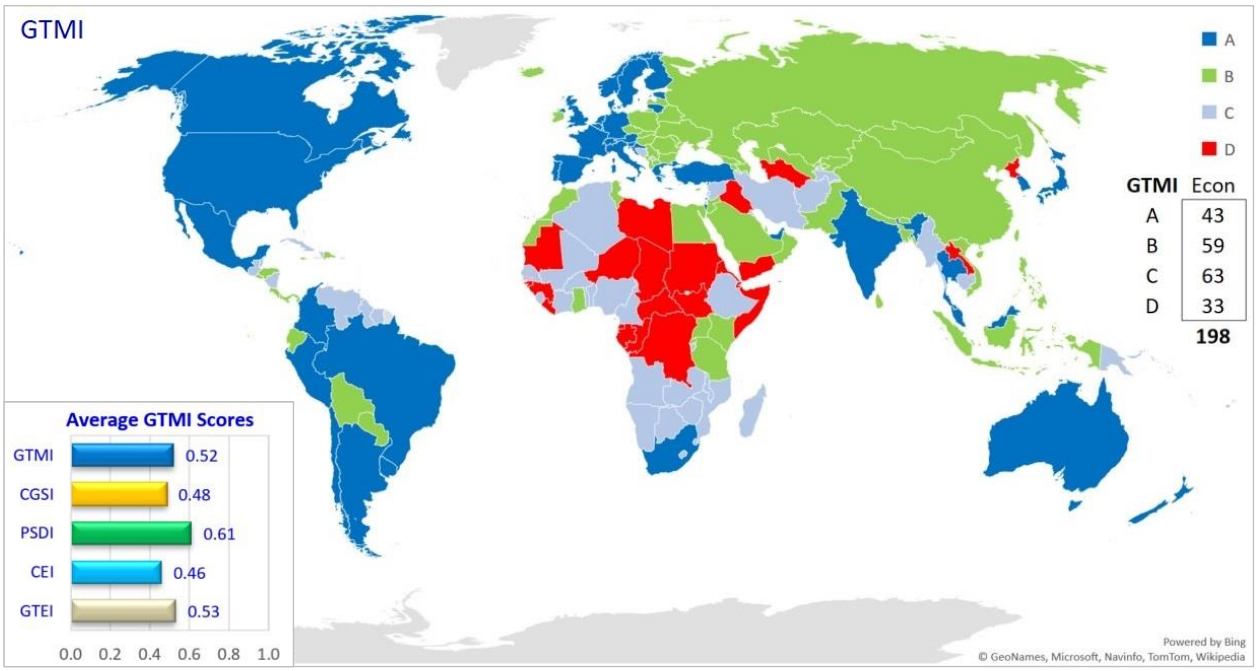
This chapter provides an overview of the GTMI results, together with the challenges and opportunities in the GovTech domain, and good practices identified during this study.

GovTech Maturity Index: State of GovTech around the world

There are 80 GovTech initiatives around the world, and good practices are highly visible in 43 economies [23] out of 198 reviewed.

The maturity of GovTech based on the GTMI groups is shown in Figure 3.1. All 198 economies are grouped from A to D based on their average GTMI score.

Figure 3.1: GovTech Maturity Index: State of GovTech Around the World, by Groups



Source: World Bank data.

Note: GTMI: GovTech Maturity Index; CGSI: Core Government Systems Index; PSDI: Public Service Delivery Index; CEI: Citizen Engagement Index; GTEI: GovTech Enablers Index.

Table 3.1 below shows that there are 43 leading economies (21 percent) using advanced/innovative digital solutions and demonstrating good practices in all four GovTech focus areas, whereas 33 governments (17 percent) have minimal or no emphasis on the GovTech agenda. Fifty-nine economies (30 percent) have significant investments in various GovTech focus areas, and 63 governments (32 percent) have ongoing projects to improve maturity.

[23] The term "economies" is used to denote the coverage of the GTMI and the GovTech dataset and is more inclusive. The 198 economies include all WBG member countries and large economies in line with WBG Data Catalog terminology.

Table 3.1: An Overview of GovTech Maturity (2020)

Group	GTMI	Economies in each Group	Economies	%E	Regions	%R
A	Very High	GovTech Leaders	**43**	21%	**23**	14%
	Argentina, Australia, Austria, Belgium, Brazil, Canada, Chile, Colombia, Croatia, Denmark, Estonia, Finland, France, Germany, Greece, Hong Kong SAR (China), India, Israel, Italy, Japan, Republic of Korea, Lithuania, Luxembourg, Malaysia, Malta, Mexico, Netherlands, New Zealand, Norway, Peru, Portugal, Singapore, Slovenia, South Africa, Spain, Sweden, Switzerland, Thailand, Turkey, United Arab Emirates, United Kingdom, United States of America, Uruguay.					
B	High	Significant focus on GovTech	**59**	30%	**56**	33%
	Albania, Armenia, Azerbaijan, Bahrain, Bangladesh, Belarus, Bhutan, Bolivia, Bulgaria, Cabo Verde, China, Chinese Taipei, Costa Rica, Cyprus, Czech Republic, Dominican Republic, Ecuador, Egypt, El Salvador, Georgia, Ghana, Honduras, Hungary, Iceland, Indonesia, Ireland, Jamaica, Jordan, Kazakhstan, Kenya, Kyrgyz Republic, Latvia, Mauritius, Moldova, Mongolia, Montenegro, Morocco, Nepal, North Macedonia, Oman, Pakistan, Panama, Paraguay, Philippines, Poland, Qatar, Romania, Russian Federation, Rwanda, Saudi Arabia, Serbia, Slovak Republic, Sri Lanka, Tanzania, Tunisia, Uganda, Ukraine, Uzbekistan, Vietnam.					
C	Medium	Some focus on GovTech	**63**	32%	**58**	34%
	Afghanistan, Algeria, Andorra, Angola, Antigua and Barbuda, Bahamas, Barbados, Belize, Benin, Bosnia and Herzegovina, Botswana, Brunei Darussalam, Burkina Faso, Burundi, Cambodia, Cameroon, Côte d'Ivoire, Cuba, Dominica, Eswatini, Ethiopia, Fiji, Grenada, Guatemala, Guyana, Haiti, Iran, Kosovo, Kuwait, Lebanon, Lesotho, Liechtenstein, Macao SAR (China), Madagascar, Malawi, Maldives, Mali, Monaco, Mozambique, Myanmar, Namibia, Nicaragua, Nigeria, Palestine, Papua New Guinea, Senegal, Seychelles, Sierra Leone, Solomon Islands, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Suriname, Syrian Arab Republic, Tajikistan, Timor-Leste, Togo, Tonga, Trinidad and Tobago, Vanuatu, Venezuela, Zambia, Zimbabwe.					
D	Low	Minimal focus on GovTech	**33**	17%	**31**	19%
	Central African Republic, Chad, Comoros, Democratic Republic of Congo, Republic of Congo, Djibouti, Equatorial Guinea, Eritrea, Gabon, Gambia, Guinea, Guinea-Bissau, Iraq, Kiribati, Korea DPR, Lao PDR, Liberia, Libya, Marshall Islands, Mauritania, Federal States of Micronesia, Nauru, Niger, Palau, Samoa, San Marino, São Tomé and Principe, Somalia, South Sudan, Sudan, Turkmenistan, Tuvalu, Yemen.					
		Totals	**198**		**168**	

Source: World Bank data.

Note: %E is the percentage of 198 economies included in the relevant group. %R is the percentage of 168 WBG client countries included in the relevant group.

Based on the information presented on 198 government websites and in published documents, the average GTMI score was 0.52 out of 1. The average score was 0.48 for Core Government Systems Index (CGIS), 0.61 for Public Service Delivery Index (PSDI), 0.46 for Citizen Engagement Index (CEI), and 0.53 for GovTech Enablers (GTEI), as shown in Figure 3.1 and Table 2.4. The higher average score for the PSDI than other focus areas indicates that many countries have national online service portals, but currently universally accessible citizen-centric services are not visible in most of the countries. Also, a relatively lower average CGSI score indicates that despite substantial investments in core government systems, most of the countries are not focused on the whole-of-government approach to improve the integration of systems and services based on an interoperability framework.

Similarly, government initiatives on the effective use of technology for citizen engagement are emerging. Regarding the enablers, most of the countries have updated digital government strategies with an emphasis on the GovTech agenda.

Figure 3.3: Average GTMI Scores, by Groups

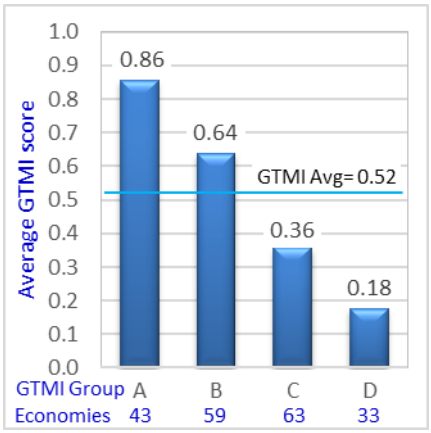
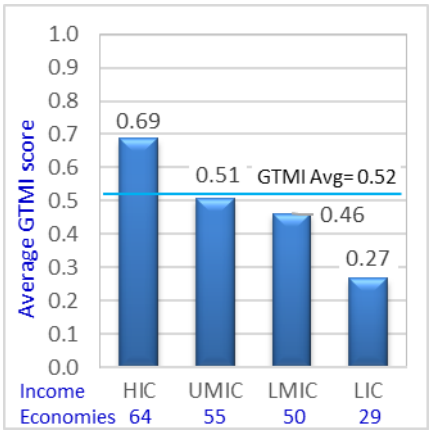


Figure 3.2: Average GTMI Scores, by Income Levels

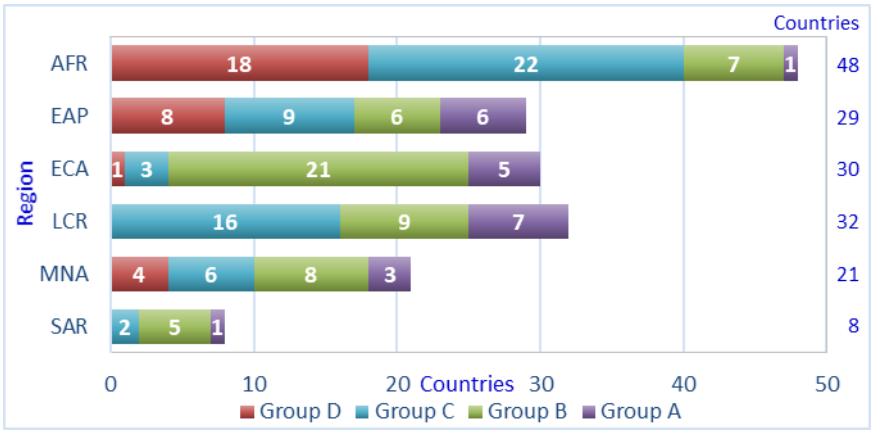


Source: World Bank data (average scores for 198 economies).

On average, countries in Group A have the highest index score, as expected, and the gap between A and D is wide, as presented in Figure 3.2. Similarly, a substantial gap exists between the average GTMI scores of high- and low-income countries, whereas the average scores for upper- and lower-middle income countries are close to each other, as shown in Figure 3.3. These observations are consistent with the findings of the WDR 2016 and 2021, according to which the digital divide continues to grow especially in developing countries. The current COVID-19 pandemic also exposed both existing social inequalities and increasing digital divide. Access to information and public services are much better in the developed world compared to the developing countries. However, many middle- or low-income and rural communities, including those in large urban areas, still lack reliable and affordable access.

The state of GovTech in the Regions is illustrated below in Figure 3.4, together with the total number of countries in each region. The largest group of countries focused on the GovTech agenda is in the Europe and Central Asia (ECA) region – 26 out of 30, or 87 percent in Groups

Figure 3.4: State of GovTech in WBG Client Countries



Source: World Bank data (168 client countries).

A and B. Other regions follow, with 16 countries in the Latin America and the Caribbean Region (LCR), 12 in East Asia and Pacific (EAP), 11 in Middle East and North Africa (MNA), 8 in Africa (AFR), and 6 in South Asia (SAR).

The Digital Economy for Africa Initiative of the World Bank (see Box 3.1) was launched in 2018 to support relevant government initiatives for Africa's digital transformation.

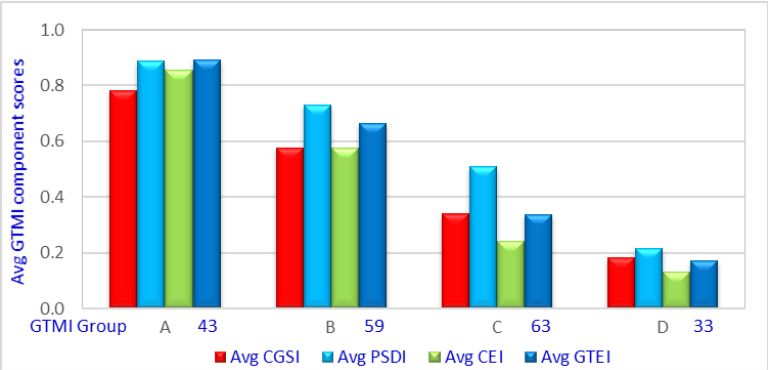
Box 3.1: Digital Economy for Africa Initiative

The WBG is focused on improving the digital economy in the Africa region in collaboration with the African Union. Under the Digital Economy for Africa Initiative, the WBG aims to support the regional digital transformation strategy for Africa to accelerate the achievement of the UN's Sustainable Development Goals and promote the development of the digital economy. A funding requirement of between 62 billion and 79 billion US dollars is estimated by the World Bank to establish the foundations for an Africa-wide digital economy. The Initiative is focused on improving connectivity and access to digital services, developing digital skills, and expanding access to e-commerce and entrepreneurship opportunities for all African citizens and businesses. GovTech is represented in the framework as part of the Digital Public Platforms pillar. Under the Initiative, there is significant potential for interest and focus on GovTech platforms, policies, and initiatives to grow. The next iteration of the GTMI is expected to reflect these developments.

Across groups, Figure 3.5 indicates that countries generally score higher in core government systems, online services and GovTech enablers compared to citizen engagement, with the exception of economies in Group A. Countries in other groups, record their lowest scores among the citizen engagement focus area. This reveals that there may be comparatively lower investments by governments in GovTech solutions to enhance engagement with citizens.

The regional variation of the GTMI component scores for different groups is presented in Figures 3.6a to 3.6f. The regional distribution of the GTMI component scores presents the progress in all four GovTech focus areas together with the gaps in specific areas. The largest gap in all regions reflects ineffective use of technology for citizen engagement, followed by lack of adoption of the whole-of-government approach. In the Africa region, there is a relatively small group of countries with significant investments in all GovTech focus areas. There is a substantial gap in citizen engagement, service delivery and GovTech enablers in most countries. In four regions, EAP, LCR, MNA, SAR, nearly half of the countries demonstrate progress in all GovTech focus areas, but there are notable gaps in citizen engagement, whole-of-government approach and service delivery areas in the remaining half. ECA is the most advanced region regarding the maturity of GovTech, despite the gaps in citizen engagement and enablers in several countries.

Figure 3.5: Average GTMI Component Scores, by Groups (198 Economies)



Source: World Bank data.

Figure 3.6: Regional Average GTMI Component Scores, by Groups (168 Countries)

Figure 3.6a: Africa (48 Countries)

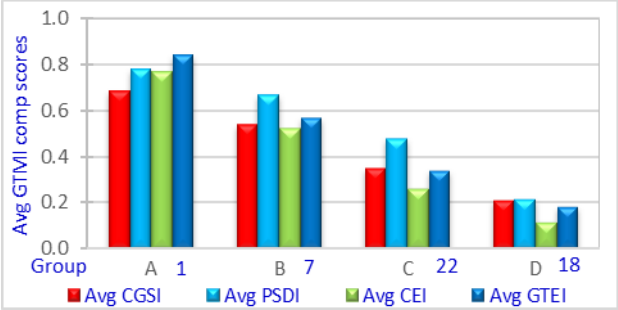


Figure 3.6b: East Asia & Pacific (29 Countries)

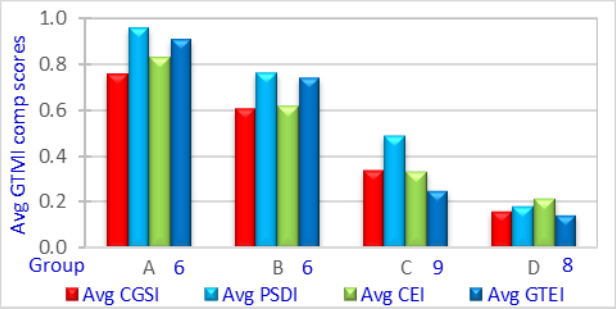


Figure 3.6c: Europe & Central Asia (30 Countries)

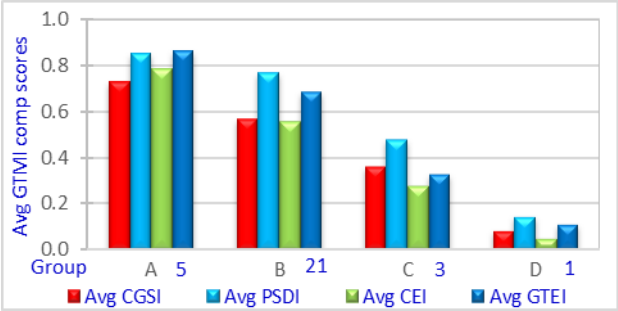


Figure 3.6d: Latin America & the Caribbean (32 Countries)

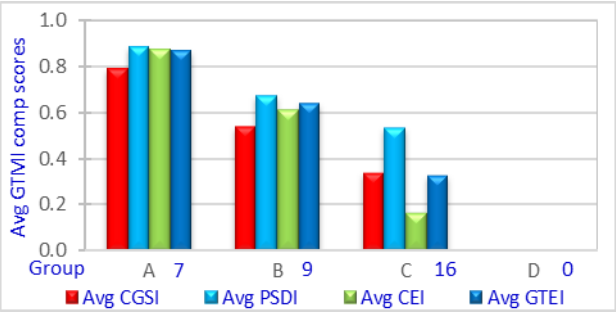


Figure 3.6e: Middle East & North Africa (21 Countries)

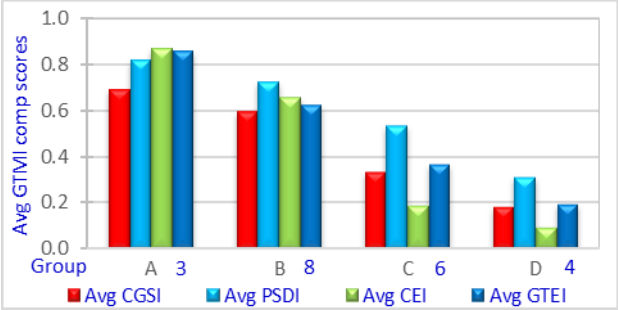
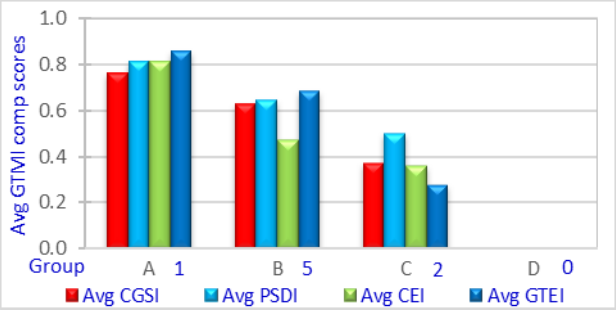


Figure 3.6f: South Asia (8 Countries)



Source: World Bank data.

Note: GTMI: GovTech Maturity Index; CGSI: Core Government Systems Index; PSDI: Public Service Delivery Index; CEI: Citizen Engagement Index; GTEI: GovTech Enablers Index. The total number of countries in each GTMI group is displayed next to the group name.

The variation of the maturity of GovTech initiatives is presented below from two different perspectives: (i) income level distribution for 198 economies (*international outlook)*; and (ii) regional distribution for 168 WBG client countries (*regional outlook)*.

Income level. The maturity of GovTech foundations in 198 economies based on income level distributions is shown below in Figure 3.7. Most of the GovTech leaders – 33 out of 43, or 77 percent – are from high-income countries (HICs), as would be expected. Most upper middle-income (UMICs) and lower middle-income countries (LMICs) are in Groups B or C. Most of the low-income countries (LICs) have minimal focus on GovTech; 27 out of 29 are in Groups C or D. All 39 fragile states are in Groups C or D, with little or no focus as yet on the GovTech agenda.

Regional distribution. The average state of GovTech maturity in 168 WBG client countries by region is presented in Figure 3.8. Among the Regions, the ECA region is the leader in GovTech activities, with 26 out of 30 countries in Groups A or B, and LCR follows with 32 countries all in Groups A, B and C. Countries in EAP, MNA, and SAR show some good practices in GovTech domain – about 50 percent of countries in these regions are in Groups A or B. There are only a few good practice examples in the AFR region – only 8 out of 48 countries are in Groups A or B, and a large proportion is in Groups C or D.

Figure 3.7: GTMI International Outlook (198 Economies)

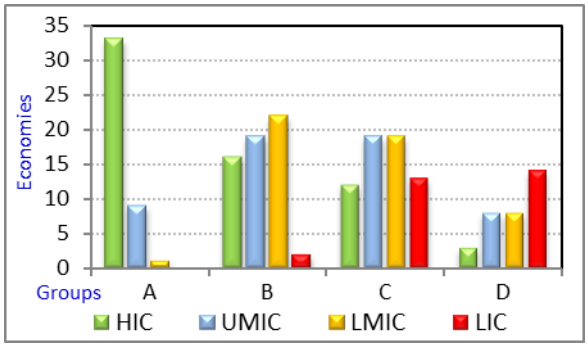
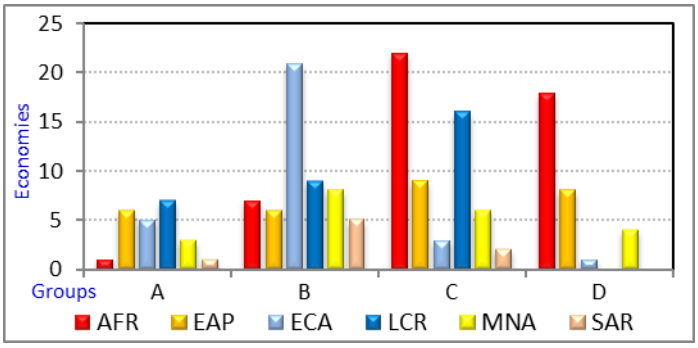


Figure 3.8: GTMI Regional Outlook (168 Countries)



Source: World Bank data.

Note: HIC = high-income country; UMIC = upper-middle-income country; LMIC = lower-middle-income country; LIC = low-income country; AFR = Africa Region; EAP = East Asia and Pacific Region; ECA = Europe and Central Asia Region; LCR = Latin America and the Caribbean Region; MNA = Middle East and North Africa Region; SAR = South Asia Region.

Findings

This section first presents the findings on specific areas which are critical components of a sustainable GovTech ecosystem: (i) institutions, policies, and strategies; (ii) emerging GovTech initiatives; and (iii) the whole-of-government approach. An overview of the key findings on all four GovTech focus areas is included next.

Institutions, policies, and strategies

Based on the GovTech dataset, there are 174 dedicated e-government or digital government entities with approved strategies and/or action plans (see Figures 3.9a and 3.9b). Most of these countries are improving the digital government ecosystem to address country-specific challenges in line with their priorities, policies and action plans, using available capacity and budget resources. Despite increasing investments in infrastructure and the availability of GovTech institutions and strategy documents, many governments around the world continue to face challenges in the implementation of necessary solutions due to capacity and resource constraints, digital inclusion, data privacy, cybersecurity, and other factors.

A review of the information on government websites of institutional and strategic approaches shows that there is growing interest in establishing GovTech units close to the center of government to promote a whole-of-government approach for reducing the duration and cost of GovTech interventions, and maximizing the impact of investments on key digital transformation programs within the last decade.

Institutional developments: Dedicated central government GovTech units have been established in 80 countries. Data governance bodies are operational in 61 countries. These bodies are mostly autonomous entities focused on the challenges of data protection and privacy, and the potential to use data for digital entrepreneurship, to contribute to the development of the digital economy. Data protection authorities exist in 103 countries, and cybersecurity emergency response teams have been established in 131 countries.[24]

Policy and strategy developments: From 2015, governments have increasingly published new policy and strategy documents to support the digital transformation of the public sector. Country-specific strategies and action plans have been approved to promote the use of disruptive technologies and Open Source Software (OSS) in about 79 countries, and to enhance digital skills in the public sector in 83 countries.

Investment developments: Government cloud – infrastructure, platform, or software as a service – exists in 106 countries. Government interoperability framework and/or service bus platforms have been established in 94 countries, and government enterprise architecture has been developed in 61 countries. These investments are increasing steadily, together with the expansion of digital skill development programs, which are present today in 107 countries. Also, public sector innovation labs have been established in 100 countries to support public sector modernization.

[24] The integrity and security of GovTech applications require regular audits performed by independent certified IT auditors. As such, the next versions of the dataset and report could include additional indicators to measure the role and capabilities of Supreme Audit Institutions in performing IT audit of core government systems, as well as the performance and compliance audits, if relevant data is available in 198 economies.

Figure 3.9: Diffusion of Digital Government and GovTech Initiatives (198 Economies)

Figure 3.9a: Digital Government and GovTech Strategies and Institutions

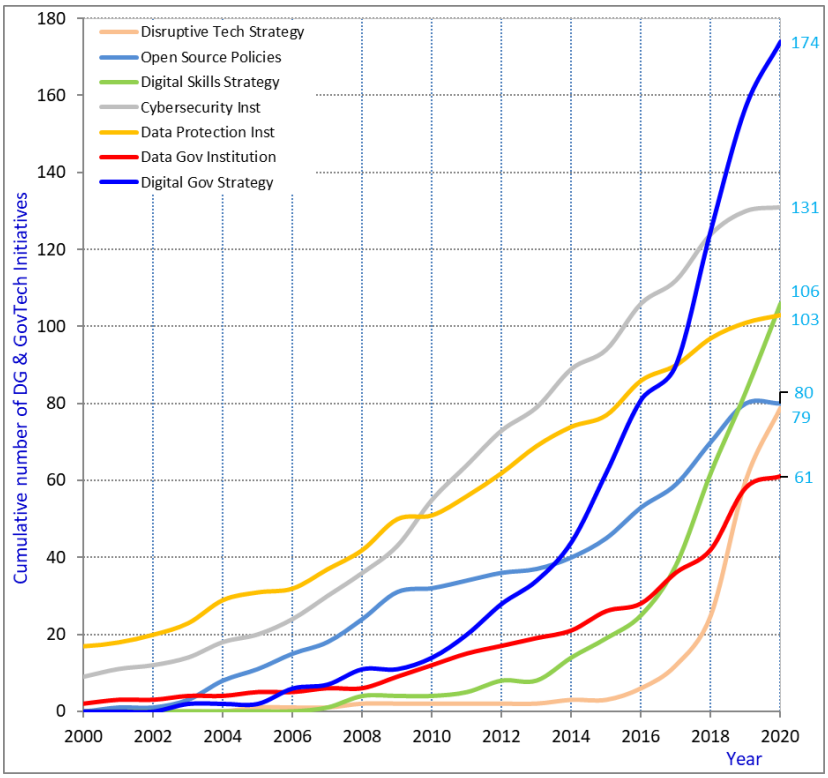
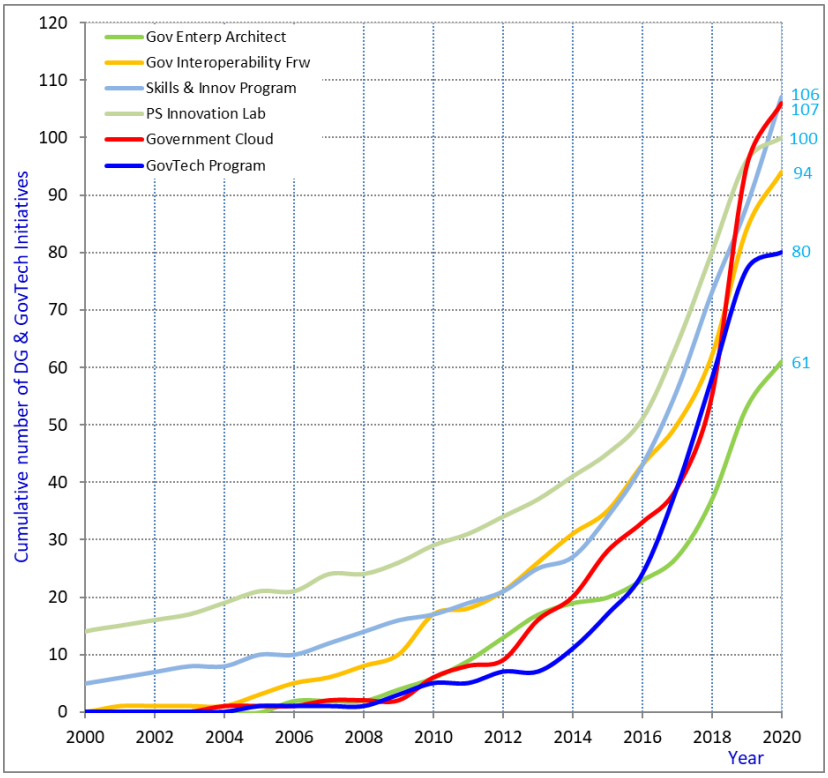


Figure 3.9b: Diffusion of GovTech Programs and Platforms



Source: World Bank data.

A group of 43 countries is leading digital transformation in the public sector, with highly visible good practices in all four GovTech focus areas, as explained above and shown in Table 3.1.

Presently, the full details of government investments in GovTech initiatives and the results achieved, or challenges faced are not recorded and reported transparently by most governments. Therefore, it is difficult to monitor progress in the implementation of most GovTech initiatives and to document cases of good practices solely based on the information available on the web and government websites. Nevertheless, the observations and findings for this study may be useful in raising awareness among government officials leading GovTech programs on the importance of sharing the results, successes and failures of GovTech initiatives transparently to help guide and inspire other countries focused on public sector modernization using GovTech. Furthermore, if GovTech investments are made with poor preparation and lack of focus on the relevant problem definition, suboptimal outcomes may emerge. Based on the availability of relevant data and reports, it may be possible to analyze the challenges faced and unintended outcomes experienced in various GovTech initiatives in some detail in the next version of the report to inform the design of new GovTech activities.

GovTech initiatives

Several different types of GovTech initiatives have emerged within the last decade to support public sector digital transformation through country-specific programs. Most of these GovTech initiatives (63 out of 80, or 79 percent) have been launched by various government entities and the rest are led by CSOs. Among 63 government entities, 42 institutions leading GovTech initiatives are connected to either the President's or Prime Minister's office or the Ministry of ICT; the rest are led by autonomous agencies or other government entities. There are 14 other GovTech initiatives led by CSOs, event organizers or the private sector to facilitate interactions among government officials, startups, and investors – for example, GovTech Brazil, GovTech Program Denmark, GovTech Gruppe in Germany, and GovTech Institute Netherlands. Most of these GovTech initiatives are focused on all four focus areas highlighted in this study and selected good practice cases are summarized further in this chapter.

GovTech Initiatives are growing globally, and more countries are looking to learn about initiatives and good practices. In 2020, several regional and international virtual events were organized to rethink how governments can operate and thrive in the new post-COVID-19 world – for example, GovTech Summit in Paris, GovTech Global in the U.K., and Campus Party in the LCR region.

Multiple supply and demand-side factors contributing to the success of digital transformation and GovTech initiatives were outlined in the World Bank's GovTech Launch Report. [25] These include sustained high-level commitment of the government leadership, allocation of necessary resources, dedicated teams to drive public sector modernization agenda, allocation of budget funds for innovation, training, and investments to enhance digital infrastructure and improve interoperability, and user adoption. In many developing

[25] GovTech Launch Report, 2020.

countries, there are significant digital divides, not only in terms of connectivity but also in devices, digital literacy, and skills necessary to take advantage of GovTech services and solutions.

Whole-of-government approach

Based on the GovTech dataset, there are 84 economies with digital government strategy documents that include specific references to the whole-of-government approach in specific areas as a part of public sector modernization medium-term action plans. Most of these countries are focused on the effective use of shared platforms to improve the interconnectivity and interoperability of government systems, automate data exchange, and provide integrated online service delivery channels. Of the 84 economies promoting the whole-of-government approach, only 16 countries are more advanced in the effective use of whole-of-government solutions. A whole-of-government approach is also important for developing a coherent and comprehensive model of data governance as explained in a recently published OECD report on data governance in the public sector.[26] There are about ten good practice cases in the OECD report presenting how holistic data governance can help to connect government as a whole. The report reviews the whole-of-government approach from several perspectives, including the presence of specific targets in the strategy documents and the existence of institutions, regulations, shared platforms, and digital skill development. A more integrated approach to public service delivery, shared digital government infrastructure, effective data governance, and interoperability frameworks will be the focus of the whole-of-government solutions in the coming years. Some of the relevant good practices are presented later in this chapter.

[26] OECD Report: "The Path to Becoming a Data-Driven Public Sector," December 2019.

The remaining parts of this section present the detailed data analysis on the four GovTech focus areas, based on the data collected for 48 GTMI indicators.

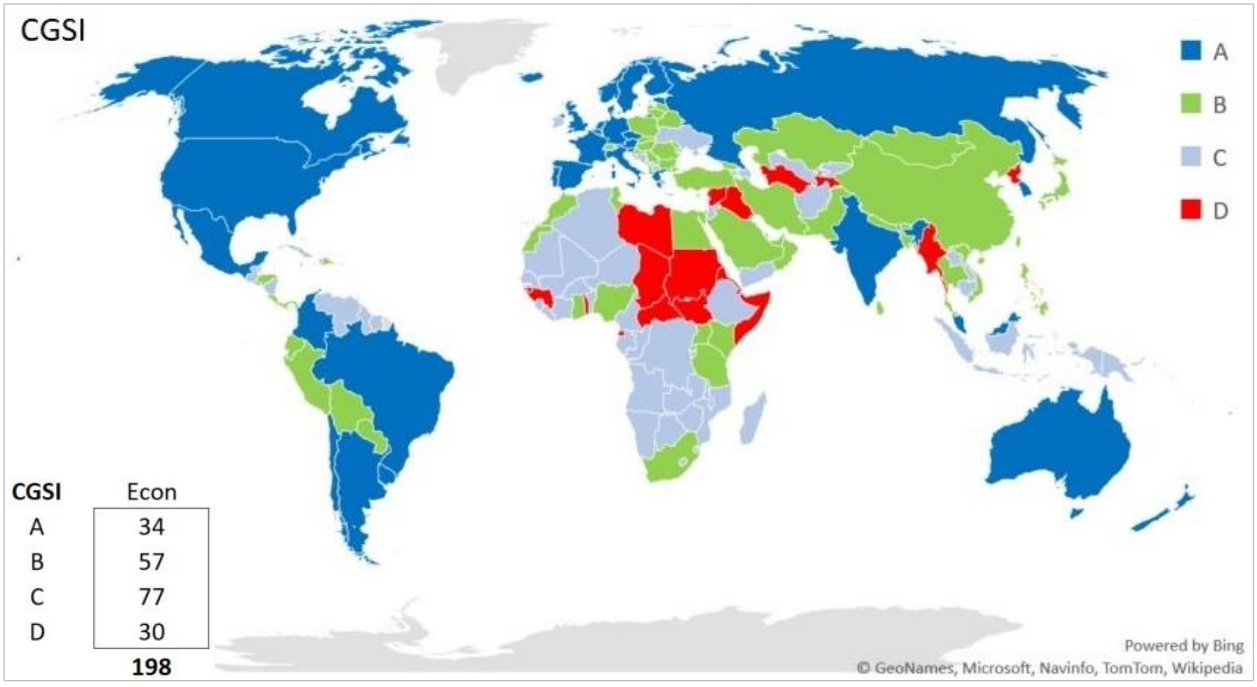
GovTech Focus areas

In this study, the specific aspects of four GovTech focus areas were presented by grouping all 198 economies into Group A (GovTech leaders) to Group D (minimal focus on GovTech) based on their GTMI score to distinguish good country practices and highlight innovative solutions. The purpose of this grouping is to present the current status of four GovTech focus areas globally. The sections below illustrate the progress in all GovTech focus areas using 48 key indicators to provide a more detailed view of the trends and gaps identified in each category.

State of Core Government Systems

There have been substantial investments in government systems and telecommunications infrastructure globally. However, many governments are presently not focused on several key aspects of the whole-of-government approach. The current status of core government systems based on the CGSI is presented in Figure 3.10.

Figure 3.10: GTMI: Current State of Core Government Systems, by Groups



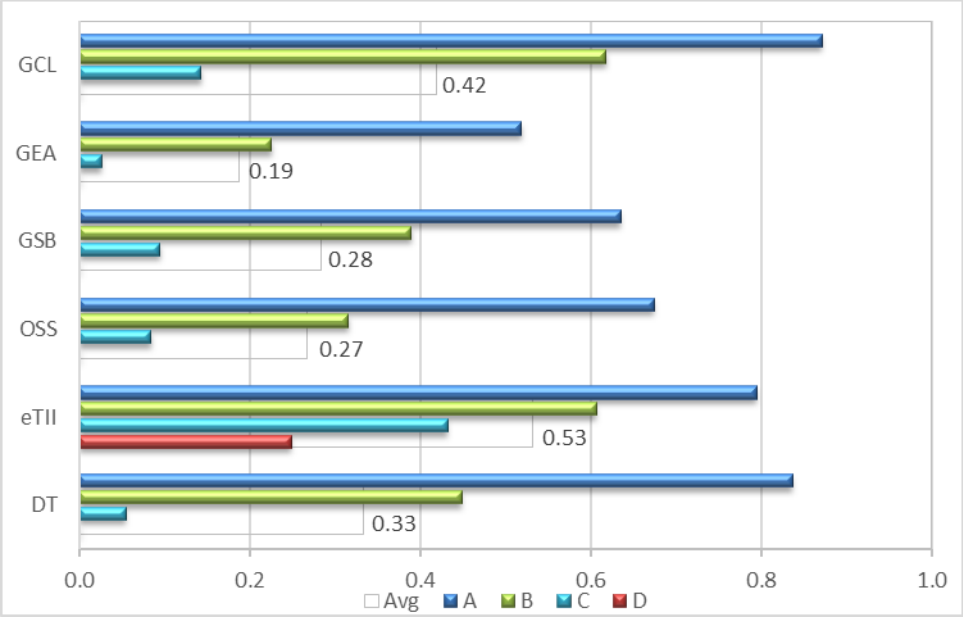
Source: World Bank data.

As shown in Figure 3.11, the focus on more advanced solutions – for example, government cloud, government enterprise architecture, government service bus, open-source software and disruptive technologies – is much less even among the GovTech leaders, Group A. The digital government strategies and action plans approved by 84 countries since 2018 include these critical aspects to promote the use of shared platforms and minimize the operational

cost of core systems and services in the future. Among these, new strategy documents updated by 17 countries in 2020 aim to improve remote connectivity, access to online services, and business continuity solutions, based on the lessons learned during the COVID-19 pandemic.

There are 15 key indicators presented in two parts related to core government systems. The first part consists of six indicators and covers less-known aspects of core government operations such as the existence of government cloud platforms and government service bus, and the initiatives to explore the use of disruptive technologies (see Figure 3.11).

Figure 3.11: State of GovTech Core Government Systems (CGSI), by Groups (Part 1)



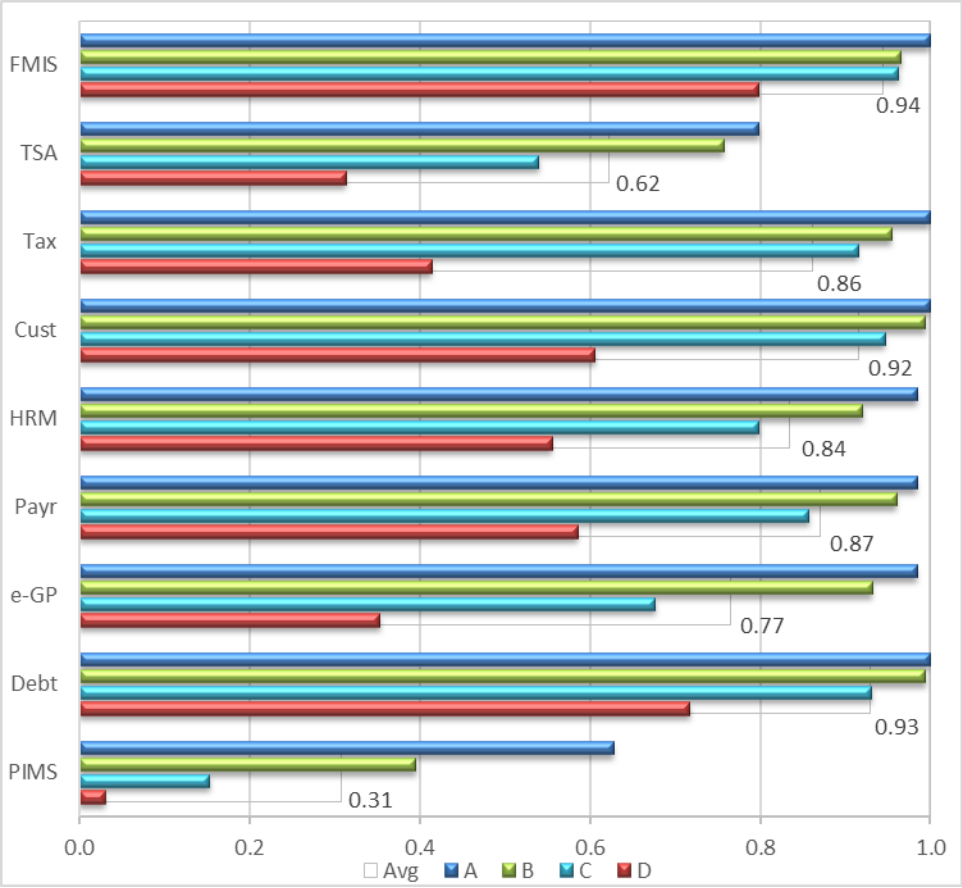
Source: World Bank data.

Note: GCL: Government cloud; GEA: Government Enterprise Architecture; GSB: Government Interoperability Framework (GIF) / Government Service Bus (GSB); OSS: Open Source Software in the public sector; eTII: UN Telecommunication Infrastructure Index (TII); DT: National strategy on Disruptive Technologies.

The second part, with nine indicators and shown in Figure 3.12, presents the details of core systems based on the GovTech dataset including a new indicator capturing the progress in Public Investment Management Systems (PIMS). Observations on key CGSI indicators are summarized below to explain the trends.

Most countries already have operational core public financial management (PFM) and other systems to support core central government operations. As shown in Figure 3.12, FMIS, tax, customs, debt management, HRMIS, and payroll systems are visible in all four groups. However, most of these systems are not interconnected and data exchange is not sufficiently automated using web services/APIs. Also, front office systems and portals supporting online services such as government e-payments, e-filing, e-declaration, and e-tendering, are usually less developed compared to back-office system capabilities such as the registration of taxpayers, accounting, reporting, and announcement of tenders.

Figure 3.12: State of GovTech Core Government Systems (CGSI), by Groups (Part 2)



Source: World Bank data.

Note: FMIS: Financial Management Information System; TSA: Treasury Single Account; Tax: Tax Management System; Cust: Customs System; HRM: Human Resources Management Information System. Payr: Payroll System; e-GP: Government e-Procurement System; Debt: Debt Management System; PIMS: Public Investment Management System.

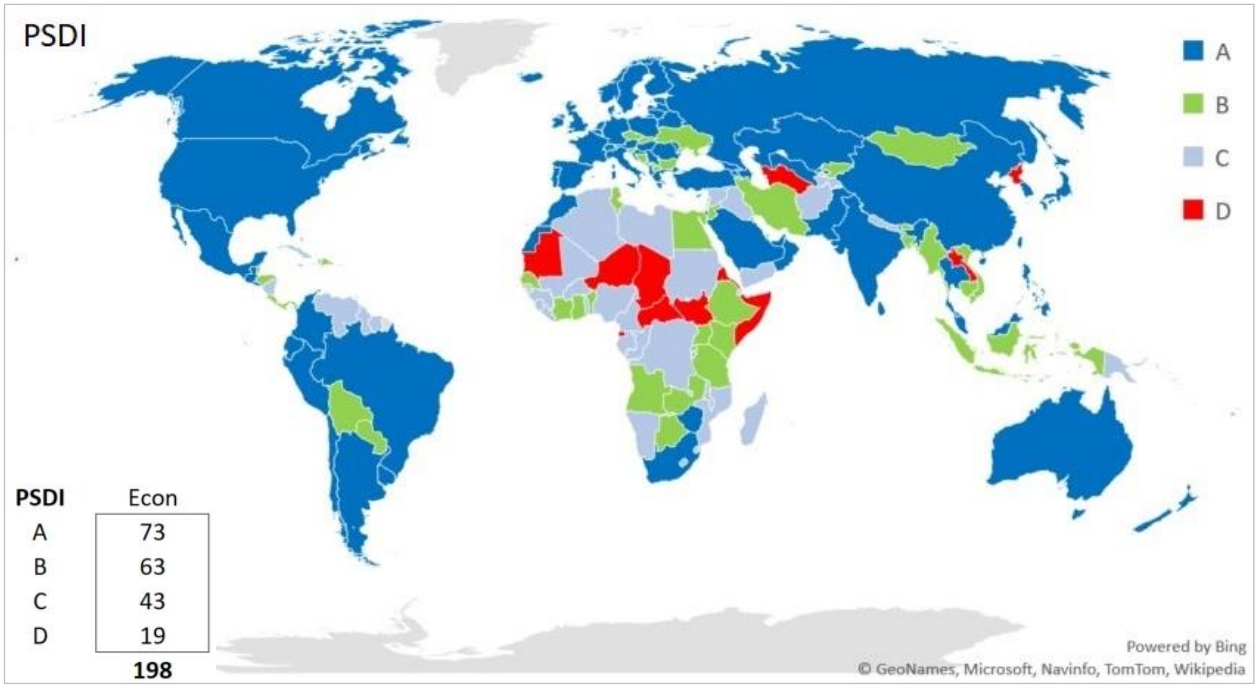
Therefore, future GovTech initiatives are expected to focus on improving the interconnectivity and interoperability of existing systems and portals, benefiting from government service bus and government cloud as shared platforms. There is also a growing interest in PIMS to enhance performance and transparency and reduce the cost and duration of large infrastructure investments. Most of the PIMS solutions (58 out of 61) have been developed by high- and middle-income countries, and about 40 percent of these systems have emerged within the last five years.

State of Public Service Delivery

Good practices in transition to citizen-centric services that are universally accessible are visible in GovTech leaders and several other countries (in Groups A and B) where the design of online services considers device- and internet-access limitations, digital literacy, cultural norms, and other factors that might inhibit access. Some of the advanced service delivery portals can measure the quality of services, provide access to citizens to monitor the progress in their applications, and submit their consent for the use of their personal data as part of the process. Such portals are visible at the national or state level in most of the EU member countries, Australia, Brazil, Canada, Colombia, India, Republic of Korea, Singapore,

U.K., U.S.A. and several other countries. The current status of public service delivery based on the PSDI is presented in Figure 3.13.

Figure 3.13: GTMI: Current State of Public Service Delivery, by Groups



Source: World Bank data.

The GovTech PSDI is based on six key indicators, including an important secondary resource, the UN OSI, as shown in Figure 3.14. Most of the existing government service portals support one-way information flow from government portals to citizens or businesses to provide information about services or available open data. Two-way information flow, interactions, and access to transactional services are visible mainly in Groups A and B, and most of these countries are focused on expanding transactional services to save substantial time and reduce the cost of services. The PSDI includes indicators measuring the capabilities of tax and customs service portals based on the data available in the GovTech dataset.

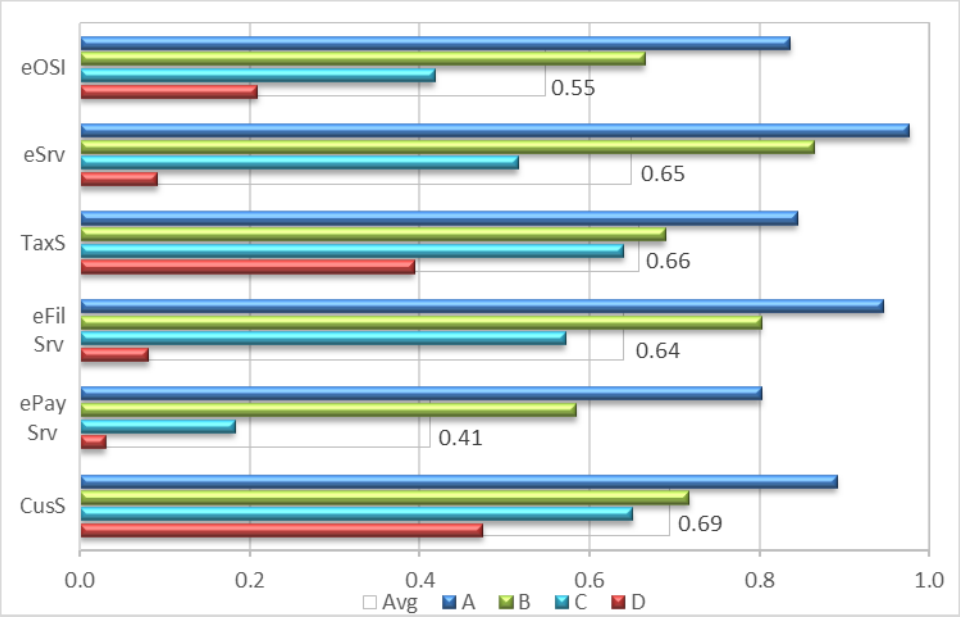
According to the UN 2020 OSI, there has been significant progress in digital services in different geographic regions and countries. E-participation and data-centric approaches have also been enhanced, and the focus on building digital skills has increased. As highlighted in the UN OSI findings, more than a billion people live with some form of disability, and 80 percent of them reside in developing countries.[27] The provision of online services catering to the needs of persons with disabilities varies widely: 152 countries have government portals integrating responsive web design, while only 75 have national portals that are accessible for persons with disabilities (meeting the requirements of the Web Content Accessibility Guidelines in line with World Wide Web Consortium (W3C) Guidelines.

Despite improvements in the delivery of online services, several challenges remain: (i) the growing concern by governments about cybersecurity and by people of data privacy and protection; (ii) ensuring availability of multiple service delivery channels to provide citizens

[27] World Bank Group, 2020: https://ida.worldbank.org/cross-cutting/disability.

with choice of service access, particularly those that may not have adequate connectivity, devices, or literacy; and (iii) limited government financial and human resources for developing and implementing digital government policies.

Figure 3.14: State of GovTech Public Service Delivery Index (PSDI), by Groups



Source: World Bank data.

Note: eOSI: UN Online Service Index (OSI); eSrv: Online public service portal; TaxS: Tax System online service portal; eFil Srv: e-Filing service portal; ePay Srv: online e-Payment service portal; CusS: Customs System online service portal.

State of Citizen Engagement

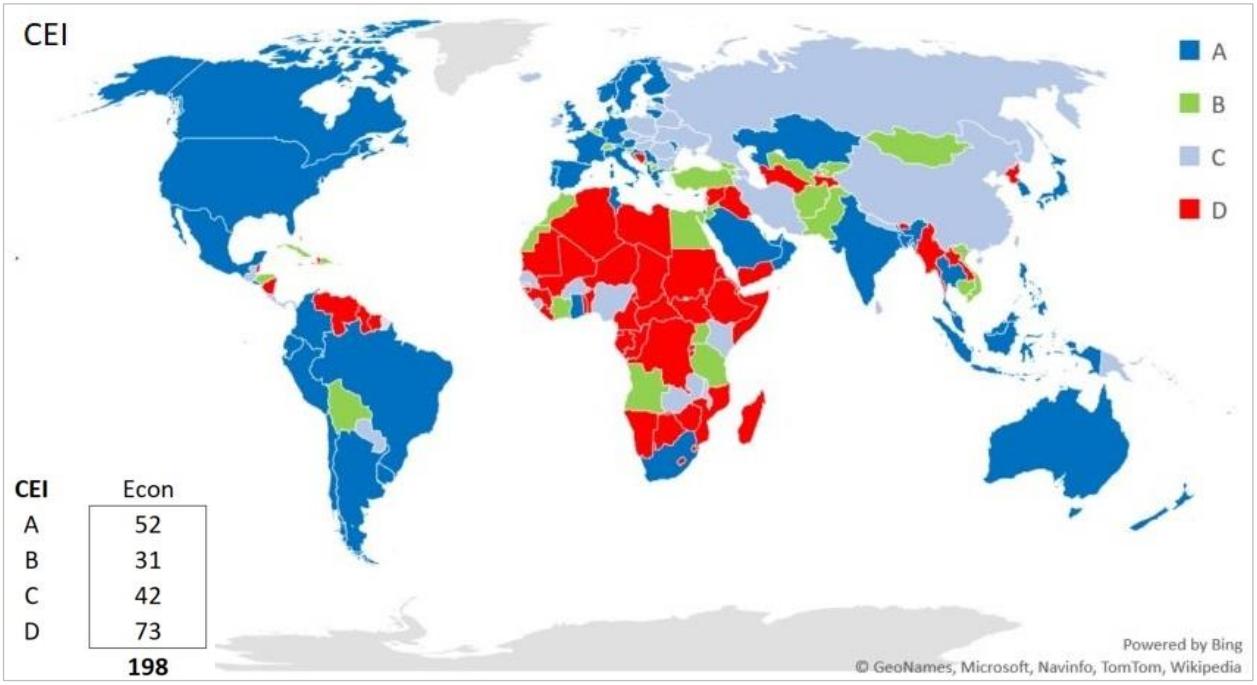
The new GovTech indicators defined for measuring the scope of existing citizen participation and feedback sites revealed that there are 82 government websites providing opportunities for e-participation beyond the provision of information, mainly in countries in Groups A and B. However, the options available on these websites to communicate with the government are limited, and only about half of the e-participation platforms have either online forms available for citizens to submit a petition, publish citizen's inputs, allow the provision of anonymous feedback, or post the government's response. The current status of citizen engagement based on the CEI is presented below in Figure 3.15.

There are 75 countries, mostly in Groups A and B, with a national citizen feedback portal including online grievance redress mechanisms (GRMs), and only about 58 of these platforms provide information on service standards such as expected or actual response times and quality of service. Only 28 citizen engagement government portals are universally accessible or provide support for users with disabilities, including availability of voice command or sign language support.[28] Finally, only 25 countries publish digital citizen engagement (DCE) performance and relevant statistics. Furthermore, there is minimal or no focus on DCE in GovTech Groups C and D countries, mainly due to capacity, resource, and

[28] More than half of these portals are in the ECA region. The EU has a policy on web accessibility (2016): https://ec.europa.eu/digital-single-market/en/web-accessibility.

infrastructure constraints, in addition to the lack of political will and demand-side gaps. Challenges in Internet access and affordability are other important factors limiting the potential of e-participation initiatives.

Figure 3.15: GTMI: Current State of Citizen Engagement, by Groups



Source: World Bank data.

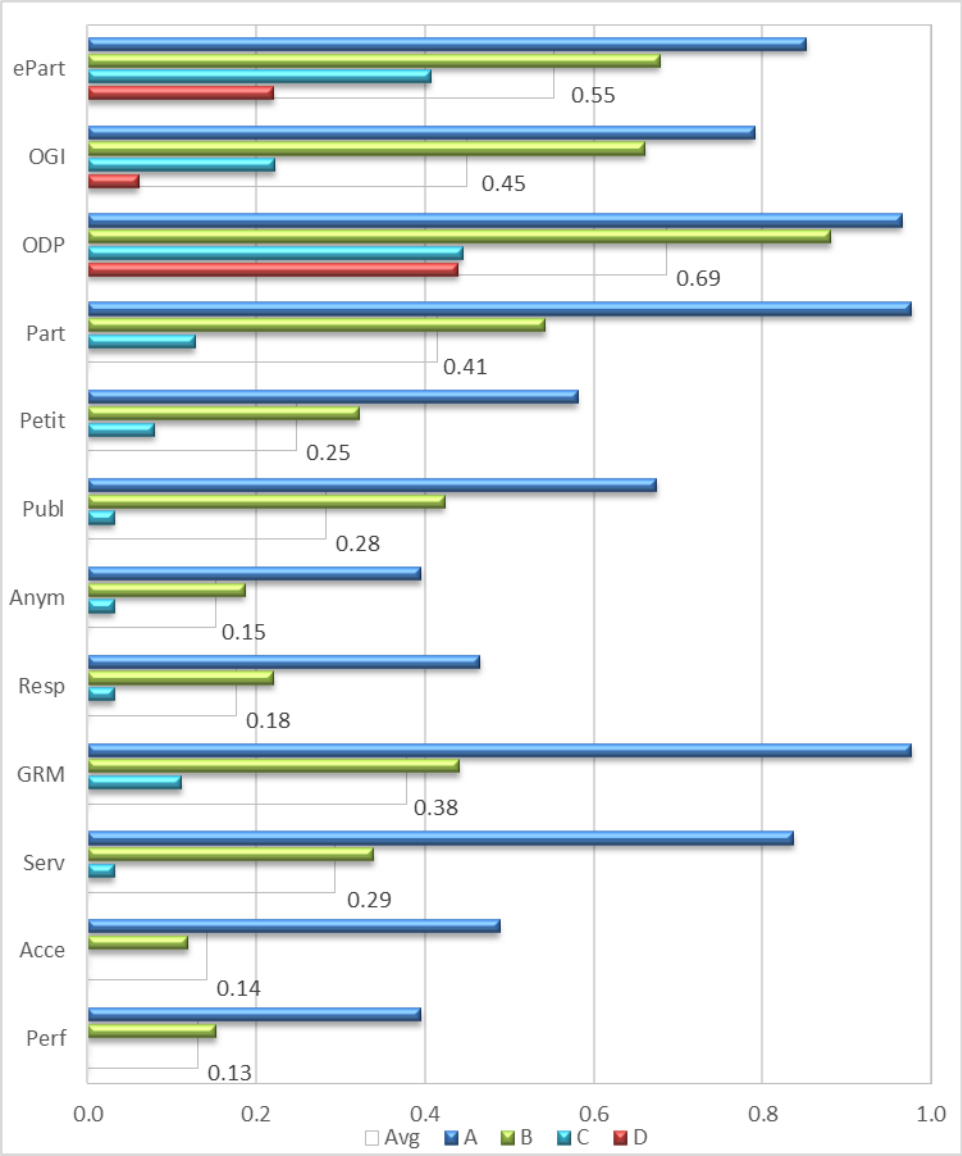
The GovTech CEI is based on 12 indicators, as shown below in Figure 3.16. This is the most difficult component of the GTMI index to measure due to the lack of adequate data on government websites about the level of citizen participation and feedback, as well as the transparency and accountability of the governments. Although several studies present digital solutions available to improve DCE,[29] it is difficult to find reliable information about the impact of these tools and the government's disclosure of service quality standards or responsiveness. Also, institutional capacity needs to be strengthened to mitigate increasing cybersecurity, data protection and privacy risks while expanding to the use of shared platforms, e-services, and citizen feedback mechanisms.

According to the findings of the UN 2020 e-Government Survey, most governments – 170 out of 198, or 86 percent – publish information in each of the six sectors considered in the survey: health, education, employment, social protection, environment, and justice. A small group of countries offers a range of opportunities for e-participation beyond the provision of information – only about 50 countries have websites for online consultations in each of the six sectors assessed. However, the extent of online consultations differs widely across regions. The level of transparency of governments on how citizens' inputs are included in decision-making also varies.

[29] Digital Citizen Engagement (DCE) is defined as the use of new media/digital information and communication technologies to create or enhance the communication channels that facilitate the interaction between citizens and governments or the private sector - see Evaluating Digital Citizen Engagement: A Practical Guide; 2016.

Private e-participation initiatives such as those implemented and monitored by civil society or other organizations, are not reviewed in this study, because the focus is on the use of technology by the public sector to engage with citizens.

Figure 3.16: State of GovTech Citizen Engagement Index (CEI), by Groups



Source: World Bank data.

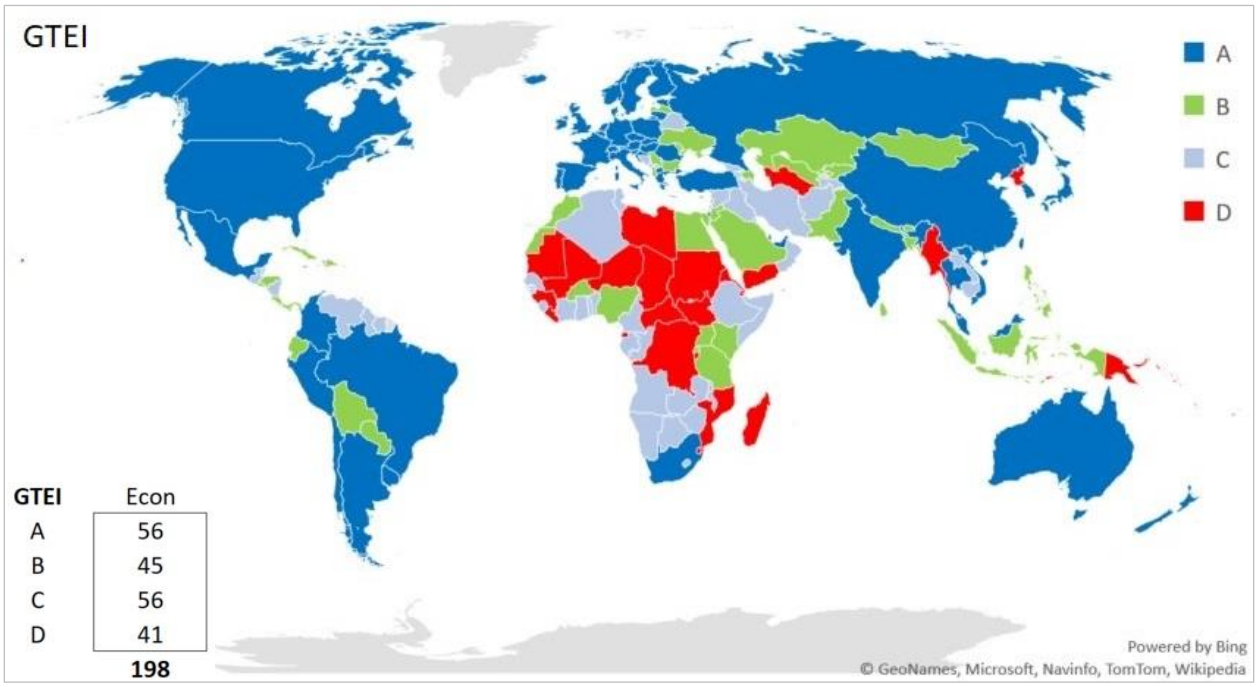
Note: ePart: UN E-Participation Index; OGI: Open Government Initiatives; ODP: Open Data Portal; Part: National website for citizen participation; Part-Petit: Is it for a petition? Part-Publ: Are citizens' inputs publicly available on the platform? Part-Anym: Does the platform allow citizens to provide feedback anonymously? Part-Resp: Is government response publicly available on the platform? GRM: National website for citizen and business feedback/Grievance Feedback Management; GRM-Serv: Does the government make the service standards available to the public? GRM-Acce: Are these platforms universally accessible or provides support for users with disabilities? Perf: Does the government publish its engagement statistics and performance regularly?

The UN e-Participation Index covers the private sector dimension and highlights that "*boundaries between public and private initiatives in e-participation have become blurrier, as both the private sector and not-for-profit organizations have built platforms for citizen action or user feedback*." Also, it is not clear that the availability of expanded digital platforms has translated into broader or deeper participation. In many cases, the take-up of e-participation solutions remains low.

State of GovTech Enablers

The GovTech Enablers Index (GTEI) measures the state of four main cross-cutting drivers of the digital transformation agenda in the public sector: digital skills in the public sector; an appropriate and conducive legal and regulatory regime; strong enabling and safeguarding institutions; and an environment that fosters innovation in the public sector. The current status of GovTech enablers based on the GTEI is presented in Figure 3.17.

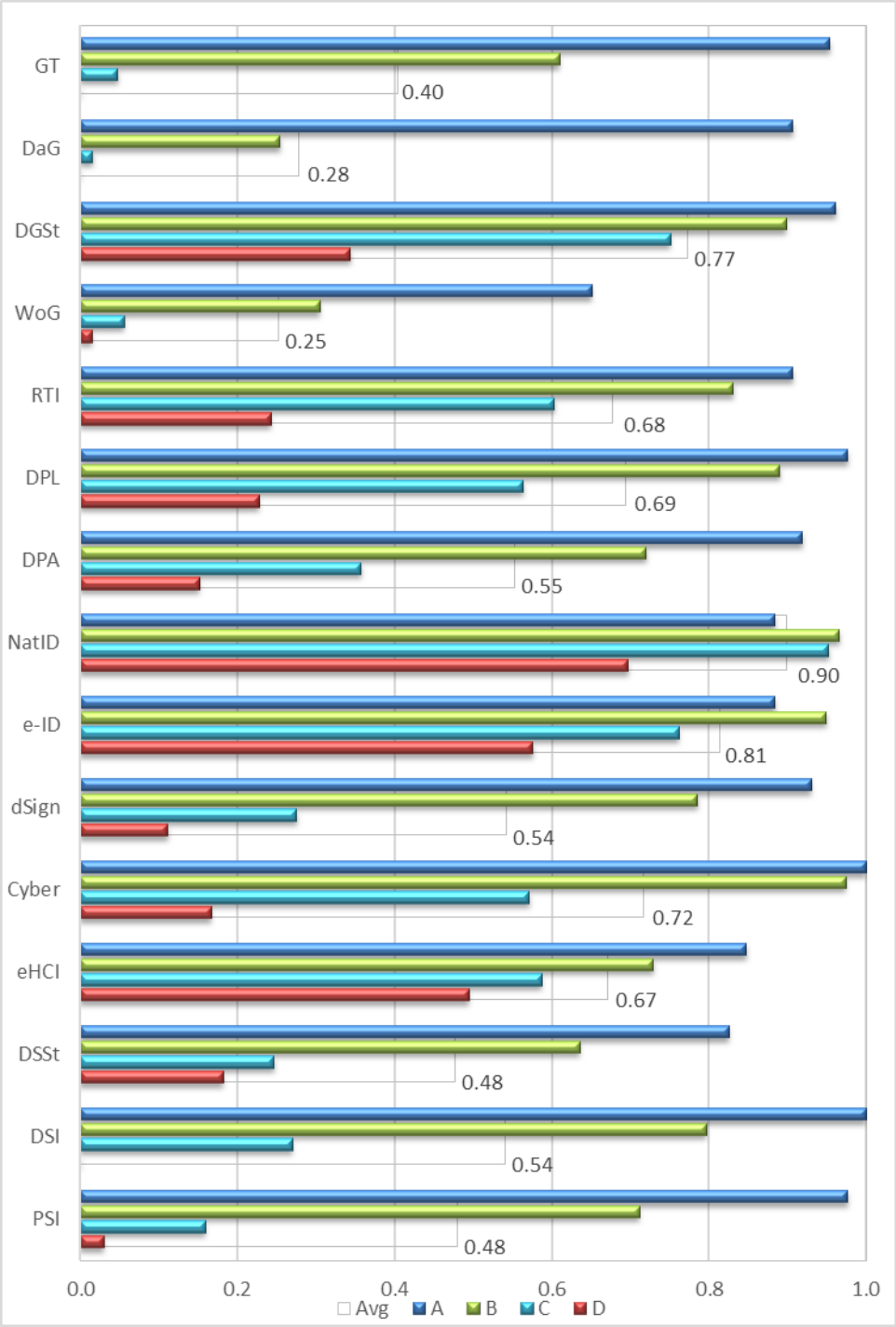
Figure 3.17: GTMI: Current State of GovTech Enablers, by Groups



Source: World Bank data.

The GTEI is based on 15 key indicators, as presented in Figure 3.18. As explained earlier, new GovTech institutions and dedicated data governance bodies have emerged in Groups A and B countries within the last decade. It is encouraging to note that most of the digital government strategies and action plans updated within the last five years include the establishment of enabling and safeguarding institutions to support the GovTech agenda, with more focus on the whole-of-government approach, digital skills and innovation in the public sector. These advanced capabilities of a local GovTech ecosystem are more visible in Group A and B countries, and there are Groups C and D countries, such as Angola, Cuba, Guatemala, Nigeria, and Senegal, also focused on improving data governance, digital skills, data literacy and public sector innovation.

Figure 3.18: State of GovTech Enablers Index (GTEI), by Groups



Source: World Bank data.

Note: GT: GovTech Institutions; DaG: Data Governance Institutions; DGSt: DG / GovTech Strategy; WoG: Whole-of-government approach; RTI: Right to Information (RTI) Laws; DPL: Data Protection/Privacy Laws; DPA: Data Protection Agency; NatID: Unique national ID system; e-ID: Digital ID; dSign: Digital signature; Cyber: Cybersecurity agency; eHCI: UN Human Capital Index (HCI); DSSt: Strategy on digital skills in public sector; DSI: Digital skills & innovation program; PSI: Entity/strategy focused on public sector innovation.

There has been good progress on the establishment of data protection agencies, cybersecurity emergency response teams, and digital skill development programs in all countries. Also, the right to information and data protection laws and regulations have been adopted in more than 130 countries (65 percent) in all groups. About half of these institutions and regulations were established and became effective within the last decade.

It is estimated from the ID4D dataset that about one billion people do not have official proof of identity, although 186 economies (94 percent) in all GovTech groups have mandatory birth registration systems, and 180 economies issue national ID to citizens. Among those that issue national IDs to citizens, in 19 countries the national ID is issued at birth, while in the others, the ID is issued after a certain age. Also, the national ID is mandatory in 151 economies (76 percent). Based on the 2018 update of the ID4D dataset, 161 economies have ID systems using digital technologies, e-ID, reinforcing the need for robust privacy and data protection safeguards.

Interestingly, GovTech Groups B and C countries are leading the implementation of unique national ID systems and digital ID solutions to improve service delivery. There is a national ID system in some of the GovTech leaders: Australia, Canada, New Zealand, U.K. and U.S.A.. Regarding the use of digital signature in the public sector for operations and service delivery, Groups A and B countries are leading, and there are emerging good practices in other country groups as well.

Challenges and Opportunities

Challenges

Key development challenges in the GovTech domain are summarized below.

- Trust in government is low (WDR, 2017). More transparency and inclusiveness are needed to improve service quality and satisfaction and strengthen confidence in government and institutions.
- Commitment at high government levels and the allocation of required resources are crucial to implementing the whole-of-government approach, removing inefficiencies, and reducing fraud and corruption risks.
- Implementing whole-of-government digital government strategies and large-scale public sector reforms is difficult, especially in low- and middle-income countries (MICs).
- Substantial investments in hardware, software, change management and skills to support the transition to integrated digital solutions and shared platforms are lacking.
- Mitigating increasing risks to cybersecurity, data protection, and privacy through strengthened institutions and regulatory environment is necessary for increasing public trust, uptake, and use of public sector platforms, e-services, and citizen feedback mechanisms.
- Digital investments need the support of “analog complements” (WDR 2016): effective regulations that empower businesses to leverage the Internet to compete and innovate; improved technical skills to take full advantage of digital opportunities; and accountable institutions to respond to citizens’ needs and demands.

- Ensuring GovTech solutions do not exacerbate existing divides in terms of the accessibility of services and the distributional implications of the cost of mobile data or Internet (especially in LICs), as well as device access, inclusion, and literacy.
- Low-income countries (LICs) and some MICs are experiencing multiple structural difficulties relating to digital and hard infrastructure, low levels of Internet use, low purchasing power, high cost of smart mobile devices, and inadequate awareness/skills to use digital technologies.

Regarding the equitable access to GovTech services and solutions, it is important to note that the level of Internet penetration/use and the reach of digital infrastructure both within countries and across regions could either promote equality or increase inequality. The CGSI includes the UN TII that captures relevant dimensions including the percentage of population using Internet, and the number of mobile cellular subscriptions per 100 habitants. Figures 3.19 and 3.20 below present a comparison of these two indicators with the GTMI groups to reflect the substantial gap between Groups A and D.

Figure 3.19: Internet Users as Percentage of Population vs GTMI, by Group

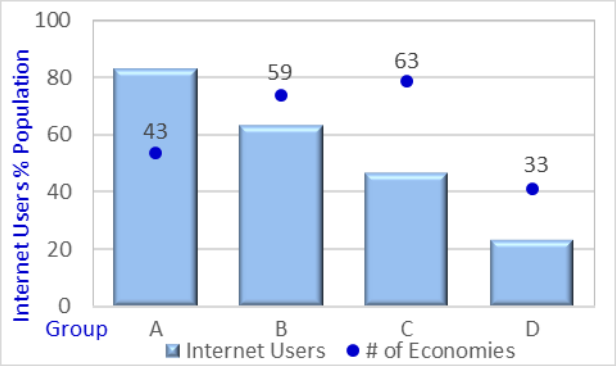
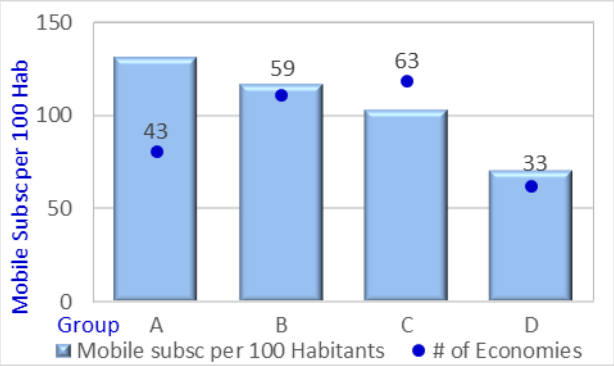


Figure 3.20: Mobile Subscribers per 100 Habitants vs GTMI, by Group



Source: World Bank data.

Additionally, the relative cost of mobile data varies by country, see: the cost of 1GB of mobile data available for 188 economies. Since individuals in LICs and MICs primarily rely on mobile data, the digital divide may be exacerbated by real costs to consumers.

Figure 3.21: Avg. Cost ($) 1GB Mobile Data vs GTMI

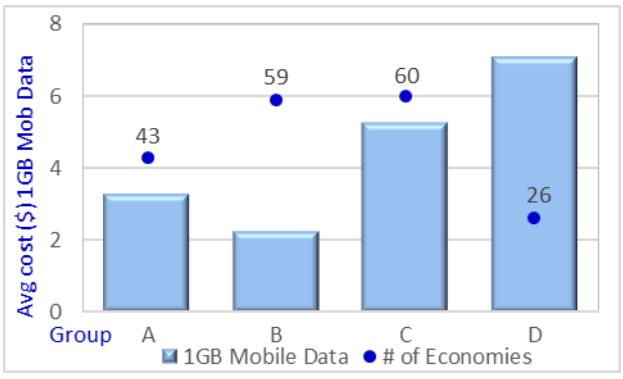
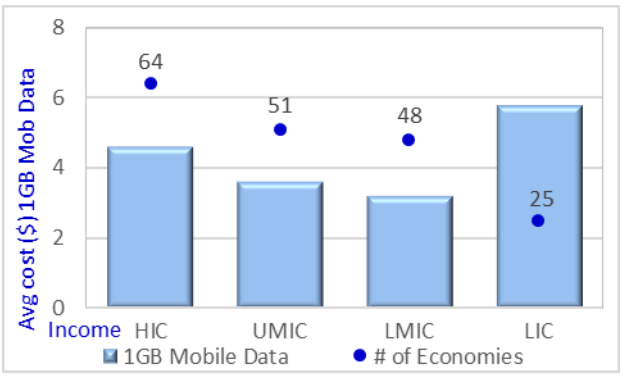


Figure 3.22: Avg Cost ($) 1GB Data vs Income Levels



Source: World Bank data.

The variation of mobile data costing in four GTMI groups and according to income levels shown in Figures 3.21 and 3.22 indicates that access to GovTech services/solutions is enjoyed primarily by wealthier populations and not equitable at national/subnational levels mainly due to the lack of adequate infrastructure and digital literacy, especially in rural areas. It is important to note the relatively lower cost of mobile data in middle-income countries and GTMI Group B countries (mostly middle income) compared to other groups, and high costs in LICs.

Opportunities

The WBG has demonstrated a comparative advantage, in terms of global knowledge and experience, to support client countries to develop effective GovTech solutions in the following areas.

- COVID-19 recovery and resilience: GovTech solutions are crucial for ensuring the continuity of core government operations and secure remote access for government officials; supporting vulnerable people and businesses; and deploying less expensive and more reliable ICT infrastructure solutions such as government cloud and mobile/portable data centers, for rapid modernization of existing systems and services.
- Government Core Operations: Modernization and digitalization of core government functions can make them more efficient, effective and transparent. Also, digital government capacity is positively associated with lower perceptions of corruption. While digital technologies can be used effectively to detect and reduce corruption and mitigate other risks, they can also provide opportunities for new types of corrupt practices.
- Human-centered[30] service delivery: GovTech envisions a whole-of-government approach with integrated e-service solutions and e-kiosks such as online access to tax, registries for citizens, businesses, property and land, and application for certificates and passports. Interoperability of government systems enables governments to generate data for more informed decision making, compliance, and monitoring.
- Citizen Engagement: GovTech facilitates citizen engagement by promoting continuous two-way communication between governments and citizens through digital solutions such as SMS messaging, open source applications, social media, and online petition platforms.
- The IDA 19 policy commitments include support for at least 12 International Development Association (IDA) countries to adopt universally accessible services and improve core government systems, with a focus on fragile and conflict and violence affected countries.
- The sustainable development agenda includes ambitious GovTech related targets to be achieved by 2030.

[30] Human-centered services, also referred to as "user-centered services," are based on the use of techniques that communicate, interact, emphasize, and stimulate the people involved, obtaining an understanding of their needs, desires, and experiences. The goal of human-centered design is to end up with a solution that is tailored to meet people's needs, with little wasted effort and reduced risk. See the 18F Methods for the use of this technique in the US Government.

- GovTech projects can support the digital governance reform and investment needs identified in the digital economy country diagnostics such as digital infrastructure, digital platforms, digital financial services, businesses, and digital skills.
- GovTech projects can also support the jobs and economic transformation agenda in developing countries.

The GovTech approach also provides an opportunity to increase collaboration among WBG global practices involved in digital and disruptive technology applications and support a whole-of-WBG approach to present the WBG capabilities to member countries and development partners with a shared vision.

In order to turn these opportunities into sustainable outcomes, the following aspects could be considered by government officials and task teams involved in GovTech initiatives:

- While the whole-of-government approach is important to enhance core government systems and promote human-centered design, this will require the establishment of an integrated national team, including all key stakeholders, seamlessly building, and improving on the GovTech results. These key entities include the ministries and agencies of telecommunications and digital economy, finance, interior, education, health, and social protection. Similarly, effective donor coordination and collaboration are needed to ensure sustainable investments and outcomes.
- GovTech teams could focus on balancing personal data protection and data sharing, and the cybersecurity measures, without which all the government efforts may be at substantial risk.
- Allocation of adequate resources and development of guidelines for the procurement of new and disruptive technology solutions are essential to ensure the sustainability of GovTech investments and measuring government performance accordingly.
- Investments in government cloud solutions, open source applications, web services, APIs, interoperability standards, government service bus and other shared platforms could reduce the cost and duration of digital transformation in public sector.
- GovTech initiatives could also focus on interconnecting government offices, schools, and hospitals through a secure, safe, and sustainable broadband strategy in collaboration with private partners.
- Improving government-to-person payments through digitization became more important, as governments worldwide sought ways to respond to the economic and social consequences of the COVID-19 pandemic. The use of digital solutions and mobile devices for cash transfers to the vulnerable population can reduce costs for governments, significantly improve recipients' access to payments, and bring digital payments one step closer to becoming the large-scale conduit for financial inclusion.
- The WBG and development partners could also improve coordination and collaboration and adopt a whole-of-WBG approach to ensure that the advice and technical assistance provided to client countries are consistent with the future demand.

Good Practices

Based on the findings of this study, 22 good practice cases were highlighted in this section related to GovTech focus areas – see Table 3.2.[31] The discussion focuses not only on already established systems or implemented services, but also on new initiatives, to proffer insights and share experiences with other countries in similar contexts.

In selecting GovTech good practices, the following criteria were applied:

- Promotion of a whole-of-government approach while modernizing and/or integrating core government systems and online services.
- Support for citizen-centric services that are universally accessible.
- Promotion of digital citizen engagement/CivicTech activities and the effective use of existing service portals for citizen participation and feedback.
- Focus on improving the local GovTech ecosystem supporting local entrepreneurs and start-ups to develop new products and services for the government.
- Use of new/disruptive technologies for public sector modernization – for example, artificial intelligence and machine learning, cloud computing, and the Internet of Things.
- Support for public data platforms, promoting the use of open public data by individuals and firms to create value.

Table 3.2: Good Practices in the GovTech Domain

Group	#	Selected GovTech good practices
A	11	Argentina, Australia, Austria, Brazil, Colombia, India, Rep. of Korea, Singapore, South Africa, Switzerland, U.A.E.
B	9	Albania, Bhutan, Cabo Verde, Indonesia, Mauritius, Moldova, Rwanda, Tunisia, Vietnam.
C	2	Madagascar, Togo.

Income Level	#	Selected GovTech good practices
High income	8	Australia, Austria, Republic of Korea, Mauritius, Singapore, Switzerland, Tunisia, U.A.E.
Upper-middle	6	Albania, Argentina, Brazil, Colombia, Indonesia, South Africa.
Lower-middle	4	Bhutan, India, Moldova, Vietnam.
Low income	4	Cabo Verde, Madagascar, Rwanda, Togo.

Region	#	Selected GovTech good practices
Africa	6	Cabo Verde, Madagascar, Mauritius, Rwanda, South Africa, Togo.
East Asia and Pacific	5	Australia, Indonesia, Republic of Korea, Singapore, Vietnam.
Europe and Central Asia	4	Albania, Austria, Moldova, Switzerland.
North & South America	3	Argentina, Brazil, Colombia.
Middle East & North Africa	2	Tunisia, U.A.E.
South Asia	2	Bhutan, India.

Source: World Bank data.

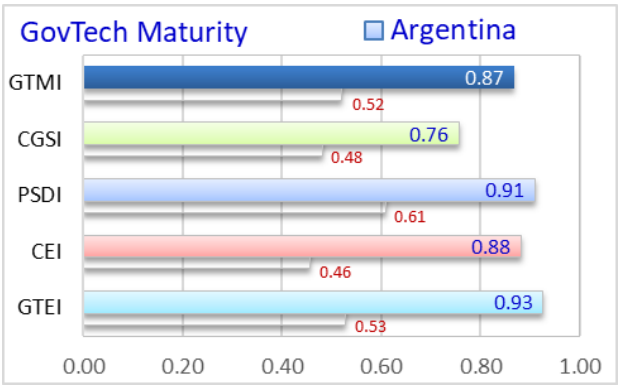
The 22 selected good practice cases are presented below, together with the GTMI scores and relevant websites. The group average score is shown behind each country-specific GTMI component score.

[31] Well-known good practice cases such as Estonia, Denmark, U.K., and U.S.A., already documented in the latest UN, EU, and OECD reports, were not included to avoid repetition, and provide more room for less known country cases.

GovTech Leaders (Group A)

Argentina

The Digital Agenda of Argentina is focused on strengthening GovTech enablers and core government systems and online services to support public sector modernization. The Undersecretariat of Open Government and Digital Country, under the Cabinet of Ministers, is leading the GovTech reforms, and the provinces have similar GovTech initiatives – for example, Secretariat of Modernization of the Government of Entre Ríos.



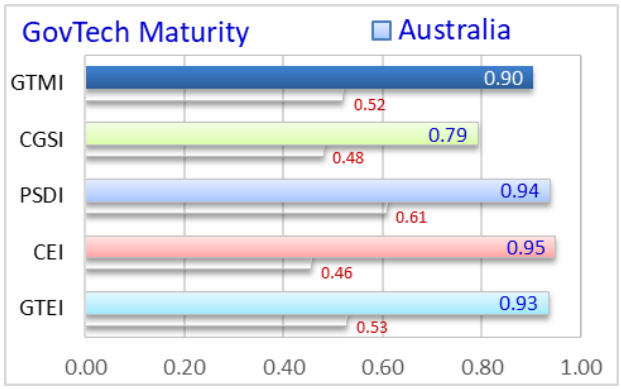
The government promotes the use of citizen-centric online services and citizen engagement. Several innovative solutions are available to promote the whole-of-government approach, including the Digital Solutions for Public Administration, Wi-Fi Country Digital, and Virtual Learning Platform to improve the quality and scope of online services and digital inclusion.

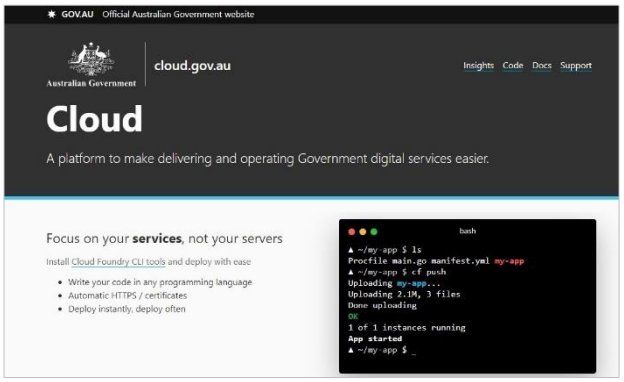
Consulta Publica is an open-source public consultation platform for dialogue and debate that allows interaction between the government and the community, promotes citizen participation, and helps to strengthen democracy. Digital Points (Punto Digital) is the most extensive digital inclusion and technology training initiative established 10 years ago. The miArgentina App provides access to all online services and public information.

The LABgobar was established in 2016 to guide public employees and entities to enhance public sector innovation and digital skills. This innovation lab has applied design thinking for solving problems collectively, focusing solutions on people, generating a diversity of alternatives, and promoting experimentation. A summary of the results achieved in public sector innovation and citizen participation projects (2017-2019) is presented on the web.

Australia

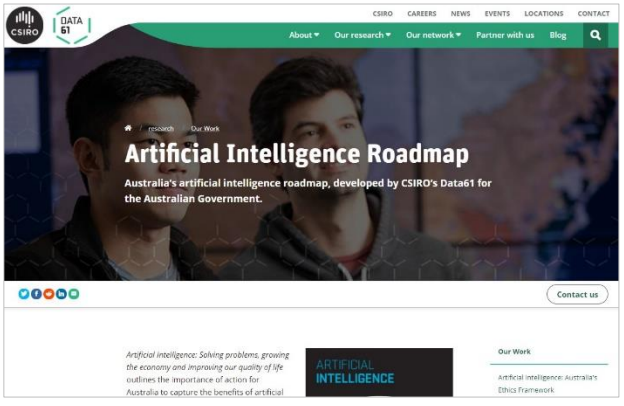
In 2018, the Australian Government released its Digital Transformation Strategy, providing a clear vision for the modernization of public services by 2025, led by the Digital Transformation Agency . As highlighted in the UN 2020 eGov Survey, the strategy includes a strong focus on making public agencies user-centric and widening the accessibility of digital services to ensure their availability for all. To embed the National Strategy in subnational and local structures, the country has formed the Australian Data and Digital Council.





Australia has a central digital government portal, my Gov, providing access to more than 900 online services. Citizens can submit a complaint or provide feedback about online services. GovTech legal framework ensures that personal digital data are protected and gives citizens a de facto right to digital government. Gov.au Observatory has been established to identify potential and actual problems people experience when using government services online.

A Government Cloud has been created as a shared platform to run web apps, freeing up teams to focus on writing code that meets user needs. It also provides real-time visibility and insight into web app usage, performance, and behavior.

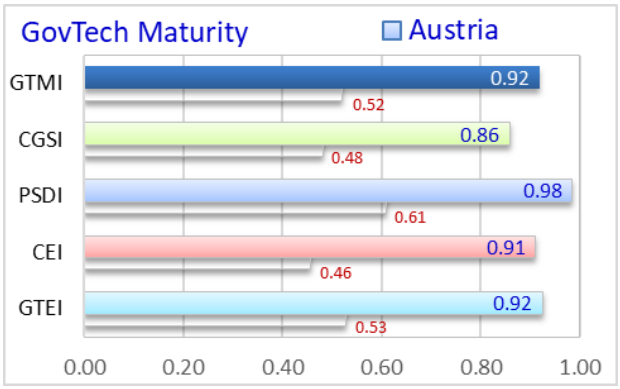


The Australian Government published an AI strategy in November 2019 to capture the benefits of AI in the public and private sectors. The government also has plans geared towards other disruptive technologies including Blockchain and Internet of Things (IoT).

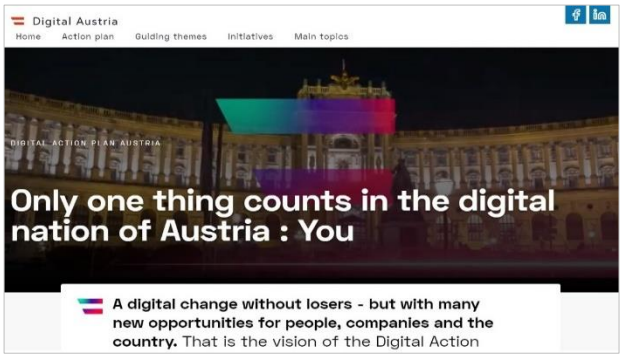
The government is also working on a new Digital Identity to provide Australian people and businesses with a single, secure way to access government and other services online.

Austria

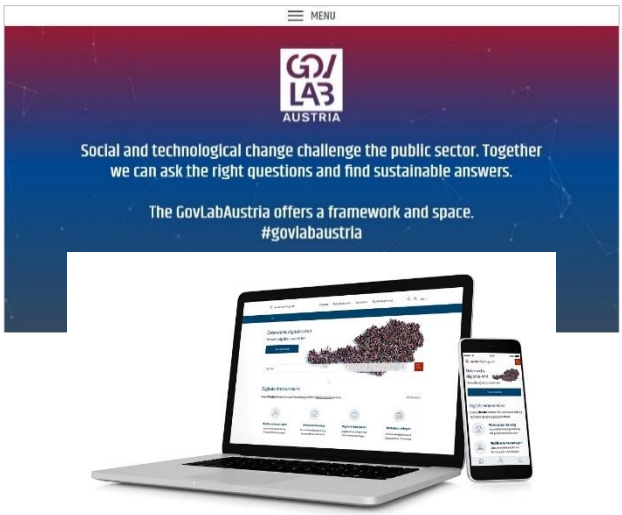
Austria is one of the GovTech leaders with high scores in all four focus areas. Austria's service delivery score is especially worth highlighting as the country has taken impressive steps to use the potential of digitization to engage citizens and deliver services. Austria placed third in Europe on four eGovernment benchmark components: user-centricity, transparency, cross-border access, and the infrastructural basis.



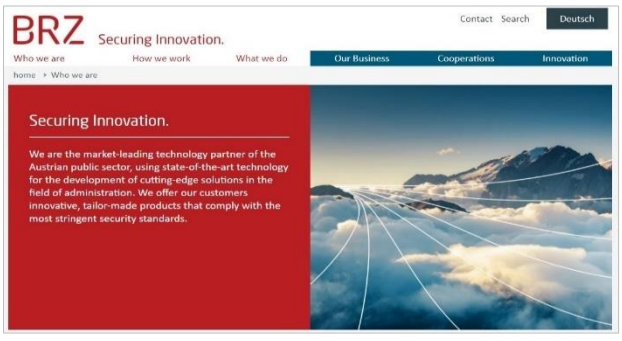
Austria also has a public sector digital skills and innovation website, GovLab Austria, which provides training on innovation methods and a platform to exchange ideas with other innovators in administration. Austria's Digital Strategy presents a very strong vision and pillars to underpin the country's digitization journey. It presents the vision to digitize responsibly and securely, considers the legal foundations of digitization and infrastructure equity and puts forth the various initiatives to promote the whole-of-government approach.



Currently, Austria's transition to Mobile Government (m-Gov) is a flagship initiative. The oesterreich.gv.at platform was launched in 2019 for access to comprehensive, online administrative information and services through various devices including "Digitales Amt" (Digital Office) mobile app. Also, the right to electronic interaction with the administration entered into force in 2020.

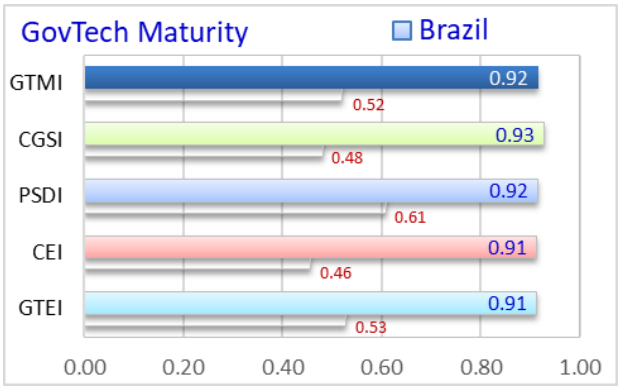


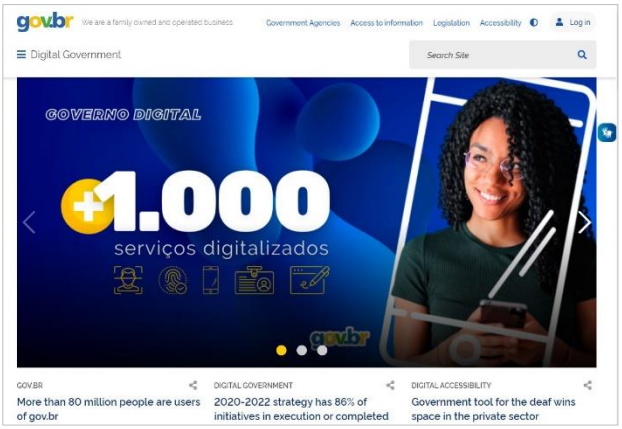
The Austrian Federal Computing Center (Bundesrechenzentrum or BRZ) is the technology partner of the public sector and one of the key contributors to the GovTech agenda. The BRZ develops and implements IT applications and e-government solutions. The BRZ's Innovation Factory has been launched to explore new ways of developing ideas. BRZ also operates one of Austria's largest data centers for the public sector.

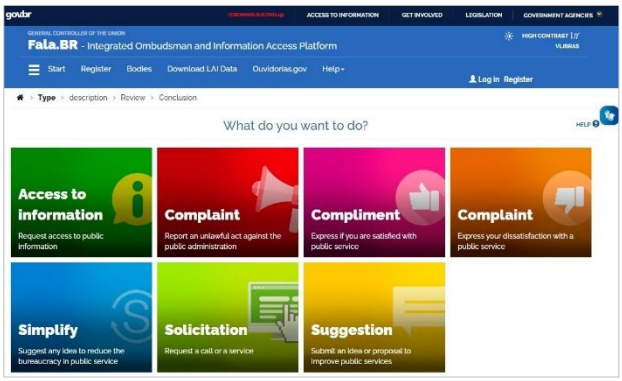


Brazil

Brazil is one of the GovTech leaders in core government systems and enablers. The country's Digital Governance Committee is responsible for digital advancement in government. Brazil's Digital Government website presents the planned trajectory of digital transformation including 2020-2022 Digital Government Strategy, as well as data governance, security and data protection frameworks. Brazil's new AI Strategy was published for consultations in December 2019.





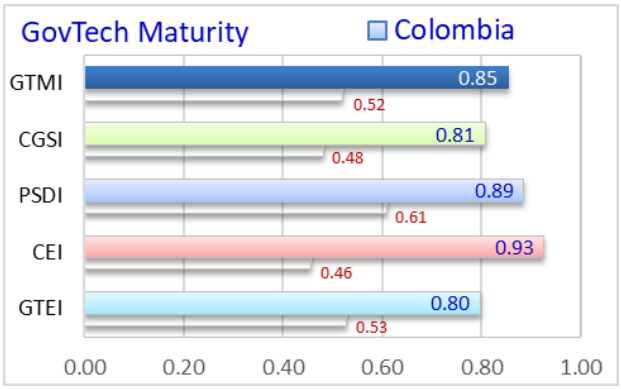


Brazil's Interoperability Standards (ePING) was launched in 2014 and revised in 2019. The use of open-source software in the public sector is being promoted through Software Público Brasileiro portal launched in April 2007 and currently providing free access to 60 solutions for different sectors. The Integrated Ombudsman and Information Access Platform (Fala.BR) is another important site for the management of citizen feedback and posting the government's responses.

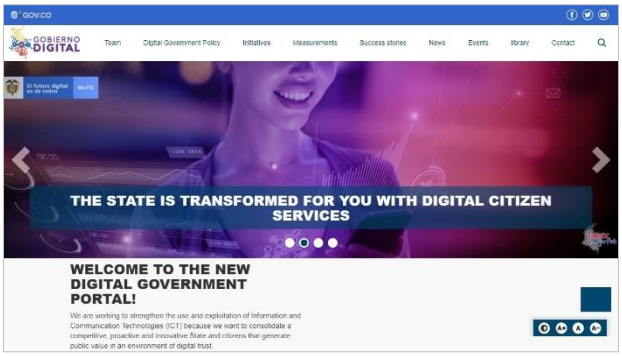
The new DG strategy is more focused on citizen-centric policies and services aiming to transform the State into a service provider that constantly seeks to understand the needs of service users and offers value and a good user experience for citizens and CSOs. Also, the first GovTech Brazil event was organized in 2018, and Brazil Lab actively supports public sector innovation.

Colombia

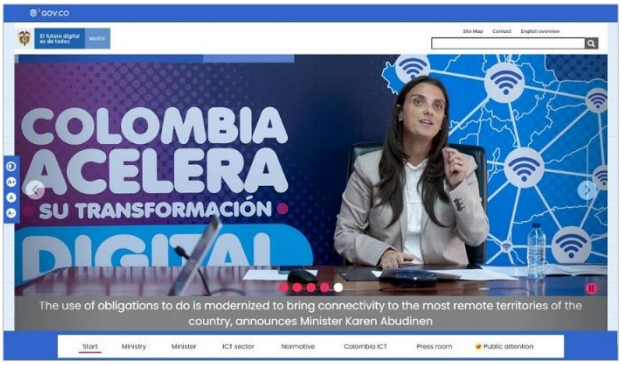
Colombia is in Group A on the GovTech Maturity Index, and ranked third on the OECD 2019 Digital Government Index that rates the digital transformation policies of 33 countries. Digital government is a national priority, and the Ministry of Information Technology and Communications (MinTIC) is leading the GovTech initiatives to improve Internet connectivity and access to online services, particularly for some of the more vulnerable groups in society.



A new Digital Government Portal presents the links to a large number of websites providing access to GOV.CO (Single Portal), Digital Single Windows, Data Sandbox, Free Open Source Software, Center for Digital Public Innovation, and more.



Urna de Cristal was launched in 2010 as a multifunctional citizen participation portal. Currently, the government is improving connectivity through 800+ new digital zones – free Internet connection points. Digital zones will continue providing 24/7 free Internet services in around 10,000 rural and remote communities at least until the year 2030 as a result of a $2 billion investment made.



GOV.CO/Territorial portal (2019) provides access to all available territorial websites created since 2010 to encourage citizen participation, promote citizen oversight, and improve countrywide access from any mobile device, tablet, or web.

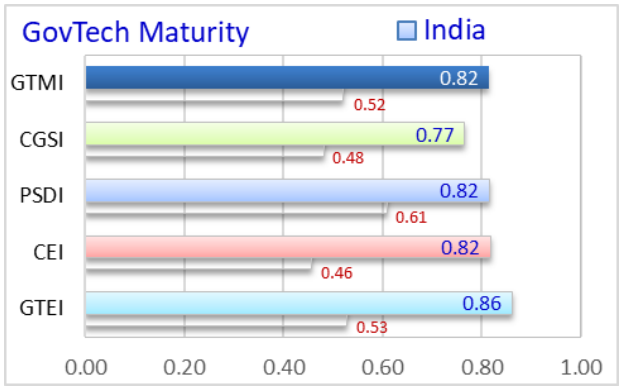
A Digital Government Index has been defined to measure the progress through interactive, territorial, national and international indices, and post the results annually on the web. Additionally, DG success stories and regular updates on all DG initiatives are published on the Digital Government website to inform the public.

India

The Digital India program launched in 2015 is the key GovTech initiative with a vision to improve digital infrastructure, access to online services, and digital literacy. All major GovTech initiatives are presented on the Digital India website. The Aadhar unique identity system is one of the key pillars of Digital India. As of December 2020, about 1.276 billion unique ID numbers have been issued and 49.7 billion authentications have been completed using Aadhar.

There are 9,960+ services listed under the National Government Services Portal for 15 key public service sectors. MyGov is a participatory governance platform designed as an interface with citizens for the exchange of ideas and views. Unified Mobile Application for New-age Governance (UMANG) is an all-in-one secure multi-channel, multi-platform, multilingual, multi-service freeware mobile app for accessing over 2,000 central and state government services. DigiLocker is a Digital Wallet, a secure cloud-based platform for the issuance, sharing, and verification of critical lifelong documents or certificates.

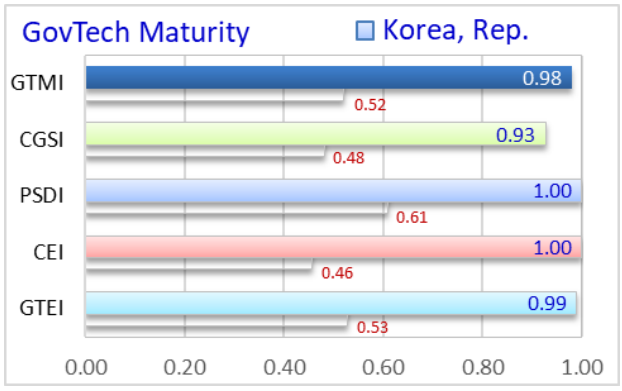
A national strategy for AI has been published and the Centre of Excellence for IoT has been established to jump-start the IoT ecosystem. Accessible India Campaign and Mobile App is a nationwide flagship campaign for achieving universal accessibility that enables people with disabilities to gain access to all services and participate fully in all aspects of life in an inclusive society. Also, India is one of the founding members of the Global Partnership on Artificial Intelligence (GPAI), established in June 2020 (currently 19 countries) for sharing multidisciplinary research and identifying key issues among AI practitioners to promote the adoption of trustworthy AI.

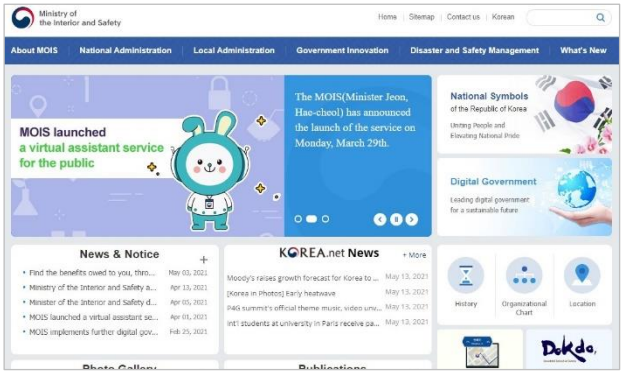


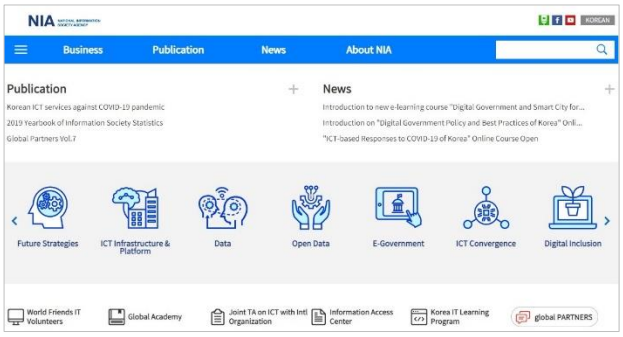
Republic of Korea

The Republic of Korea (RoK) is among the top five countries in all four GovTech focus areas, and the global leader in citizen engagement. The Ministry of Interior and Safety (MoIS) website is the entry point for the RoK's vision and strategy for digital transformation. A rich set of plans is available for download: e-government 2020 Action Plan, Intelligent Government Basic Plan, and DG Innovation Promotion Plan. These plans have institutionalized the pursuit of a whole-of-government approach and specify the strategy for a transition to intelligent information technologies such as AI, big data analytics, cloud, open platforms, IoT, and online to offline (O2O).[32] The RoK also has plans for machine learning and blockchain, with pilot projects underway, together with a national 5G strategy.

The RoK is committed to citizen participation, consistent with its Open Government Initiative membership since 2011. The national participatory budget website is another fine example of citizen engagement. Policies and guidelines on GEA, data classification, and standardization have been established and enforced over the years. There is also an open data portal with up-to-date downloadable data in different formats, including CSV, XML, and JSON.







[32] In Korea, DG Innovation Plan emphasizes non-contact public services and O2O (online to offline) services to citizens by combining virtual and physical spaces through hyper-connected devices such as Internet of Things (IoT), cloud computing, big data analytics, mobile devices, and other intelligent technologies. In Gov 3.0 environment, Korean officials do not wait at the office for the digital access and applications of citizens needing administrative services, but actively visit the blind spots using sophisticated digital devices to provide the customized and integrated services.

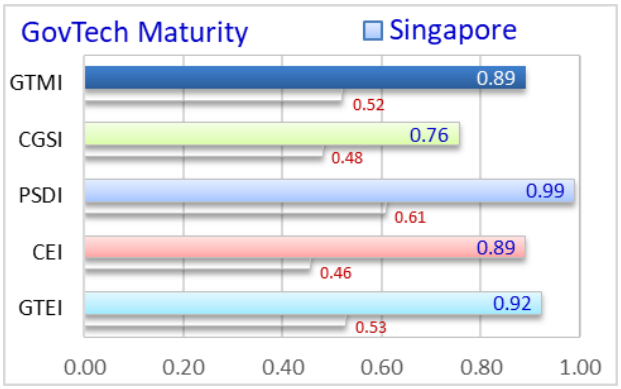
Singapore

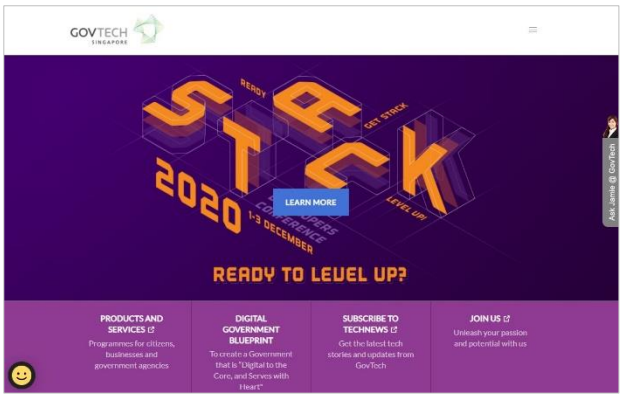
In Singapore, the Government Technology Agency (GovTech Singapore) is responsible for the implementation of national digital government strategies and services using a whole-of-government approach. In 2014, Singapore launched the Smart Nation initiative, of which digital government is an integral part. In 2018, the Digital Government Blueprint was developed to better leverage data, harness new technologies, and drive broader efforts to build a digital economy and digital society.

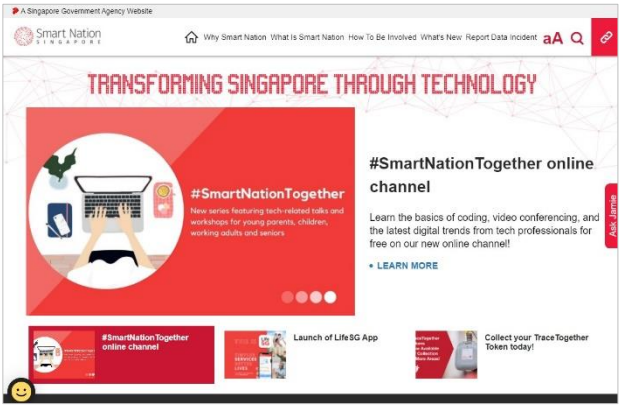
Singapore has a one-stop-shop government portal (Gov.sg) that provides access to specialized portals for e-services, open data, e-participation, and public procurement. The government has also created digital platforms for citizens to plan and monitor their social security savings or report issues with government services. Singapore is using predictive systems and services in the health sector, tax administration, business registry, smart city applications, and more.

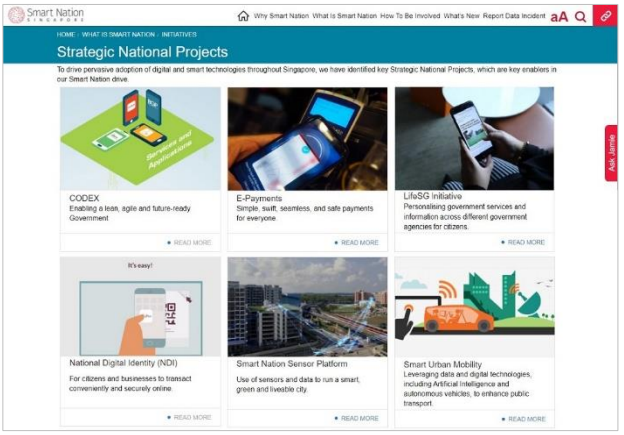
Singapore is one of the global leaders in the GovTech ecosystem and broadband access. The Personal Data Protection Act and Cybersecurity legislation were approved in 2012, whereas the Government Data Office was subsequently established in 2018. Despite these opportunities, many elderly Singaporeans cannot use the Internet and are, consequently, digitally marginalized.

The Smart Nation website presents the details of Strategic National Projects, including Core Operations Development Environment and eXchange (CODEX), National Digital Identity (NDI), Smart Nation Sensor Platform, e-Payments, and Mobile Apps. Another new platform is Open Certs, a blockchain-based application offering an easy and reliable way to issue and validate tamper-resistant academic certificates.







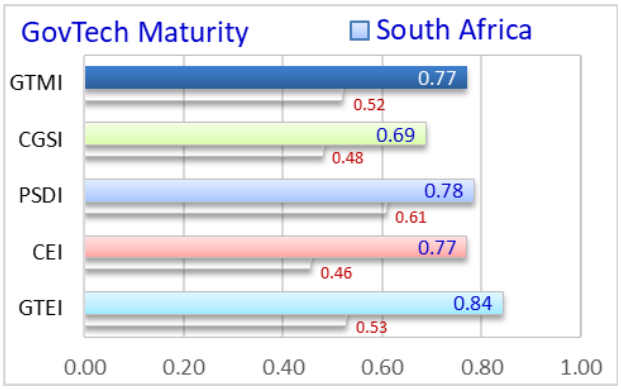


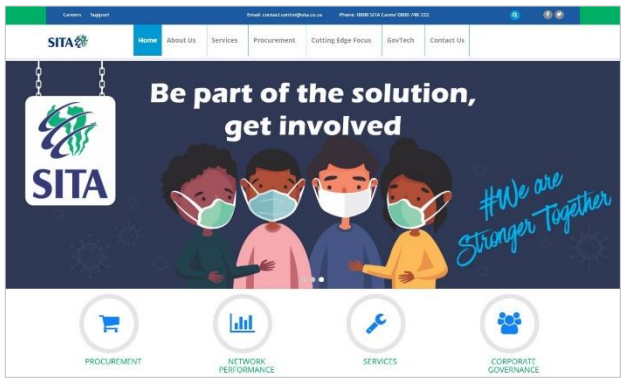
South Africa

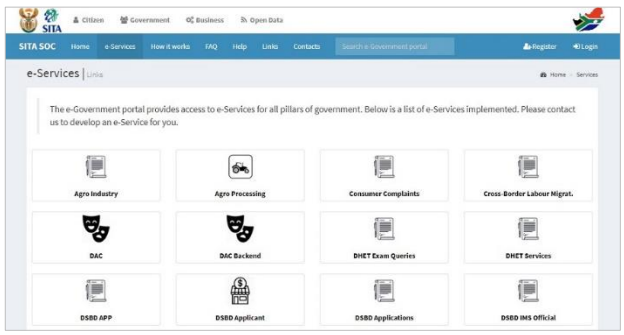
South Africa is one of the leaders in digital transformation in the Africa region, particularly in core government systems, citizen engagement and enablers. The State Information Technology Agency (SITA) website presents the 2020-2025 digital transformation strategy, which emphasizes four key elements: citizen engagement, empowering employees, transforming services, and creating shared platforms, in addition to optimizing operations. SITA GovTech site provides a platform for knowledge sharing concerning lessons, solutions, and ideas.

A new e-Government portal was launched in 2020 to improved access to online services for citizens, businesses, and government entities. Also, in 2001, the Centre for Public Service Innovation was established to develop digital skills and promote innovation for improved service delivery in collaboration with CSOs and the private sector. The CPSI Multi-Media Innovation Centre (MMIC) is open to all public sector entities, and public employees are invited to use it to explore innovative practices or for training.

The Department of Public Service and Administration (DPSA) has launched the "Batho Pele" (People First) program in 1997 for transforming public service delivery based on eight principles: consultation, service standards, redress, access, courtesy, information, transparency, and value for money. This approach has been adjusted over the years, with the addition of the "Know Your Service Rights Campaign" and other initiatives to revitalize the promotion of Batho Pele within the public service. The annual National Batho Pele Excellence Awards recognize public servants who are selfless, dedicated, committed, and who go the extra mile in servicing citizens.





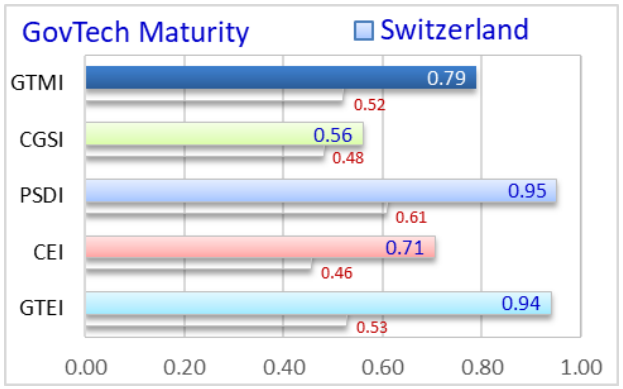


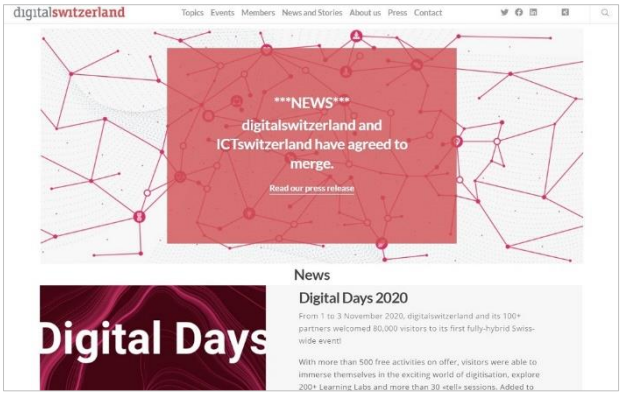
Switzerland

The Swiss Government runs one of the most advanced economies in public sector digital transformation. The Federal Council and the Federal Office for Communications coordinate the operationalization of the Swiss digital agenda. Increased use of virtual interfaces for public service delivery is currently one of its primary focus areas. The eID Act was put in place in 2019 to ensure secure identification in the use of public online services. Switzerland is pursuing a whole-of-government approach through its Digital Strategy, which is an umbrella strategy that is complemented by sectoral strategies.

The e-Government website provides rich information on projects, as well as the downloadable Digital Strategy together with related publications. There are also options to translate the website into German, Italian, French, or English making it user-friendly across these languages. The digital strategy also emphasizes equal opportunity through a universal service that embodies special services for the disabled, including voice access to directory services and sign-language relay services for those with hearing challenges.

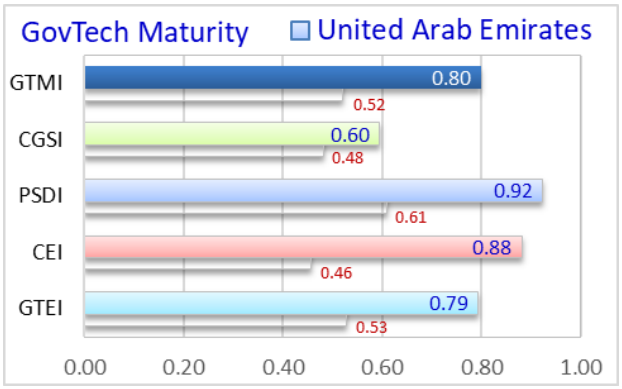
The Swiss Digital Initiative (SDI) was launched in 2015 to strengthen trust in digital technologies and the actors involved in ongoing digital transformation. The SDI has launched the first Swiss Global Digital Summit in September 2019 to promote constructive discussions on the topic of "Ethics and Fairness in the Age of Digital Transformation." Swiss Digital Days 2020 was organized in November 2020 with the participation of 80,000 visitors from 100+ partners as the first fully-hybrid Swiss-wide event. The SDI is promoting GovTech activities together with relevant state and non-state actors.





United Arab Emirates

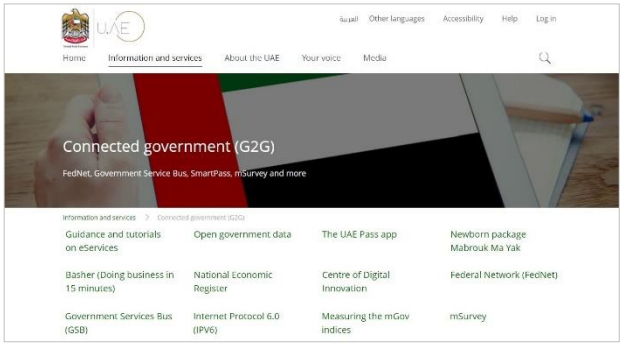
The United Arab Emirates is one of the most mature countries in citizen-centric online public services focus area in the Middle East and North Africa region. The digital government website provides information about digital government strategies including the UAE Strategy for the Fourth Industrial Revolution, U.A.E. Strategy for Artificial Intelligence, National Innovation Strategy, and Emirates Blockchain Strategy 2021.



It has a digital government maturity model which it uses as a unified reference to assess its own digital maturity for further guidance and improvement. The U.A.E. also publishes its citizen engagement performance and has a dedicated website, mSurvey, that allows the public to articulate their opinions easily and to transparently provide feedback on policies and various development issues.

In 2021, the Dubai government is expected to go completely paperless, eliminating more than 1 billion pieces of paper used for government transactions every year. The Digital ID/UAE Pass is the digital national identity for all citizens, residents, and visitors, and it allows users to access the services of local and federal government agencies, and other service providers. Ongoing GovTech initiatives also include the establishment of the Emirates Council for Digital Wellbeing, and transition to Fifth Generation (5G) - IMT-2020 standards.

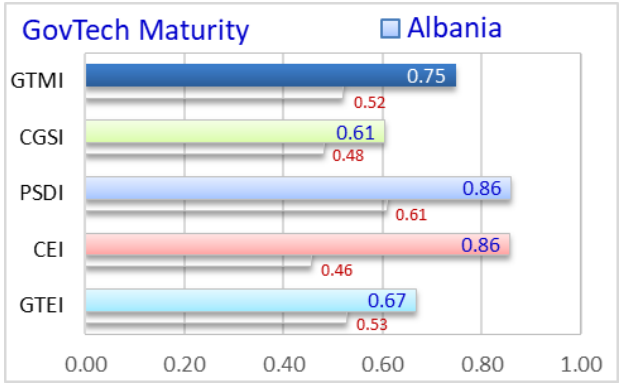
The UAE Strategy for Digital Transactions 2021 aims to adopt advanced technologies and employ them to convert 50 percent of government transactions at the federal level to a blockchain platform by 2021. The Dubai Blockchain Strategy is also expected to contribute to transforming Dubai into the first city to be fully managed by the blockchain platform.

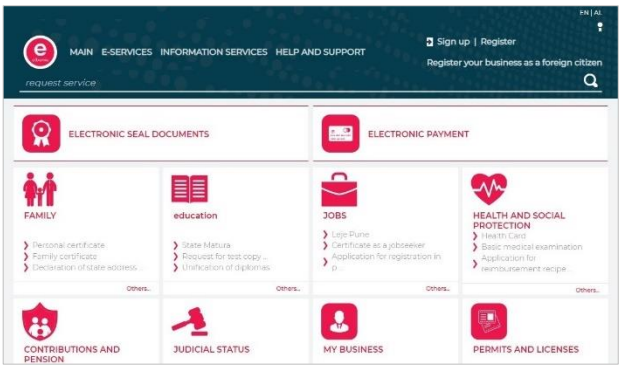


Significant Focus on GovTech (Group B)

Albania

The National Agency for Information Society (NAIS) is leading the GovTech initiatives in Albania. A new digital government strategy is expected to be launched in 2021 with a focus on universally accessible services, citizen engagement, and whole-of-government. The e-Albania portal is an integrated, online service delivery platform providing access to 750+ mostly transactional (level 3 or 4) services for 1.6 million registered users. The Agency for Integrated Service Delivery (ADISA) has established nine citizen service centers and ten service counters to expand access to services. Also, "The Albania We Want" platform was launched as an open interaction platform with citizens and businesses. Citizens can provide feedback on public services, submit a complaint, share their ideas, and request information about government decisions and activities.

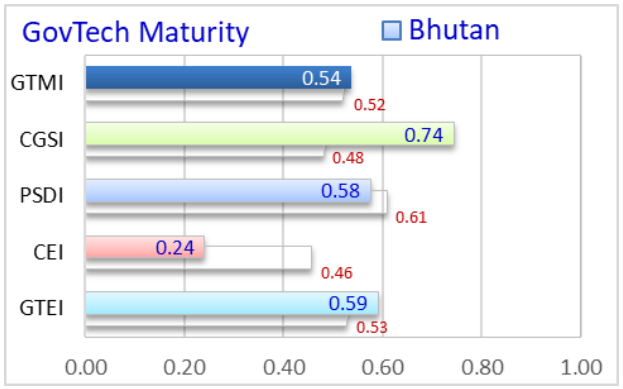




Bhutan

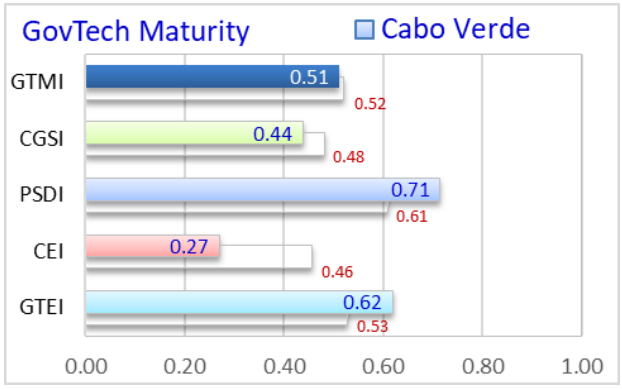
Bhutan falls in Group B on the GTMI and in 2020 moved up 23 positions in the UN EGDI ranking due to significant improvements in several GovTech foundations, including the expansion of Internet access to most of the government offices, schools and hospitals, expansion of online services, and digital skills development in the public sector.

The Department of Information Technology & Telecom (DITT) is promoting the whole-of-government approach and managing shared platforms, including the e-GIF Portal. A government service bus based on an open source WSO2 platform is in place to connect core government systems. The Ministry of Finance (MoF) initiated the integrated financial management information system and other system modernization projects to improve budget performance.

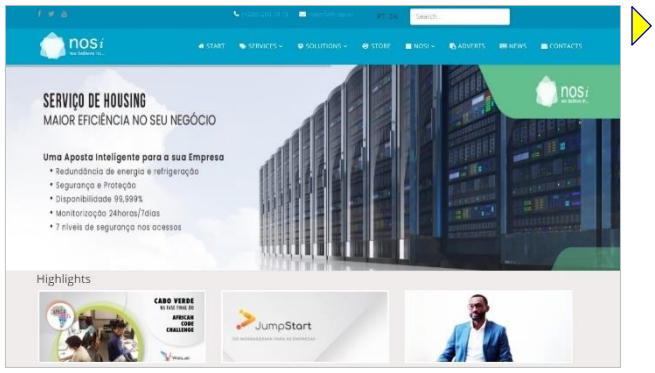


Cabo Verde

Cabo Verde has gradually improved its core government systems, infrastructure and digital skills with a focus on a whole-of-government approach. The Information Society Operational Unit (NOSI) has created a state-owned government network to connect all public entities and provide access to a range of shared platforms and services, including email and government and municipal management applications.

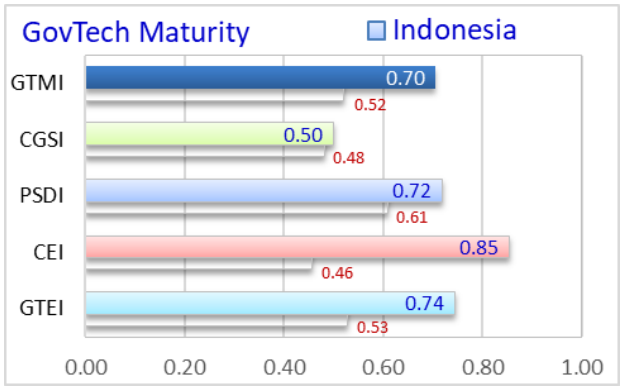


Common information and data exchange standards have been adopted by several public platforms. The NOSI has also developed the Integrated Government Resources Planning (IGRP) system using the Platform as a Service (PaaS) model and Mkonekta (Serviçus Públicus na Bu Mô) mobile app for secure access to public services, including electronic payments.



Indonesia

Indonesia is in Group B on the GTMI and moved up 19 positions in the UN 2020 EGDI ranking due to improvements in online services, e-participation index, and GovTech enablers. Strong institutional and legal foundations have been established through the 2018 Presidential Regulation on e-Government and the 2019 Regulation on Integrated Government Data Management.

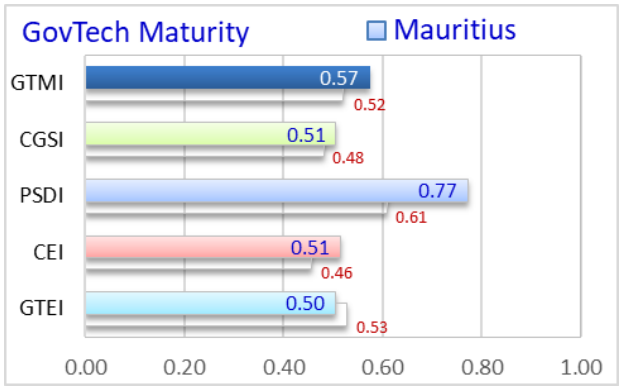


The policy formulation authority for data governance falls under the Ministry of Administrative and Bureaucratic Reform (MENPAN-RB). The Ministry of Planning (BAPPENAS) is responsible for planning and data governance. Access to online services is provided through the Ministry of Communications and Informatics (KOMINFO) and several other agency-specific portals. Ongoing activities are focused on new digital government strategy, single public service portal, expanding the connectivity, and digital skill development.

Mauritius

Mauritius is one of the leading countries in the Africa region, particularly in public service delivery. The Central Informatics Bureau (CIB) website presents the Digital Government Transformation Strategy 2018-2022 focused on accelerated public sector digitization to enhance operational effectiveness and to provide better service to citizens. The Central Information Systems Division (CISD) is responsible for supporting all government systems and maintaining shared platforms.

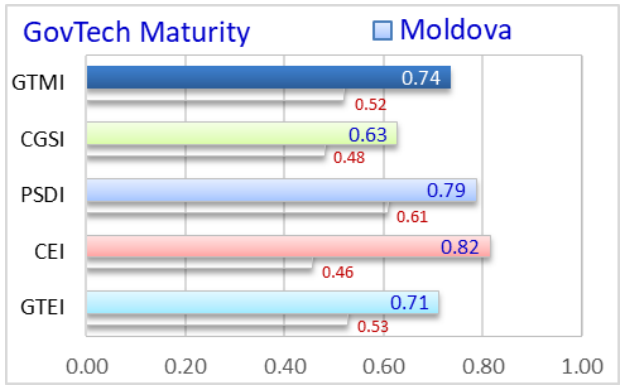
Mauritius takes a partnership-oriented approach that allows flexibility in the adoption of digital technologies tailored to the needs of public institutions. The State Informatics Ltd. (SIL) and the State Informatics Training Centre Ltd. (SITRAC) are other entities supporting government cloud services and digital skills, respectively.



Moldova

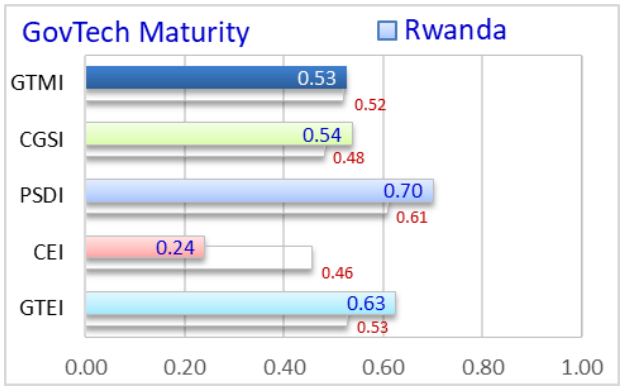
Moldova has mature online services and citizen engagement platforms in place. The government is currently focused on the enhancement of existing systems and digital skills, as well as the implementation of new service delivery models. The MCloud was established as a private government cloud in 2014 to improve the interoperability of systems and reduce the operating costs by consolidating more than 120 data centers and server rooms as a part of the whole-of-government approach.

Currently, around 70 percent of public services are hosted in cloud. Building on the open source WSO2 platform, 53 public entities are connected to MConnect that has been used to manage over 15 million data exchange transactions in 2020. Total savings to date is estimated as US$30 million since the deployment of MCloud.



Rwanda

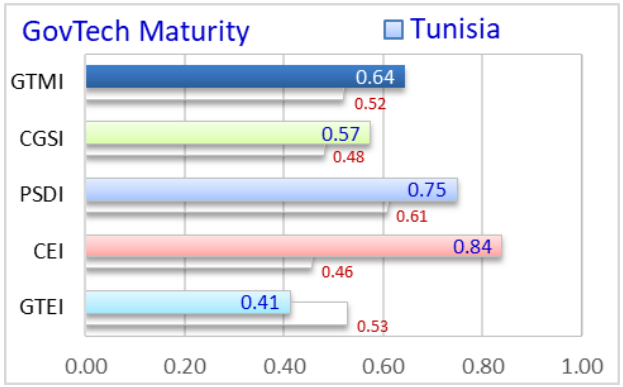
Rwanda's Vision 2050 and Smart Rwanda Master Plan place a strong emphasis on creating a knowledgeable society through the implementation of smart ICT strategies. The Rwandan Information Society Authority (RISA) is leading digital transformation and the adoption of frontier technologies in the public sector. The Digital Transformation Department is focused on the improvement of ICT infrastructure and digital skills.



Despite limited resources, the country has made great strides in offering public services online, and most public officials use ICT and the Internet extensively in their everyday work. The Irembo portal provides access to 89 online services via mobile devices or computers. The e-Government platform supports two-way communication, not only in providing e-services updates but also allowing individuals to request information and voice their concerns directly.

Tunisia

In Tunisia, the Ministry of Communication Technologies (MoCT) is leading GovTech initiatives with a focus on improving online services and enablers. The National Strategic Plan "Digital Tunisia 2020" is focused on several focus areas, including the transition to a transparent and agile e-Administration at the service of the citizen and reduction of the digital divide.

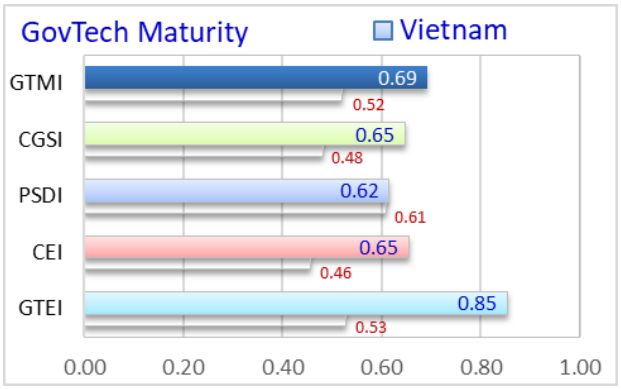


Additionally, the "Smart Tunisia" program was launched (based on public-private partnership) to create 50,000 jobs in the digital sector. The Tunisia Government Portal provides access to 460+ mainly informational online services. The MoCT website includes a multifunctional citizen participation section offering a variety of options such as online submission of complaints, ideation forum, and access to open data and government documents.

Vietnam

Vietnam's Office of the Government (OOG) is leading the country's GovTech initiatives. Substantial progress has been made in several GovTech focus areas since 2016. The National Public Service Portal was launched in 2019 and is currently providing 2,700 online services for citizens and businesses to more than 417,000 registered users. The details of savings due to online services of 84 ministries and agencies in 63 localities and other system modernization projects are reported by the OOG. Also, the e-Cabinet system has been in use since June 2019.

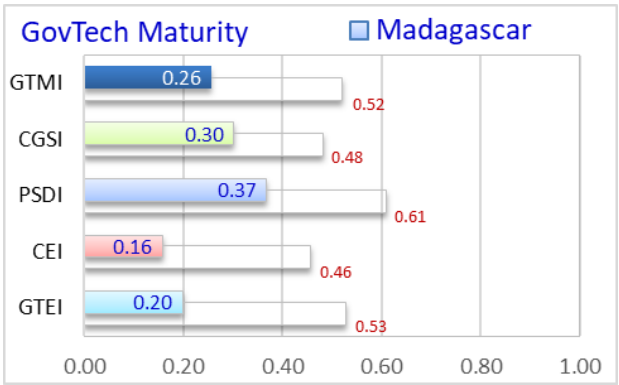
A One-Stop Center for e-Government Services has been launched by the Ministry of Information and Communication for citizen feedback (complaints, petitions, or support), and the government's responses are posted online for all questions and feedback.



Some Focus on GovTech (Group C)

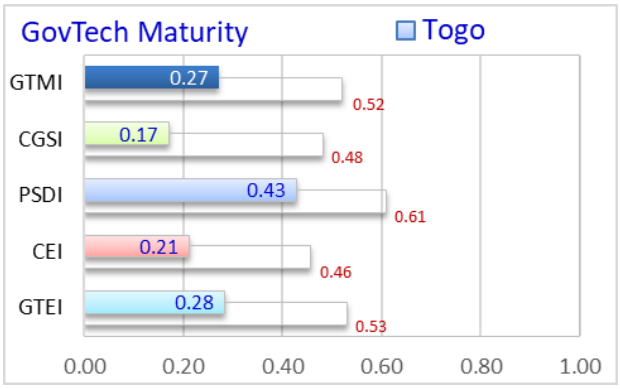
Madagascar

Madagascar falls in Group C on the GTMI, and significant opportunities exist to improve all four aspects of GovTech. There is high-level government commitment to public sector digital transformation. A Digital Governance Unit was created in 2019 to implement the national digital governance strategy, based on an agile and user-centric design approach. The Digital Governance and Identification Management System Project (PRODIGY) was launched in September 2020 to strengthen civil registration and identity management systems, streamline and digitize key public services, and improve the government's capacity to deliver online services. Considering the high cost of mobile internet connectivity, the project is focused on improving multimodal service delivery to target people with limited literacy and the most basic phones.



Togo

In Togo, the Ministry of Digital Economy and Digital Transformation is championing numerous GovTech initiatives. The National Digital Planning Strategy (2018-2022) set out an ambitious digital development plan with a focus on regulatory, institutional and organization measures, including the law on cybersecurity. Togo's Computer Emergency Response Team (CERT.tg) has been launched in February 2021.



The government is implementing GovTech solutions to modernize the public sector and improve service delivery in different sectors including education and agriculture. The government portal includes links to the Presidency and the Ministry websites. A public service portal provides access to information and forms. Ongoing activities also include the establishment of a fiber-optic network connecting all 565 public buildings in Lomé and the creation of a Network Operations Center.

It is also important to highlight the emerging good practices in some difficult settings like Somalia. According to the latest WBG update, there are 39 fragile and conflict-affected situations around the world – 18 in Group C, 21 in Group D.

Emerging Good Practices in Somalia

In Somalia, the financial management information systems (FMIS) of the federal government and five member states are all cloud-based solutions, and two web-based applications have been used in six locations supporting daily operations since 2015. Monthly budget results of the federal government are posted in open data format on the cloud, and member states regularly post their monthly budget reports on their respective Ministry of Finance websites. In 2019, four member states cost-effectively launched and operationalized their cloud-based HRMIS and payroll systems within the year. The federal government and other member states are currently developing similar cloud-based HRMIS/Payroll systems to improve their core government systems. These systems operate as disconnected platforms, and data exchange is not yet automated. Additionally, the federal government and member states have several ongoing projects to support other key actions of the digital agenda, including the development of a digital ID system for improving civil registration and online services. All these platforms have been developed with substantial support from development partners, and the government is currently focused on strengthening institutional capacity and preparing the foundations for a transition to the next level in public sector digital transformation within five years.

Chapter 4. Conclusions

Advances in digital technologies and the transition to a data-driven public sector can radically change the way governments operate and interact with citizens. GovTech has great potential for improving core government systems, citizen-centric services and citizen engagement to deliver on the promises of the digital age. However, turning the promise of digital solutions and data into tangible, measurable and consistent outcomes remains a challenge in most countries.

Governments must adapt to changing societal demands that stem from digital advancements, as well as the coronavirus pandemic. The GTMI was developed to measure the key aspects of four focus areas of the new frontier in digital transformation and to inform decisions on priority actions for public sector modernization.

This study revealed that there is growing interest in GovTech initiatives around the world. Government entities leading the GovTech agenda exist in 80 economies out of 198 reviewed, and mature digital government and good practices are highly visible in 43 economies.

Within the last two decades, 174 economies have launched digital government or GovTech initiatives and strategies to address country-specific challenges. About 120 countries have developed new digital government strategies within the last five years that are substantially different from earlier e-government initiatives. New strategy documents are more focused on the GovTech agenda and promote a whole-of-government approach to public sector modernization, as well as improved accessibility to online services, multifunctional citizen participation platforms, and a sustainable GovTech ecosystem.

Key findings of this study can be summarized as follows:

- **Focus on GovTech:** Despite increasing investments in ICT infrastructure and the availability of GovTech institutions and strategy/policy documents, the maturity of GovTech foundations is less than expected in most countries. All countries generally score higher in the area of core government systems, online services, and GovTech enablers, compared to digital citizen engagement or CivicTech. Despite good progress in most regions, digital government divides persist between and within regions.
- **Visibility of results:** Investments in GovTech initiatives and achieved results or challenges are not recorded and reported transparently by most governments. Therefore, it is difficult to monitor the progress in most GovTech initiatives and to highlight good practices based on the information available on the web.[33]

[33] It should be noted that the web links included in the GovTech global dataset to present the evidence collected from relevant government websites for all 48 GTMI key indicators may be changed by the governments from time to time. Hence, some of the web links may not be working after a while. As a good practice, governments may wish to use dedicated websites with stable web links (URLs) for critical GovTech systems, services, strategy documents, and important initiatives, and include a direction to the new site whenever there is a change in the web link of a specific website.

- **Core government systems:** Most countries have already developed core government systems (back- and front-office solutions), online service and open data portals and countrywide ICT infrastructure supporting central and local government operations. However, these systems are usually fragmented and disconnected, and data exchange is point-to-point, not automated and secured using web services/APIs based on well-defined protocols.
- **Shared platforms and standards:** There is growing interest in many countries in developing shared digital government platforms such as cloud-based solutions, mobile apps, and a government service bus to support operational and service delivery requirements of public entities. Despite a minimal focus on government enterprise architecture (GEA), which appears to be more difficult to develop and implement in a large number of countries, there is substantial interest in developing government gateways/service bus, interoperability frameworks and cloud platforms, as some of the key components of a GEA.
- **Online services:** Integrated national portals are available in many countries to support online service delivery, mostly one-way information flow from the government to citizens or businesses. Two-way information flow, universally accessible user-centric transactional services supported by mobile apps, and quality of service metrics are visible in a limited number of countries, mainly in Groups A and B.
- **Digital citizen engagement:** Governments and CSOs have launched various technology solutions to improve digital citizen engagement, but it is difficult to find information about the impact of these tools and service quality standards or responsiveness. Also, multifunctional citizen participation portals that provide capabilities to submit a petition, publish citizen's inputs, allow the provision of anonymous feedback or post the government's response are visible only in a relatively small group of countries.
- **GovTech enablers:** Most of the digital government strategies and action plans approved within the last five years include the establishment of enabling and safeguarding institutions to support the GovTech agenda, with more focus on a whole-of-government approach, data-driven public sector, digital skill development and innovation labs. The use of public-private partnerships to draw upon private sector skills, innovations, and investments to address public sector challenges is visible in a small group of countries. Also, there is growing concern about cybersecurity and data privacy risks.
- **ID4D:** According to the ID4D dataset, about one billion people do not have official proof of identity, although 186 economies have mandatory birth registration systems and 180 economies issue national ID to citizens. Additional efforts are needed to expand the issuance of unique national ID at birth and to strengthen civil registration and identification systems, especially in the AFR and SAR regions.
- **Disruptive technologies:** The potential of new and disruptive technologies has been recognized and used by several high- and middle-income countries. National strategies/plans for artificial intelligence, blockchain, IoT, drones, and other emerging technologies are evident. Some GovTech leaders are already using AI and chatbots to reduce administrative burden, strengthen oversight functions and improve service quality.

The findings and good practice cases presented in this study demonstrate that the GovTech focus areas identified by the WBG are highly relevant to the public sector digital transformation agendas in most countries.

Key messages

- **Commitment at high government levels and allocation of necessary resources are crucial for the sustainability of GovTech initiatives**. Beyond strong political will and adequate resource allocation, active cooperation, and coordination across institutional arrangements and among key actors are critical to achieving improved outcomes (WDR, 2017; WDR, 2021). Dedicated GovTech entities and strong governance mechanisms are essential to advance the whole-of-government approach and improve GovTech maturity.
- **Large-scale GovTech challenges are more evident in the Africa and South Asia regions,** and more substantial resources need to be allocated to address digital divide, infrastructure, and governance issues compared to other regions. Findings presented by the GovTech Maturity Index can assist in identifying priority actions in these regions and specific countries.
- **Countries could focus more on improving the interconnectivity and interoperability of existing systems and portals**, benefiting from government cloud, service bus and APIs, as cost-effective shared platforms in future GovTech initiatives.
- **Next-generation online service portals could expand transactional services** to save substantial time, reduce cost and improve the quality of services. Also, as highlighted in the UN OSI findings, more than a billion people live with some form of disability, and 80 percent of them reside in the developing world. Universally accessible user-centric services should be launched to reach vulnerable sections of the population and reduce the digital divide.
- **GovTech initiatives could focus more on multifunction citizen participation platforms** through effective CivicTech solutions to deepen the citizen-government relationship, improve accountability, and build public trust in government.
- **Further investments in digital skill development and innovation in the public sector** are crucial to supporting the transition to data-driven culture and strengthening technical skills, particularly in low-income countries.
- **Governments could promote the use of open data by individuals and firms to create economic value-addition through public data platforms**. While sharing and reusing public and personal data both inside and outside government, the increasing cybersecurity, data protection, and privacy risks should also be mitigated by governments.
- **The *World Development Report 2021* highlights the importance of data governance, which is highly relevant to the GovTech agenda.** The report puts forward five high-level recommendations: (i) forge a new social contract for data; (ii) increase data use and reuse to realize greater value; (iii) create more equitable access to the benefits of data;

(iv) foster trust through safeguards that protect people from the harm of data misuse; and (v) pave the way for an integrated national data system.

- **Governments could increase citizen trust in data-driven societies and promote GovTech more effectively** by adopting solid legal frameworks and establishing strong data protection agencies. Privacy concerns are an integral part of an open data-driven environment, and an assurance of protection would foster trust in the open data systems.
- **Interconnectivity between traditional and 'new' data is necessary to advance digital transformation**. The integration of traditional and new (digital) data can accelerate and strengthen service delivery, particularly for the historically underserved and marginalized. Traditional data, including censuses, household surveys, Civil Registration and Vital Statistics (CRVS), and other administrative data remain fundamental to the progress of GovTech.
- **Governments could better promote the development of local GovTech ecosystems** by supporting local entrepreneurs and start-ups to develop new products and services. Also, incentives could be provided to draw upon private sector skills, innovation, and investments to address public sector challenges.
- **The use of frontier and disruptive digital technologies can greatly improve core government operations and online service delivery**. Disruptive technologies can be used to simplify and shorten the provision of online services at a reduced cost, improve the efficiency of core government systems, including e-procurement, increase transparency, and reduce corruption risks.
- **Future GovTech initiatives could also consider six dimensions that characterize a fully digital government:**[34] (i) digital by design; (ii) data-driven public sector; (iii) government as a platform; (iv) open by default; (v) user-driven; and (vi) proactiveness. These important aspects are defined in detail in the OECD's DGPF published in October 2020.

The coronavirus pandemic has highlighted how critical GovTech solutions can be in difficult times to ensure the continuity of core government operations, provide secure remote access to online services, and support vulnerable people and businesses. Governments should allocate the necessary resources to improve GovTech maturity during the COVID-19 recovery and resilience phase, and adapt to the "new normal" through effective partnerships with all stakeholders.

[34] OECD Digital Government Policy Framework (DGPF); October 2020.

Appendixes

Appendix A: Explanation of GovTech Indicators

To measure the maturity level of GovTech focus areas, 48 key indicators are defined (32 new + 16 updated data fields). These key indicators are presented below in Table 4.1, with a brief explanation about the measurement method, points, and evidence (links/URL of relevant web pages) of observed characteristics.

Table 4.1: Key GovTech Indicators

#	Indicator	What is measured	How it is measured	Source [35]	N/U
	Core Government Systems Index (CGSI)				
1	Government cloud	Is there a government cloud available for all government entities?	0 = No 1 = Planned / Cloud strategy 2 = Yes (in use)	DG 2020	New
2	Government enterprise architecture	Is there a government enterprise architecture?	0 = No 1 = In draft / Planned 2 = Partially implemented 3 = Yes (in use)	DG 2020	New
3	Government Interoperability Framework (GIF) / Government Service Bus (GSB)	Is there a government service bus (government gateway) or interoperability platform in place?	0 = No 1 = Planned / In progress 2 = Yes (not mandatory) 3 = Yes (mandatory for all gov institutions)	DG 2020	New
4	Financial Management Information System	Is there an operational FMIS to support central gov PFM functions?	0 = No 1 = Implementation / upgrade in progress 2 = Pilot implementation/reduced scope 3 = Fully operational	DG 2020	Upd
5	Treasury Single Account (TSA) for automating government payments	Is there a TSA linked with FMIS to automate payments and bank reconciliation?	0 = No 1 = Implementation / upgrade in progress 2 = TSA partially operational 3 = Fully operational (centralized TSA)	DG 2020	Upd

[35] DG 2020 = WBG DG/GovTech Systems and Services (DGSS) dataset (198 economies); UN 2020 = 2020 UN e-Government Survey (193 countries); ID4D 2018 = Identification for Development (ID4D) dataset (198 economies). New = New data field included in the latest version of the DGSS. Upd = Updated data field in DGSS imported from previous versions of the dataset.

#	Indicator	What is measured	How it is measured	Source [35]	N/U
6	Tax Management System	Is there an operational Tax Management System?	0 = No 1 = Planned 2 = Implementation in progress 3 = Operational	DG 2020	Upd
7	Customs System	Is there an operational Customs System?	0 = No 1 = Planned 2 = Implementation in progress 3 = Operational	DG 2020	Upd
8	HRMIS	Is there an operational Human Resources Management Information System (HRMIS) with an online service portal?	0 = No 1 = Planned 2 = Implementation in progress 3 = Operational	DG 2020	Upd
9	Payroll System	Is there an operational Payroll System linked with HRMIS?	0 = No 1 = Planned 2 = Implementation in progress 3 = Operational	DG 2020	Upd
10	e-Procurement System	Is there an e-Procurement portal supporting public procurement – recurrent budget + investments?	0 = No 1 = Yes Only tender/contract information 2 = Yes Including bidding docs & contract awards 3 = Yes Including interfaces with gov systems	DG 2020	Upd
11	Debt Management System	Is there an operational Debt Management System for foreign and domestic debt?	0 = No 1 = Planned 2 = Implementation in progress 3 = Operational	DG 2020	Upd
12	Public Investment Management System	Is there an operational Public Investment Management System?	0 = No 1 = Planned 2 = Implementation in progress 3 = Operational	DG 2020	New
13	Open Source Software in public sector	Is there a government Open Source Software policy/action plan the for public sector?	0 = No 1 = Yes Proposed 2 = Yes Advisory or R&D 3 = Yes Mandatory	DG 2020	New

#	Indicator	What is measured	How it is measured	Source [35]	N/U
14	UN Telecommunication Infrastructure Index (TII)	The TII is composed of four indicators: • Estimated Internet users per 100 inhabitants. • Number of mobile subscribers per 100 inhabitants. • Active mobile-broadband subscription. • Number of fixed broadband subs per 100 inhabitants.	0 to 1	UN 2020	New
15	Disruptive technologies	Does the government have a specific national strategy on new/disruptive technologies (e.g., AI, Blockchain)?	0 = No 1 = In draft / Planned 2 = Yes (approved)	DG 2020	New
	Public Service Delivery Index (PSDI)				
16	UN Online Service Index (2020)	UN Online Service Index (OSI) is a composite normalized score derived based on an Online Service Questionnaire. The 2020 Online Service Questionnaire (OSQ) consists of a list of 148 questions (Yes/No).	0 to 1	UN 2020	New
	OSI – Information available	Is there any "information about" something such as laws, policies, legislation, or expenditures?	0 = No 1 = Yes		
	OSI – Existence of a feature	Is there any evidence on the "existence of" a feature such as social networking tools?	0 = No 1 = Yes		
	OSI – Ability to do something	Is it possible to do something on the website (i.e. run a transaction)?	0 = No 1 = Yes		
17	Online public service delivery portal	Is there a national online public service portal for citizens, businesses, and government entities?	0 = No 1 = Yes Level 1 or 2 Mostly information / forms. Some online transactions (G2C, G2B). 2 = Yes Level 3 or 4 Mostly transactional (G2C, G2B, G2G) including single sign-on.	DG 2020	Upd

#	Indicator	What is measured	How it is measured	Source [35]	N/U
18	Tax online service portal	Is there an operational Tax System online service portal?	0 = No information on services 1 = Information services/forms 2 = Transactional services 3 = Connected services (Single Window)	DG 2020	Upd
19	e-Filing	Is there an operational e-Filing service portal for citizens and businesses, including e-payment options?	0 = No 1 = Provide information only 2 = Online e-Filing services 3 = Online e-Filing + payments	DG 2020	Upd
20	e-Payment	Is there an online e-Payment portal providing support for various e-Services?	0 = No 1 = Yes Fragmented systems; multiple platforms 2 = Yes Centralized shared platform	DG 2020	Upd
21	Customs online service portal	Is there an operational Customs System online service portal?	0 = No information on services 1 = Information services/forms 2 = Transactional services 3 = Connected services (Single Window)	DG 2020	Upd
	Citizen Engagement Index (CEI)				
	Inclusive Participation				
22	UN E-Participation Index (2020)	Government use of online services in providing info to its citizens or "e-information sharing", interacting with stakeholders or "e-consultation" and engaging in decision-making processes or "e-decision-making".	0 to 1	UN 2020	New
	E-Information	Enabling participation by providing citizens with public information and access to info without or upon demand.	0 to 1		
	E-Consultation	Engaging citizens in contributions to and deliberation on public policies and services.	0 to 1		
	E-Decision making	Empowering citizens through co-design of policy options and coproduction of service components/delivery modalities.	0 to 1		

#	Indicator	What is measured	How it is measured	Source [35]	N/U
23	Open Government Portal	Is there an Open Government portal?	0 = No 1 = Yes	DG 2020	New
24	Open Data portal	Is there an Open Data portal?	0 = No 1 = Yes (information only) 2 = Yes (providing access to open data)	DG 2020	New
	Participation & Feedback				
25	National website for citizen participation	Is there a national platform that allows citizens to participate in policy decision-making?	0 = No 1 = Yes	DG 2020	New
26		• Is it for a petition?	0 = No 1 = Yes		New
27		• Are citizens' inputs publicly available on the platform?	0 = No 1 = Yes		New
28		• Does the platform allow citizens to provide feedback anonymously?	0 = No 1 = Yes		New
29		• Is government response publicly available on the platform?	0 = No 1 = Yes		New
30	National website for citizen and business feedback	Are there government platforms such as website or app that allow citizens or businesses to provide feedback – compliments, complaints, suggestions, information requests – directly to the government on service delivery and their performance?	0 = No 1 = Yes	DG 2020	New
31		• Does the government make the service standards such as response time and procedure available to the public?	0 = No 1 = Yes		New
32		• Are these platforms universally accessible or provides support for users with disabilities – for example, e-services, and availability of voice commands?	0 = No 1 = Yes		New
	Government Responsiveness				
33			0 = No	DG 2020	New

#	Indicator	What is measured	How it is measured	Source [35]	N/U
	Government responsiveness	Does the government publish its engagement statistics and performance regularly?	1 = Yes		
	GovTech Enablers Index (GTEI)				
34	GovTech Institutions	Is there a government body focused on GovTech – digital transformation, whole-of-government, services, etc.?	0 = No 1 = Yes	DG 2020	New
35	Data Governance Institutions	Is there a government entity in charge of data governance or data management?	0 = No 1 = Planned/In progress 2 = Yes (established)	DG 2020	New
36	DG / GovTech Strategy	Is there a specific national GovTech/digital transformation strategy?	0 = No 1 = Planned/In progress 2 = Yes (<=2014) 3 = Yes (>=2015)	DG 2000	New
37	Whole-of-government	Is there a whole-of-government approach to implement data governance?	0 = No 1 = Planned/In progress 2 = Yes (institutionalized)	DG 2020	New
38	Right to Information (RTI) Laws	Are there national laws, statues, or regulations – for example, right to information, access to information – to make data and information available to the public online or digitally?	0 = No 1 = Draft / Consultations in progress 2 = Yes (effective)	DG 2020	New
39	Data Protection/Privacy Laws	Is there a data protection/privacy law?	0 = No 1 = Draft / Consultations in progress 2 = Yes (effective)	DG 2020	New
40	Data Protection Agency	Is there a data protection authority?	0 = No 1 = Not established yet (visible in law) 2 = Yes	DG 2020	New
41	National ID	Is there a foundational unique national ID system in place?	0 = No 1 = Yes	ID4D 2018	Upd
42	Digital ID	Is there a Digital ID that can be used for identification and services?	0 = No 1 = Yes	ID4D 2018	Upd
43	Digital Signature	Is there a digital signature regulation and PKI infrastructure in place to support gov operations and service delivery?	0 = No Digital Signature 1 = Regulation approved; No infrastructure yet (Public Key Infrastructure, Certificate Authority) 2 = Regulations and infrastructure in place. Not used yet/in progress	DG 2020	Upd

#	Indicator	What is measured	How it is measured	Source [35]	N/U
			3 = Operational. Used in practice for operations and e-Services		
44	Cybersecurity	Is there a cybersecurity emergency response team (CERT/CSIRT)?	0 = No 1 = Planned 2 = Yes (established)	DG 2020	New
45	UN Human Capital Index (HCI)	The Human Capital Index (HCI) has four components: (i) adult literacy rate; (ii) the combined primary, secondary and tertiary gross enrolment ratio; (iii) expected years of schooling; and (iv) average years of schooling.	0 to 1	UN 2020 193 countries	New
46	Digital skills in the public sector	Is there a government strategy/program to improve the digital skills/data literacy of public employees?	0 = No 1 = Planned / In progress 2 = Yes	DG 2020	New
47	Digital skills & innovation	Is there a training program to improve digital skills/data literacy and innovation in the public sector?	0 = No 1 = Yes	DG 2020	New
48	Public sector innovation	Is there a government entity/strategy focused on public sector innovation – innovation hubs, private sector investments, etc.?	0 = No 1 = Planned / In progress 2 = Yes	DG 2020	New

Appendix B: The GovTech Dataset and Selected Indicators

The GovTech dataset is composed of six main components as described below in Figure 4.1. The dataset is an extended version of a global dataset on government systems and services, originally developed in 2014 and updated every two years during the preparation of several WBG studies and flagship reports: 2014 FMIS and Open Budget Data Study; 2016 WDR Digital Dividends; 2018 WBG Digital Adoption Index; 2020 GovTech Maturity Index; and WDR 2021: Data for Better Lives. The GovTech dataset contains a rich set of data covering important aspects of the digital government/GovTech initiatives in 198 economies.

International outlook: The GovTech dataset includes key indicators measuring various dimensions in 198 "economies," including all 188 of the "World Bank member countries", plus some of the "large economies" – from EU, OECD and APEC – to present a broader spectrum of GovTech agenda. Income level distributions of key indicators are presented for 198 economies. This approach was consistently used in all global datasets created by the GGP since 2014.

Regional outlook: The "Region" field included in the GovTech dataset can be used to filter and present various dimensions for 168 "World Bank client countries," that are receiving advisory and financial support to implement public sector modernization activities, without including developed countries and large economies. All regional distributions of key indicators are presented for 168 client countries.

Figure 4.1: Description of the GovTech Dataset (198 Economies)

Basic Data	• Name of economy + Income level + Population + GNI • Relevant data fields: Columns B:I in the "DGSS" tab
Core Government Systems Indicators	• 15 key indicators: I-1 to I-15 • Relevant data fields: Columns LD:LR in the "DGSS" tab
Public Service Delivery Indicators	• 6 composite indicators: I-16 to I-21 • Relevant data fields: Columns LS:LX in the "DGSS" tab
Citizen Engagement Indicators	• 12 key indicators: I-22 to I-33 • Relevant data fields: Columns LY:MJ in the "DGSS" tab
GovTech Enablers Indicators	• 15 key indicators: I-34 to I-48 • Relevant data fields: Columns MK:MY in the "DGSS" tab
GovTech Maturity Index Scores and Groups	• Calculation of sub-indices based on weights (expert opinion) • GTMI scores and groups: Columns KW:LC in the "DGSS" tab

Source: World Bank data.
Note: GTMI: GovTech Maturity Index; GNI = gross national income.

In this study, selected key indicators and the GTMI scores were presented both for 198 economies and 168 WBG client countries (see Table 4.2) to be able to compare two different perspectives (international/income level and regional distributions).

Table 4.2: List of 198 Economies, Including 168 WBG Client Countries in the Regions

Economy	Income	Region	Economy	Income	Region	Economy	Income	Region
Afghanistan	LIC	SAR	Germany	HIC	-	North Macedonia	UMIC	ECA
Albania	UMIC	ECA	Ghana	LMIC	AFR	Norway	HIC	-
Algeria	LMIC	MNA	Greece	HIC	-	Oman	HIC	MNA
Andorra	HIC	-	Grenada	UMIC	LCR	Pakistan	LMIC	SAR
Angola	LMIC	AFR	Guatemala	UMIC	LCR	Palau	HIC	EAP
Antigua and Barbuda	HIC	LCR	Guinea	LIC	AFR	Palestine	LMIC	MNA
Argentina	UMIC	LCR	Guinea-Bissau	LIC	AFR	Panama	HIC	LCR
Armenia	UMIC	ECA	Guyana	UMIC	LCR	Papua New Guinea	LMIC	EAP
Australia	HIC	-	Haiti	LIC	LCR	Paraguay	UMIC	LCR
Austria	HIC	-	Honduras	LMIC	LCR	Peru	UMIC	LCR
Azerbaijan	UMIC	ECA	Hong Kong SAR, China	HIC	EAP	Philippines	LMIC	EAP
Bahamas	HIC	LCR	Hungary	HIC	ECA	Poland	HIC	ECA
Bahrain	HIC	MNA	Iceland	HIC	-	Portugal	HIC	-
Bangladesh	LMIC	SAR	India	LMIC	SAR	Qatar	HIC	MNA
Barbados	HIC	LCR	Indonesia	UMIC	EAP	Romania	HIC	ECA
Belarus	UMIC	ECA	Iran	UMIC	MNA	Russian Federation	UMIC	ECA
Belgium	HIC	-	Iraq	UMIC	MNA	Rwanda	LIC	AFR
Belize	UMIC	LCR	Ireland	HIC	-	Samoa	UMIC	EAP
Benin	LMIC	AFR	Israel	HIC	MNA	San Marino	HIC	-
Bhutan	LMIC	SAR	Italy	HIC	-	São Tomé and Principe	LMIC	AFR
Bolivia	LMIC	LCR	Jamaica	UMIC	LCR	Saudi Arabia	HIC	MNA
Bosnia & Herzegovina	UMIC	ECA	Japan	HIC	EAP	Senegal	LMIC	AFR
Botswana	UMIC	AFR	Jordan	UMIC	MNA	Serbia	UMIC	ECA
Brazil	UMIC	LCR	Kazakhstan	UMIC	ECA	Seychelles	HIC	AFR
Brunei Darussalam	HIC	-	Kenya	LMIC	AFR	Sierra Leone	LIC	AFR
Bulgaria	UMIC	ECA	Kiribati	LMIC	EAP	Singapore	HIC	EAP
Burkina Faso	LIC	AFR	Korea, DPR	LIC	-	Slovak Republic	HIC	ECA
Burundi	LIC	AFR	Korea, Rep.	HIC	EAP	Slovenia	HIC	ECA
Cabo Verde	LMIC	AFR	Kosovo	UMIC	ECA	Solomon Islands	LMIC	EAP
Cambodia	LMIC	EAP	Kuwait	HIC	MNA	Somalia	LIC	AFR
Cameroon	LMIC	AFR	Kyrgyz Republic	LMIC	ECA	South Africa	UMIC	AFR
Canada	HIC	-	Lao PDR	LMIC	EAP	South Sudan	LIC	AFR
Central African Republic	LIC	AFR	Latvia	HIC	ECA	Spain	HIC	-
Chad	LIC	AFR	Lebanon	UMIC	MNA	Sri Lanka	LMIC	SAR
Chile	HIC	LCR	Lesotho	LMIC	AFR	St. Kitts and Nevis	HIC	LCR
China	UMIC	EAP	Liberia	LIC	AFR	St. Lucia	UMIC	LCR
Chinese Taipei	HIC	EAP	Libya	UMIC	MNA	St. Vincent & the Grenadines	UMIC	LCR
Colombia	UMIC	LCR	Liechtenstein	HIC	-	Sudan	LIC	AFR
Comoros	LMIC	AFR	Lithuania	HIC	ECA	Suriname	UMIC	LCR
Congo, Dem. Rep.	LIC	AFR	Luxembourg	HIC	-	Sweden	HIC	-
Congo, Rep.	LMIC	AFR	Macao SAR, China	HIC	EAP	Switzerland	HIC	-
Costa Rica	UMIC	LCR	Madagascar	LIC	AFR	Syrian Arab Republic	LIC	MNA
Côte d'Ivoire	LMIC	AFR	Malawi	LIC	AFR	Tajikistan	LIC	ECA
Croatia	HIC	ECA	Malaysia	UMIC	EAP	Tanzania	LMIC	AFR
Cuba	UMIC	-	Maldives	UMIC	SAR	Thailand	UMIC	EAP
Cyprus	HIC	-	Mali	LIC	AFR	Timor-Leste	LMIC	EAP
Czech Republic	HIC	ECA	Malta	HIC	MNA	Togo	LIC	AFR
Denmark	HIC	-	Marshall Islands	UMIC	EAP	Tonga	UMIC	EAP
Djibouti	LMIC	MNA	Mauritania	LMIC	AFR	Trinidad and Tobago	HIC	LCR
Dominica	UMIC	LCR	Mauritius	HIC	AFR	Tunisia	LMIC	MNA
Dominican Republic	UMIC	LCR	Mexico	UMIC	LCR	Turkey	UMIC	ECA
Ecuador	UMIC	LCR	Moldova	LMIC	ECA	Turkmenistan	UMIC	ECA
Egypt	LMIC	MNA	Monaco	HIC	-	Tuvalu	UMIC	EAP
El Salvador	LMIC	LCR	Mongolia	LMIC	EAP	Uganda	LIC	AFR
Equatorial Guinea	UMIC	AFR	Montenegro	UMIC	ECA	Ukraine	LMIC	ECA
Eritrea	LIC	AFR	Morocco	LMIC	MNA	United Arab Emirates	HIC	MNA
Estonia	HIC	ECA	Mozambique	LIC	AFR	United Kingdom	HIC	-
Eswatini	LMIC	AFR	Myanmar	LMIC	EAP	United States of America	HIC	-
Ethiopia	LIC	AFR	Namibia	UMIC	AFR	Uruguay	HIC	LCR
Fed. States of Micronesia	LMIC	EAP	Nauru	HIC	EAP	Uzbekistan	LMIC	ECA
Fiji	UMIC	EAP	Nepal	LMIC	SAR	Vanuatu	LMIC	EAP
Finland	HIC	-	Netherlands	HIC	-	Venezuela, RB	UMIC	LCR
France	HIC	-	New Zealand	HIC	-	Vietnam	LMIC	EAP
Gabon	UMIC	AFR	Nicaragua	LMIC	LCR	Yemen	LIC	MNA
Gambia, The	LIC	AFR	Niger	LIC	AFR	Zambia	LMIC	AFR
Georgia	UMIC	ECA	Nigeria	LMIC	AFR	Zimbabwe	LMIC	AFR

The GTMI is calculated based on 48 key indicators defined in four categories:

- Core government system indicators [**I-1 to I-15**]
- Public service delivery indicators [**I-16 to I-21**]
- Citizen engagement indicators [**I-22 to I-33**]
- GovTech enablers [**I-34 to I-48**]

As presented in Figure 4.1, the GovTech dataset includes several sections to display the raw data collected using all key indicators in separate columns, together with additional information related to each indicator such as weblink to the relevant website of the institution or published strategy document, year of establishment or publication, the operational status of systems, and level of online services. The "Metadata" tab explains the details of all data fields, and the header row of the "DGSS" tab also has comments/notes embedded in each column header to explain all indicators and meaning of specific points or other attributes.

There are several other tabs in the GovTech dataset, including automatically updated graphs, maps, and tables to visualize data – all graphs and tables are linked to specific fields in the "DGSS" tab. The "DGSS_Stats" tab includes the trend lines and graphical presentation of all key indicators. Income level and regional distribution of 48 key GTMI indicators are presented, together with the GovTech Maturity Index by Groups. The "GT_Stats" tab presents the diffusion of DG/GovTech initiatives, as well as the relationships between GTMI and various DG indices. The "GTI" tab includes the GovTech Maturity Index world map presenting four groups, GTMI calculations, and the details of GTMI and sub-indices for all 198 economies, together with the findings on four sub-indices for relevant indicators, split by country groups. The "Other" tab includes new DG/GovTech indices (OECD, CAF) published in 2020, and their comparison with the GTMI. The "Contents" tab of the GovTech dataset provides an overview of the contents for additional information on all tabs.

Sections below include the detailed presentation of findings on the following 12 selected key indicators related to less-known aspects of GovTech focus areas:

- I-1 Government cloud platforms
- I-2 Government Enterprise Architecture (GEA) framework
- I-3 Government Interoperability Framework (GIF)/Government Service Bus (GSB)
- I-13 Open Source Software policies in the public sector
- I-15 National strategy on disruptive technologies
- I-17 Online public service delivery portals (level of services)
- I-25 National website for citizen participation
- I-34 GovTech institutions
- I-36 Data Governance institutions
- I-37 Whole-of-government approach, as a part of the national DG strategy
- I-47 Public/academic programs for digital skills and innovation
- I-48 Public entity/strategy focused on public sector innovation

Key Indicators

I-1	Is there a government cloud available for all government entities?

Points	Responses	Economies	%E	Regions	%R
2	Yes. There is an operational government cloud in use.	**60**	31%	**42**	25%
1	In progress. There is a cloud strategy or implementation is in progress.	**46**	23%	**39**	23%
0	No. There is no government cloud strategy or platform yet.	**92**	46%	**87**	52%

The availability of a government cloud – public, private, hybrid – that provides various shared services such as Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS) for the government entities is measured through this indicator.

Of the 60 countries that have an operational government cloud platform, 35 are HICs, 11 UMICs, 13 LMICs, and 1 LIC. Of the 46 countries having an approved government cloud strategy or establishing their cloud platforms, 17 are HICs and 16 UMICs. Figure 4.2a shows that about half of the governments – 92 out of 198, or 46 percent – do not yet have any focus on government cloud, and most of these are LICs or MICs. Most of the fragile states do not have government cloud platforms, but some of these countries are using public-private cloud platforms to run some of their core government systems. In Somalia, FMIS and HRMIS/Payroll solutions are running on regional cloud platforms to support daily operations.

Regarding the regional distribution, EAP and ECA regions are leading with nine countries that have operational government cloud platforms, as shown in Figure 4.2b. There are 39 ongoing activities in the regions to establish government cloud – either a cloud-first or cloud-only policy approved, or the establishment of a government cloud is in progress. Most of the governments in the AFR region, 36 out of 48, or 75 percent, have no focus as yet on government cloud.

Figure 4.2: Income Level and Regional Distributions for Indicator I-1

Figure 4.2a: Income Level Distribution for I-1

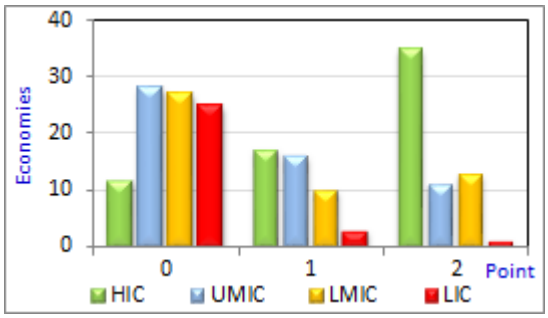
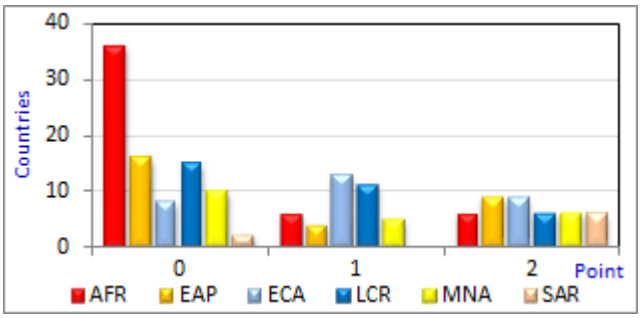


Figure 4.2b: Regional Distribution for I-1



Source: World Bank data.

I-2	Is there a Government Enterprise Architecture (GEA)?

Points	Responses	Economies	%E	Regions	%R
3	Yes. GEA is in use broadly.	**6**	3%	**4**	2%
2	Partially implemented.	**39**	20%	**23**	14%
1	In draft/planned.	**16**	8%	**15**	9%
0	No. There is no GEA yet.	**137**	69%	**126**	75%

This indicator presents the status of Government Enterprise Architecture (GEA),[36] if any. Implementation of the GEA is difficult especially in the public sector, and good practices in the adoption of this approach to support the whole-of-government approach are limited.

Most of the existing GEA solutions – 29 out of 45, or 64 percent – are visible in HICs, as presented in Figure 4.3a. Additionally, there are 16 countries from all income levels developing their GEA frameworks. A large group of the governments, 137 out of 198, or 69 percent, are not focused on GEA, which provides a common framework for the integration of strategic, business, and technology management as part of public sector modernization.

In all regions, the data shows that there is a small group of countries using GEA framework effectively, as illustrated in Figure 4.3b. For example, the framework is adopted and in use in Bhutan, Brazil, India, and the Republic of Korea; it is developed but not fully utilized in 23 other countries. Most of the governments in the AFR region, 40 out of 48, or 83 percent, are not yet focused on GEA. This low level of maturity and interest may stem from the fact that the GEA is both abstract and complex. Despite all the challenges and limited use in the public sector, there are several popular solutions, especially in the private sector. The Open Group Architecture Framework (TOGAF) is one of the most used frameworks for enterprise architecture today in the public and private sectors, providing an approach for designing, planning, implementing, and governing an enterprise digital architecture.

Figure 4.3: Income Level and Regional Distributions for Indicator I-2

Figure 4.3a: Income Level Distribution for I-2

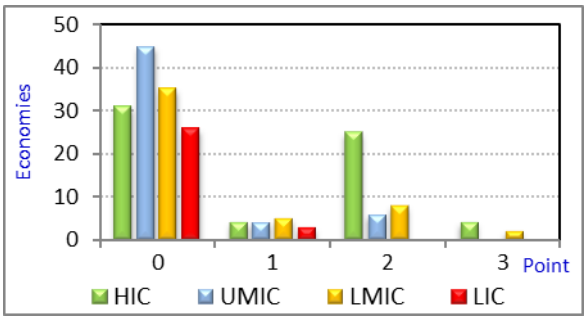
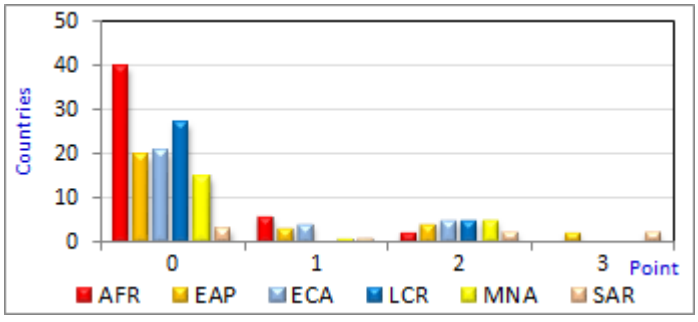


Figure 4.3b: Regional Distribution for I-2



Source: World Bank data.

[36] According to the Open Group Architecture Framework (TOGAF), Government Enterprise Architecture is defined as "*a whole of government approach to support government ecosystems by transcending boundaries for delivering services in a coordinated, efficient, and equitable manner.*" TOGAF supports all four components of the overall enterprise architecture: Business (or Business Process) Architecture; Applications Architecture; Data Architecture; and Technology Architecture.

I-3	Is there a Government Interoperability Framework (GIF)/Service Bus (GSB)?

Points	Responses	Economies	%E	Regions	%R
3	Yes. Mandatory for all government institutions.	**4**	2%	**2**	1%
2	Yes. Not mandatory.	**67**	34%	**48**	29%
1	Planned / In progress	**23**	11%	**20**	12%
0	No.	**104**	53%	**98**	58%

The state of Government Interoperability Framework (GIF)[37] and of Government Service Bus (GSB) as a part of the shared government platforms are measured through this indicator. These platforms are integral parts of the Data and Technology Architecture components of the GEA framework, which are relatively easier to implement compared to Applications and Business Architecture.

There is growing interest in GIF/GSB platforms to set the standards and automate secure data exchange between mutually interacting government systems. Most of the existing GIF/GSB solutions – 38 out of 71, or 53 percent – are visible in HICs, and the remaining platforms are mainly in MICs – see Figure 4.4a. Most of the fragile states do not yet have GIF/GSB solutions.

Regarding the regional distribution, ECA, LCR, and MNA regions are leading with more than 10 countries having operational GIF/GSB platforms, as shown in Figure 4.4b. Despite several ongoing activities in all regions to establish GIF/GSB platforms, more than half of the governments, 98 out of 168, or 58 percent, are not yet focused on such shared platforms.

Figure 4.4: Income Level and Regional Distributions for Indicator I-3

Figure 4.4a: Income Level Distribution for I-3

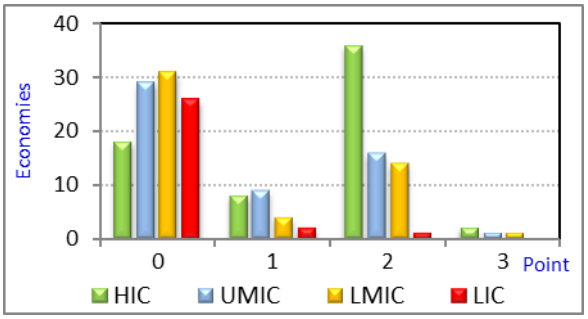
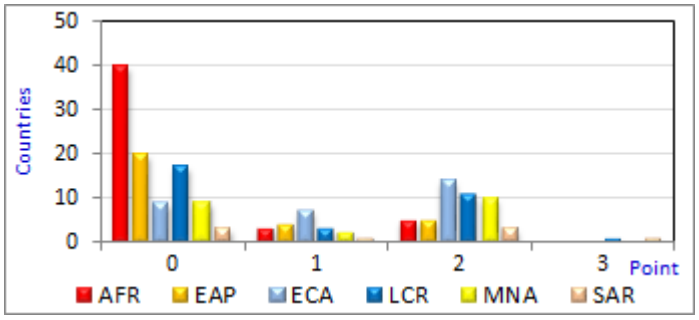


Figure 4.4b: Regional Distribution for I-3



Source: World Bank data.

[37] A Government Interoperability Framework (GIF) is a document that specifies a set of common elements such as vocabularies, concepts, principles, policies, guidelines, recommendations, standards, and practices for agencies that wish to work together, towards the joint delivery of human-centric joined-up public services. A Government Service Bus (GSB) is a secure and integrated platform for automating data exchange between mutually interacting software applications in a service-oriented architecture (SOA) based on well-defined protocols.

I-13	Is there a government Open Source Software (OSS) policy for the public sector?

Points	Responses	Economies	%E	Regions	%R
3	Yes. OSS policy is mandatory.	**4**	2%	**1**	1%
2	Yes. OSS policy is advisory or for R&D needs	**71**	36%	**53**	32%
1	Yes. OSS policy is proposed.	**5**	3%	**5**	3%
0	No.	**118**	60%	**109**	65%

This indicator measures the adoption of Open Source Software (OSS) policies by the government, based on an updated dataset originally produced by the Center for Strategic and International Studies.[38]

The adoption of OSS policies in the public sector is low in general. Most of the countries that have approved OSS policies – 43 out of 75, or 57 percent – are in HICs, and the remaining 32 MICs have mainly advisory policies in place, as presented in Figure 4.5a. Four countries – Brazil, Italy, the Netherlands, Sweden – have mandatory OSS policies, and there is a large group of countries with one or more advisory policy documents to promote the use of OSS in the public sector. No fragile state has an approved OSS policy.

The pattern of regional distribution is similar, as illustrated in Figure 4.5b. The EAP, ECA, and LCR regions lead with more than 41 out of 54 OSS policies adopted. Of the 109 governments (65 percent) with no OSS policy, most are in the AFR region.

Figure 4.5: Income Level and Regional Distributions for Indicator I-13

Figure 4.5a: Income Level Distribution for I-13

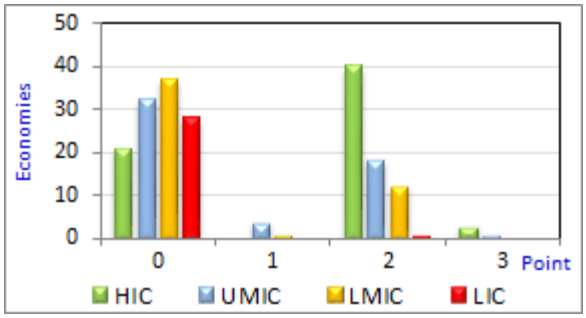
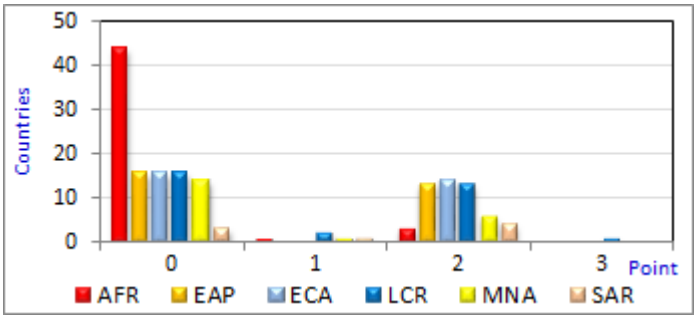


Figure 4.5b: Regional Distribution for I-13



Source: World Bank data.

[38] The Government Open Source Policies dataset was originally developed by the Center for Strategic and International Studies (CSIS) in 2010. This dataset was expanded by including new policy documents adopted by the government within the last decade.

I-15	Is there a national strategy for new/disruptive technologies?

Points	Responses	Economies	%E	Regions	%R
2	Yes.	**53**	27%	**34**	20%
1	In draft / planned.	**26**	13%	**22**	13%
0	No.	**119**	60%	**112**	67%

The state of adoption of national strategy documents focused on the effective use of disruptive technologies in the public sector is measured through this indicator.

About 64 percent (34 out of 53) of existing national strategies on disruptive technologies have been approved by the HICs, and the rest is distributed among 13 UMICs, 4 LMICs, and 2 LICs (see Figure 4.6a). The main focus of the government's disruptive technology strategy documents produced within the last decade has been on Artificial Intelligence (AI)/Machine Learning – 56 out of 79, or 71 percent. Sixteen countries have more than one disruptive technology strategy – for example, a strategy for blockchain, IoT, and drones – and they are mostly HICs. Most of the LMICs and LICs are not focused on using disruptive technologies in the public sector yet.

Most of the national disruptive technology strategies (96 percent) were adopted within the last five years. The adoption of such strategies is typically low in the public sector in most regions, as shown in Figure 4.6b. ECA is the most active region with nine approved and 11 draft AI strategies, and the AFR, EAP, LCR, and MNA regions follow with 24 approved strategies in total. There are relatively new disruptive technology strategies approved in Benin, Mauritius, Rwanda, Sierra Leone, and South Africa in the AFR region. The focus on disruptive technology strategies is mini mal in the SAR region.

AI and chatbots are reducing the administrative burden on service providers by providing virtual assistance to online and mobile users. One example is the Alex chatbot developed by the Australian Taxation Office to address general taxation inquiries from citizens. Facebook chatbots are also supporting service delivery in the Philippines and Madagascar. These chatbots provide information and expand the reach for citizen feedback to monitor the implementation of decentralized service delivery as is happening through the Madagascar Public Sector Performance Project.

Figure 4.6: Income Level and Regional Distributions for Indicator I-15

Figure 4.6a: Income Level Distribution for I-15

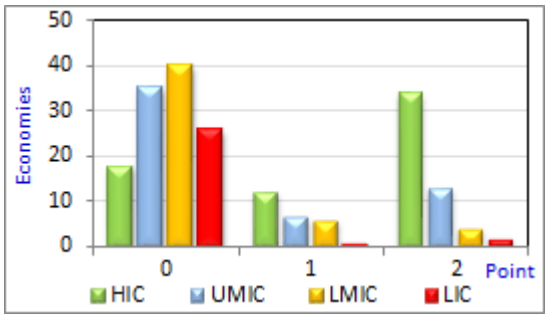
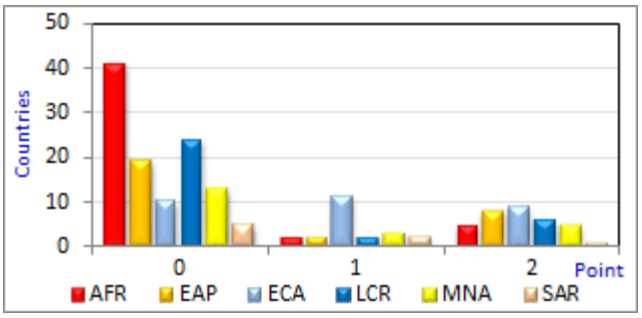


Figure 4.6b: Regional Distribution for I-15



Source: World Bank data.

I-17	Is there an online public service portal for citizens and businesses?

Points	Responses	Economies	%E	Regions	%R
2	Yes (Level 3 or 4). Mostly transactional (G2C, G2B, G2G) including single sign-on and other advanced features.	**105**	53%	**78**	46%
1	Yes (Level 1 or 2). Mostly information/forms. Some online transactions (G2C, G2B).	**47**	24%	**45**	27%
0	No. There is no online public service portal yet.	**46**	23%	**45**	27%

This indicator measures the presence of online service delivery portals and the level of services provided by the governments.

Income level distribution is presenting the results for all 198 economies, whereas regional distribution is presenting the status in 168 WBG client countries. All key indicators and the GTMI scores/groups are presented similarly.

A majority of the economies – 152 out of 198, or 77 percent – have dedicated online public service delivery portals, and most of these – 105 out of 152, or 69 percent – support Level 3 or 4 transactional services.[39] Of the 46 governments (23 percent) that have no online service portal, most are LICs or LMICs – see Figure 4.7a. Most of the fragile states do not yet have service delivery portals.

The pattern of regional distribution is similar, as shown in Figure 4.7b. Most of the countries – 123 out of 168, or 73 percent – have online public service delivery portals, and 78 governments (46 percent) provide Leve l 3 or 4 services. Of the 45 governments (27 percent) with no online service portal, most are in the AFR region.

Figure 4.7: Income Level and Regional Distributions for Indicator I-17

Figure 4.7a: Income Level Distribution for I-17

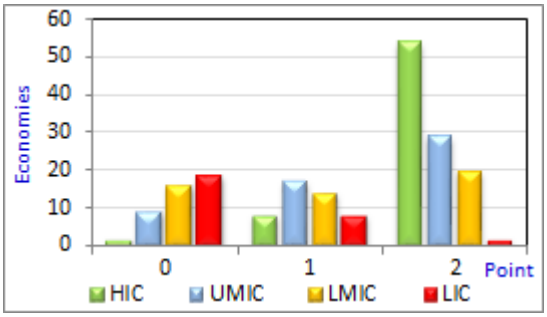
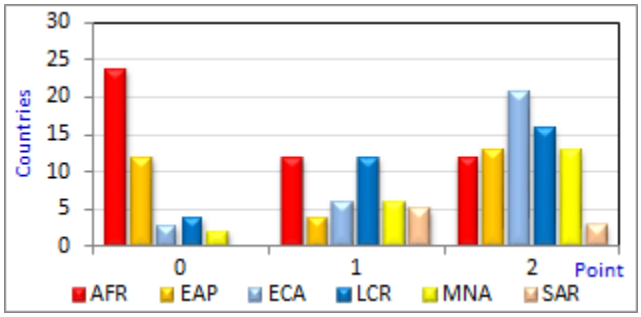


Figure 4.7b: Regional Distribution for I-17



Source: World Bank data.

[39] The UN proposes a four-stage model of e-service maturity ranging from Level 1: emerging to Level 4: Connected. More information is available at UN e-Government Survey 2014.

I-25	Is there a national portal for citizen participation in policy decision-making?

Points	Responses	Economies	%E	Regions	%R
1	Yes.	**82**	41%	**60**	36%
0	No.	**116**	59%	**108**	64%

While there are many different approaches to citizen engagement and participation in the policy process, enabling online tools is a way to extend citizen reach and promote engagement. This indicator measures the presence of multifunctional citizen participation platforms.

Figure 4.8a shows that about half of the countries in HICs and UMICs – 60 out of 119 – have multifunctional national portals for citizen participation. Such platforms are not available in most LICs. Of the 82 countries having a citizen participation platform, 49 governments provide options to submit petitions, 56 publish citizen's inputs online, 32 allow citizens to provide feedback anonymously, and 37 respond to citizen questions.

There is a relatively small group of countries, 60 out of 168, or 36 percent, with a citizen participation portal in the WBG regions, as illustrated in Figure 4.8b. The ECA (15), LCR (13), EAP (12), and MNA (10) regions are leading with online portals providing various options for citizen participation. There are only six countries out of 48 with a citizen participation platform in the AFR region.

Figure 4.8: Income Level and Regional Distributions for Indicator I-25

Figure 4.8a: Income Level Distribution for I-25

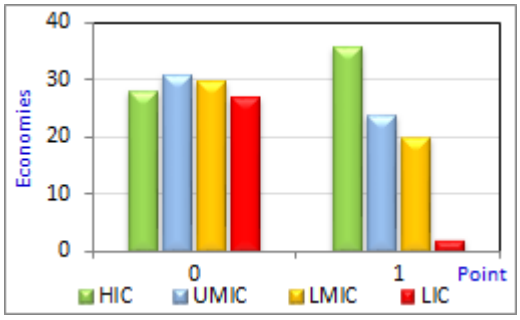
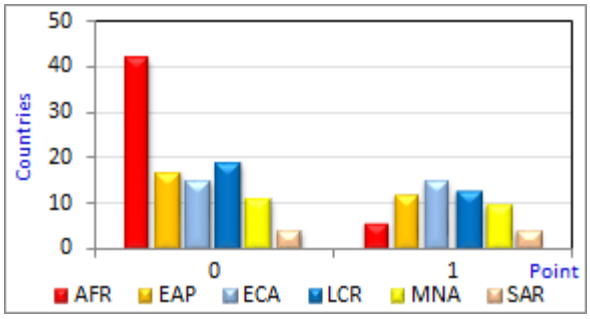


Figure 4.8b: Regional Distribution for I-25



Source: World Bank data.

I-34	Is there a government body focused on GovTech (digital gov transformation)?

Points	Responses	Economies	%E	Regions	%R
1	Yes. There is a GovTech institution established.	**80**	40%	**60**	36%
0	No.	**118**	60%	**108**	64%

GovTech has been growing globally over the last five years, and countries more often are adopting a centralized approach to digital transformation management. The presence of GovTech institutions established to lead digital transformation in the public sector is measured through this indicator.

Of the 80 countries having a GovTech institution in charge of public sector modernization, 41 are HICs, 21 UMICs, 17 LMICs and 1 LIC – see Figure 4.9a. Around 86 percent of these institutions have been established within the last six years to implement new digital transformation action plans. Among these, 27 GovTech institutions have been established under the President's or Prime Minister's Administration as a Center of Government agency, 15 are connected to the Ministry of ICT, and others are either autonomous or connected to another public entity. Mature GovTech institutions are focused on several key aspects of the digital government agenda, including policy/strategy, eGov/eServices, private sector partnership, digital skills, and use of disruptive technologies in the public sector. Most of the fragile states do not yet have a GovTech institution.

Regarding the regional distribution, 20 out of 60 GovTech institutions (33 percent) have been established in the ECA region, and EAP (12), LCR (11), MNA (9) and SAR (5) regions follow, as shown in Figure 4.9b. Most of the governments in the AFR region have no focus as yet on GovTech institutions.

Figure 4.9: Income Level and Regional Distributions for Indicator I-34

Figure 4.9a: Income Level Distribution for I-34

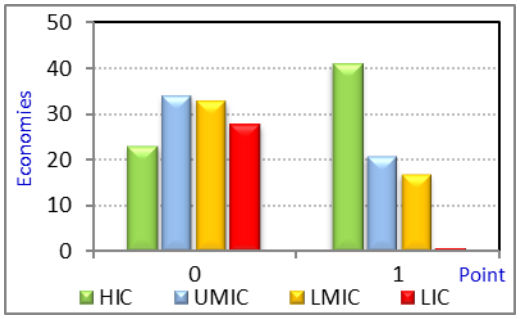
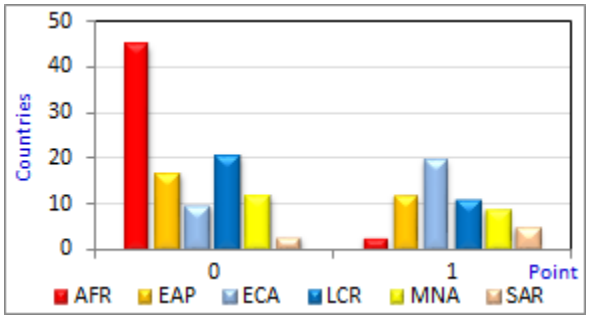


Figure 4.9b: Regional Distribution for I-34



Source: World Bank data.

I-35	Is there a government entity in charge of data governance/data management?

Points	Responses	Economies	%E	Regions	%R
2	Yes. Established by law.	**49**	25%	**31**	18%
1	Planned / In progress	**12**	6%	**8**	5%
0	No.	**137**	69%	**129**	77%

Data governance and management institutions are a growing trend, reflecting the challenges of data protection and privacy, and the potential to use data for digital entrepreneurship, contributing to the digital economy development. This indicator measures the presence of dedicated data governance entities in the public sector.

About 70 percent of existing data governance institutions have been established in the HICs (34 out of 49), and 10 UMICs and 5 LMICs follow, as shown in Figure 4.10a. In 12 countries, either the establishment of new data governance bodies is in progress or there are plans to establish them. Of the 61 data governance institutions established or in progress, 27 are separate/autonomous institutions, whereas 34 are a part of another government entity. Fifty of these institutions support a holistic data governance approach, with a central body supporting all entities, and the remaining 11 support multilevel data governance – a central or federal agency provides guidelines, but data governance is separately implemented by each federal/state. Nearly 60 percent of these institutions have been established within the last six years.

Regarding the regional distribution, a relatively small group of countries, 31 out of 168, or 18 percent, have dedicated data governance institutions – see Figure 4.10b. The EAP region has the largest number of data governance institutions with 10, and ECA (7), LCR (6), and MNA (5) regions follow. Another 8 institutions are expected to be established soon in the ECA, AFR, LCR and MNA regions. Only two out of 48 countries in the AFR region are in the process of establishing a new institution for data governance.

Figure 4.10: Income Level and Regional Distributions for Indicator I-35

Figure 4.10a: Income Level Distribution for I-35

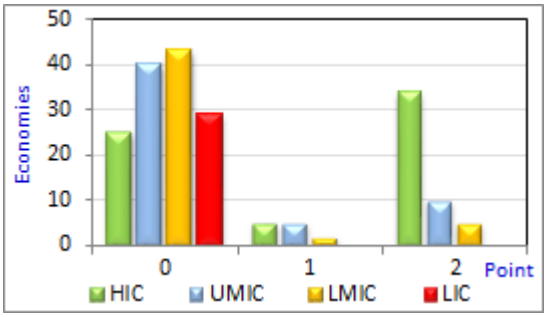
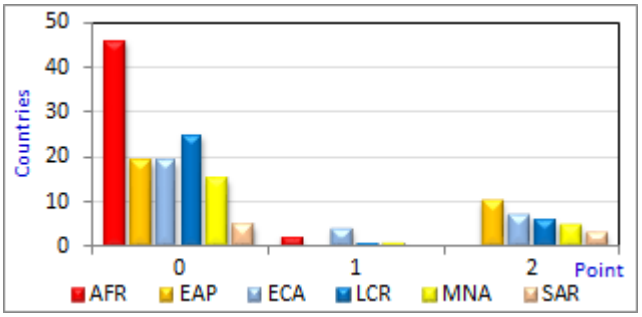


Figure 4.10b: Regional Distribution for I-35



Source: World Bank data.

I-47	Is there an academic/public program to improve digital skills/data literacy and innovation in the public sector?

Points	Responses	Economies	%E	Regions	%R
1	Yes.	**107**	54%	**81**	48%
0	No.	**91**	46%	**87**	52%

Countries are recognizing the need to upskill their civil servants and increasing the focus on enhancing digital skills in the public sector. This indicator measures the presence of specific programs available to improve digital skills and innovation in the public sector.

There are 107 programs available for the improvement of digital skills and data literacy in the public sector. Nearly half of these programs are in the HICs, and the remaining part is in MICs – see Figure 4.11a. Only six out of 29 LICs (20 percent) have specific programs focused on the improvement of digital skills. Most of these programs, 100 out of 107, or 93 percent, have been launched by public entities, and emerging academic and CSO programs focused on the GovTech agenda can be found in several countries including Canada, Colombia, India, Jordan, Spain, South Africa, and U. S. A. About 70 percent of the programs have been initiated within the last five years.

Regarding the regional distribution, ECA and LCR regions are leading with 20 and 19 countries, respectively, having specific public sector training programs to enhance digital skills, and the EAP, MNA and SAR regions follow – see Figure 4.11b. Despite the presence of relevant programs in 15 countries, most of the governments in the AFR region – 33 out of 48, or 69 percent – have little investment in the development of digital skills in public sector. In addition to these government-led programs, development partners also provide free massive open online courses (MOOCs), for example, Atingi and Apolitical GovTech course to enhance digital skills and data literacy in public sector.

Figure 4.11: Income Level and Regional Distributions for Indicator I-47

Figure 4.11a: Income Level Distribution for I-47

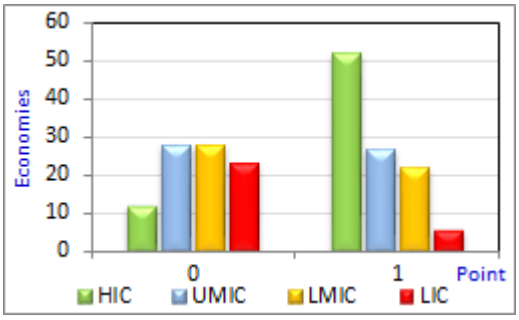
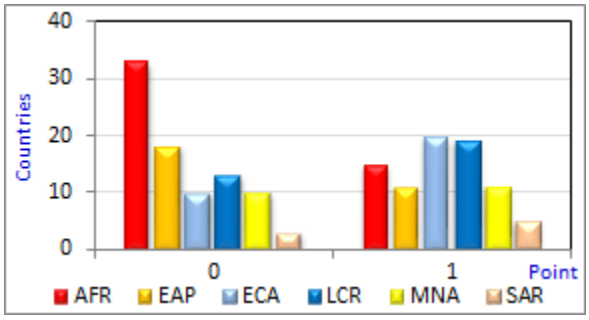


Figure 4.11b: Regional Distribution for I-47



Source: World Bank data.

I-48	Is there a government entity/strategy focused on public sector innovation?

Points	Responses	Economies	%E	Regions	%R
2	Yes.	**90**	46%	**66**	40%
1	Planned / In progress.	**10**	5%	**10**	5%
0	No.	**98**	49%	**92**	55%

There is growing interest in establishing public sector innovation labs or public entities supporting innovation and digital skills in the public sector, in collaboration with the private sector. This indicator measures the presence of government entities having the mandate to improve public sector innovation.

Of the 91 countries having a dedicated unit or GovLab for public sector innovation, 45 are HICs, 21 UMICs, 20 LMICs, and 5 LICs, as presented in Figure 4.12a. There are nine other ongoing initiatives to establish such units in nine countries. Many of these initiatives, 64 out of 100, or 64 percent, are focused on supporting innovation and improving digital skills in the public sector. About 55 percent of these initiatives were launched within the last five years.

ECA and LCR regions are leading with 20 and 18 countries respectively, in having GovLab initiatives or strategy documents supporting the enhancement of digital skills and innovation in the public sector, and the EAP, MNA, and SAR regions follow, as illustrated in Figure 4.12b. Despite the presence of relevant initiatives in 13 countries, most of the governments in the AFR region – 35 out of 48, or 73 percent – have little focus on public sector innovation.

Figure 4.12: Income Level and Regional Distributions for Indicator I-48

Figure 4.12a: Income Level Distribution for I-48

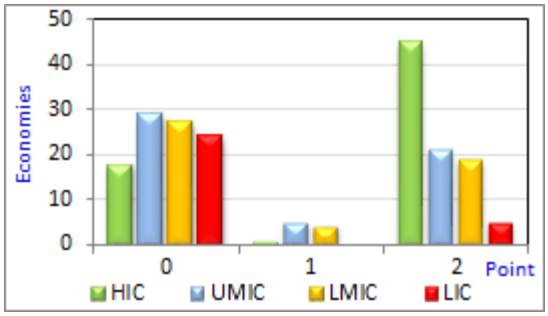
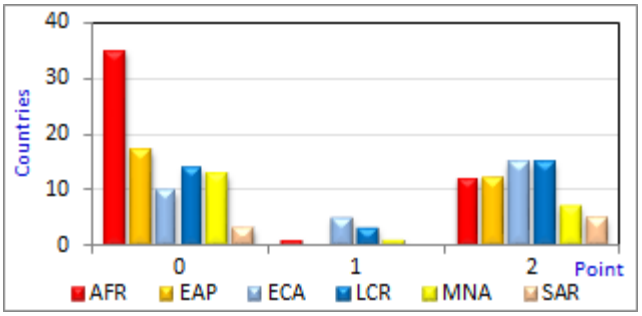


Figure 4.12b: Regional Distribution for I-48



Source: World Bank data.

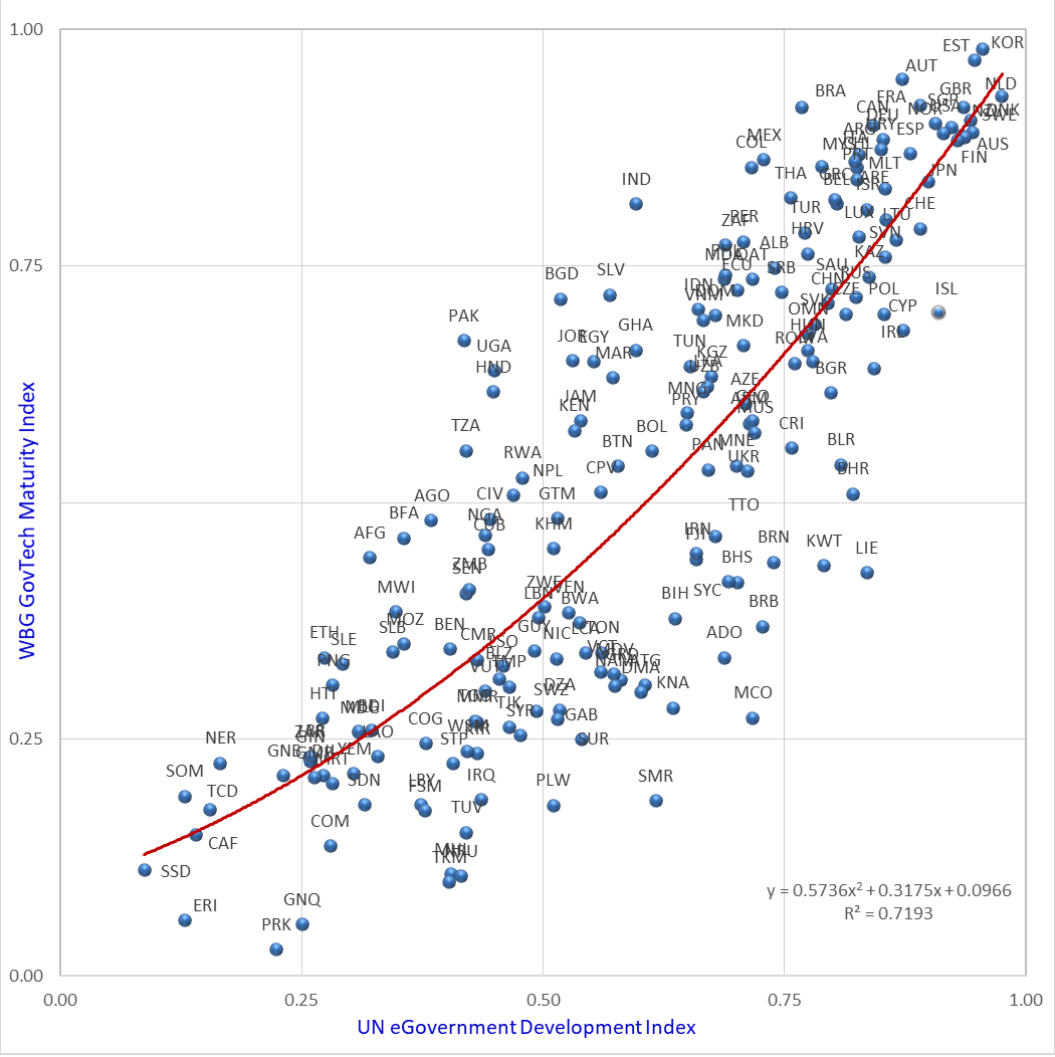
Appendix C: Comparison with Other GovTech Indices

A comparison of the GTMI with other relevant GovTech indices is presented in this section to demonstrate the consistency of findings and observations.

Relationship with the UN e-Government Development Index

Since all three components of the UN EGDI[40] and EPI are highly relevant to the GovTech domain, these indices were used in the calculation of the composite GovTech Maturity Index, in addition to 42 indicators defined by the World Bank team and included in the GovTech dataset. The scatter diagram of the GovTech Index and UN EGDI – Figure 4.13 and Table 4.3 – reveals a positive correlation between these scores, as expected.

Figure 4.13: Comparison of GovTech Maturity Index with UN EGDI (193 Economies)



[40] The 2020 UN e-Government Development Index (EGDI) measures the scope and quality of online services, the status of telecommunication infrastructure, and existing human capacity in 193 UN member states. The UN e-Participation Index (EPI) is derived as a supplementary index to extend the EGDI by focusing on government use of online services in providing information to its citizens (e-information sharing), interacting with stakeholders (e-consultation), and engaging in decision-making processes (e-decision-making).

Table 4.3: Comparison of GTMI with UN EGDI, by Number of Countries in each Group

UN EGDI vs. GTMI		GTMI Groups (# of countries)			
UN EGDI	**Country**	**A**	**B**	**C**	**D**
0.75-1.00	57	37	18	2	
0.50-0.74	69	5	34	27	3
0.25-0.49	59		6	31	22
0.00-0.24	8				8
	193	42	58	60	33

Source: World Bank data.

Due to the importance of the UN EGDI and EPI, specific weights were assigned to each of these UN indices while calculating the GTMI and its four components, as explained earlier. The above table demonstrates that the grouping of countries based on the additional 42 key GovTech indicators defined for this study is largely consistent with the UN EGDI groups, despite some differences.

The UN EGDI measures the readiness and capacity of national institutions to use ICTs to deliver public services based on comprehensive survey results and rich datasets. According to the EGDI, 126 out of 193, or 65 percent of the countries have high or very high scores and offer specific digital services for youth, women, older people, persons with disabilities, migrants and/or those in poverty, contributing to efforts aimed at leaving no one behind. Similarly, more governments are using online platforms for public procurement and the recruitment of civil servants – 80 percent of countries publish government vacancies online. The GTMI scores of some of these countries are lower compared to the UN EGDI. These differences are due to a relatively lower level of maturity in specific GovTech focus areas, including whole-of-government approach, citizen-centric and universally accessible services, and citizen engagement.

As presented in Figure 4.13, there are 57 countries with very high UN EGDI scores, 37 of which are among the GovTech leaders (Group A) based on their GTMI scores. Some of these countries have lower GTMI scores (18 in Group B and two in Group C), since their focus on four GovTech focus areas is less than other countries. Similarly, 69 countries have high UN EGDI scores (Group B), and more than half of these – 39 out of 69, or 57 percent – have relatively high GovTech scores (Groups A or B). The remaining 30 countries have lower GTMI scores; 27 are in Group C and three in Group D. The main reason for these patterns is the focus on new key indicators used for the GovTech Maturity Index that measure lesser-known aspects of public sector digital transformation that are not measured by the UN EGDI and other indices.

Also, there are 67 countries with medium or low UN EGDI scores (Groups C and D), and about half of these countries – 37 out of 67, or 55 percent –have some investments in GovTech focus areas to enable them to receive similar medium or higher GTMI scores. Despite this, the remaining 30 countries have low GTMI scores indicating that they have limited or no interest in the GovTech agenda. This also demonstrates that the GTMI measures more specific dimensions of the GovTech agenda compared to the UN EGDI, and there is inadequate focus on GovTech enablers and other focus areas in a larger number of Groups C and D countries – 93 out of 193, or 47 percent.

The overall conclusion of the comparison of GTMI with the UN's 2020 EGDI is that the GTMI can be useful to monitor the maturity of digital transformation in four focus areas.

Comparison with the OECD Digital Government Index

The OECD's Digital Government Index (DGI) was published in October 2020 to measure the maturity of digital government in 33 countries, including 29 OECD Member countries and 4 non-Member countries: Uruguay, Brazil, Panama and Argentina, with a focus on six key aspects: digital by design; data-driven public sector; government as a platform; open by default; user-driven approach; and proactiveness. Since these dimensions are highly relevant to the GovTech agenda, a comparison of the DGI and GTMI is presented below – see Figure 4.15 and Table 4.4.

Figure 4.14: Comparison of GTMI with OECD Digital Government Index (33 Countries)

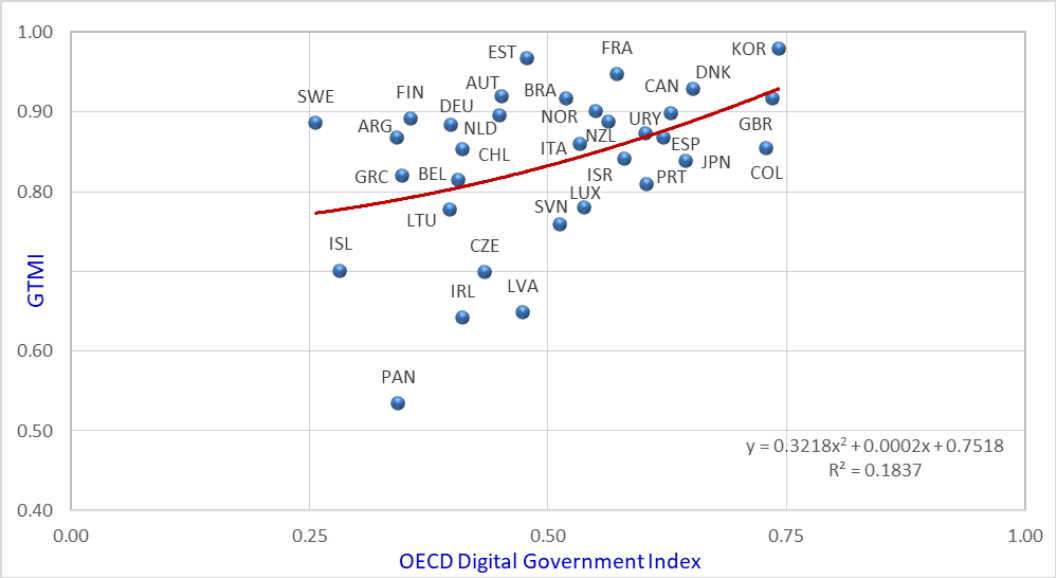


Table 4.4: Comparison of GTMI with OECD DGI, by Number of Countries in each Group

DGI vs. GTMI		GTMI Groups (# of Countries)			
DGI	**Country**	**A**	**B**	**C**	**D**
0.75 - 1.00					
0.50 - 0.74	17	17			
0.25 - 0.49	16	11	5		
0.00 - 0.24					
	33	28	5	0	0

Source: World Bank data.

Based on the composite DGI, there are 17 countries with high scores in all six dimensions, and their GTMI scores are comparable (17 in Group A). Similarly, there are 16 countries with high scores in some of the DGI dimensions and their GTMI scores are also high (11 in Group A, and five in Group B). This indicates that the OECD's DGI and new GTMI are capturing most of the good practices in the GovTech domain consistently, with comparable indicators.

Comparison with the CAF GovTech Index

The GovTech Index 2020 published by the CAF (Development Bank of Latin America) in June 2020 is another relevant index measuring the degree of maturity of GovTech ecosystems, the dynamism of tech-for-good startup markets, and the degree of innovation of public institutions. A comparison of the CAF GovTech Index and GTMI is presented in Figure 4.17 and Table 4.5.

The CAF GovTech Index (CGTI) consists of 28 indicators across seven dimensions. Most of these indicators (24) have been taken from existing datasets, but some (four new indicators) have been calculated by the CAF, as explained in the CGTI methodology. Specific weights have been used in the CGTI based on *expert opinions*, similar to the GTMI approach.

Figure 4.15: Comparison of GTMI with CAF GovTech Index (16 countries)

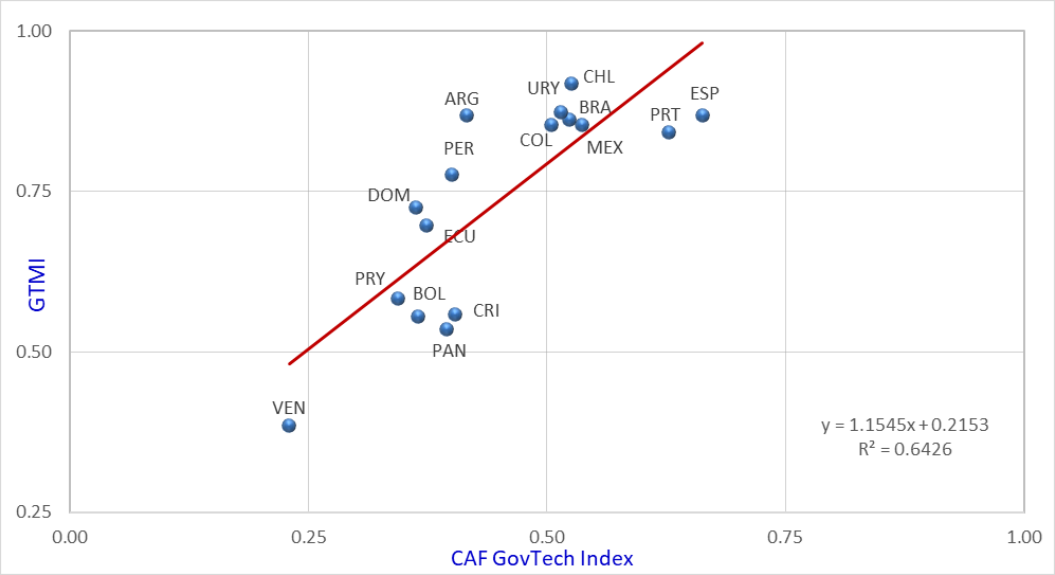


Table 4.5: Comparison of GTMI with CGTI, by Number of Countries in each Group

CAF GTI vs. GTMI		GTMI Groups (# of Countries)			
CAF GTI	**Country**	**A**	**B**	**C**	**D**
0.75 - 1.00	0				
0.50 - 0.74	7	7			
0.25 - 0.49	8	2	6		
0.00 - 0.24	1			1	
	16	9	6	1	0

Source: World Bank data.

According to the composite CGTI, there are seven countries, all in Group A, with relatively higher scores in all seven dimensions, and their GTMI scores are comparable. Similarly, there are eight countries with high scores in some of the CGTI dimensions and also high GTMI scores – two in Group A, six in Group B. There is only one country with relatively lower scores in all dimensions of the CGTI, whereas the GTMI score is higher. The CGTI indicators are more focused on innovation environment, startups, and broader digital government indicators, compared to the specific focus of WBG GTMI on four focus areas. Hence, most of the 16 countries included in CGTI survey are getting higher GTMI scores due to the

differences in selected indicators. This also indicates that the CAF's new GovTech Index and GTMI are complementary to each other, with comparable results.

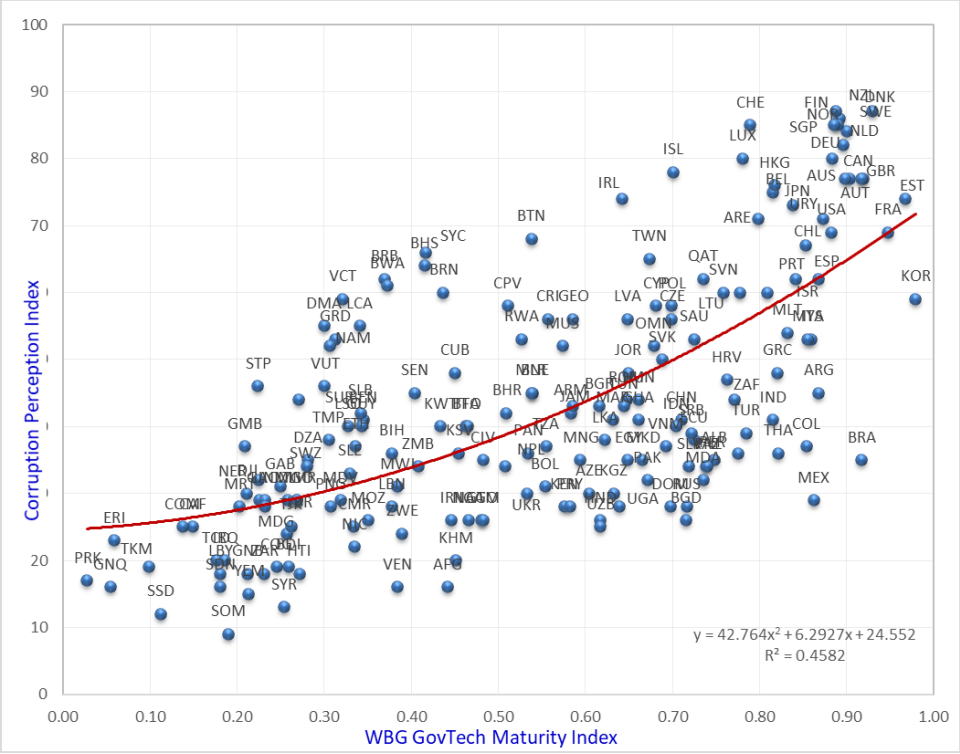
Based on the comparative analyses with relevant indices, it can be concluded that the indicators defined for this study produce consistent results when compared to other relevant indicators of digital government or GovTech, and additionally bring in measures of the less known dimensions related to GovTech initiatives to complement existing surveys and datasets.

Indicators showing the impact of GovTech on broader aspects of governance

GovTech initiatives provide governments with opportunities to improve public services, get better value-for-money, and curb corruption. Several governance indicators can be compared with the GTMI to have a better sense of the potential impact of GovTech on broader aspects of governance. The sections below present the relationship of the GTMI with the Corruption Perception Index (CPI) and two of the Worldwide Governance Indicators (WGI).

A comparison of the GTMI with the CPI[41] is presented in Figure 4.16. The top 17 countries with the lowest level of perceived corruption (CPI >= 75) have relatively large GTMI scores; 16 in Group A, and one in Group B).

Figure 4.16: Comparison of GTMI with Corruption Perception Index (180 economies)



Source: World Bank data.

[41] The Corruption Perception Index (CPI) is a composite index - a combination of 13 surveys and assessments of corruption, collected by a variety of reputable institutions - that scores countries based on how corrupt a country's public sector is perceived by experts and business executives. Each of the sources included in the CPI is standardized to allow for aggregation into the CPI score. The standardization converts all the data points to a scale of 0-100, where a 0 represents the highest level of perceived corruption, and 100 the lowest level of perceived corruption in 180 countries.

It emerges from this analysis that a higher maturity level of GovTech initiatives correlates positively with the improved perceptions of corruption.

The Worldwide Governance Indicators (WGI)[42] include several relevant dimensions that could be used for the calculation of the GTMI. After a detailed review of the underlying datasets, it was noted that the sources used for the calculation of various components do not cover most of the 198 economies historically. Hence, the WGI components were not used in the calculation of the GTMI. A comparison of the GTMI scores with the Government Effectiveness indicator, Control of Corruption, and Voice and Accountability indicators is presented below.

The **WGI Government Effectiveness Indicator** is based on the data collected from over 30 sources covering 196 countries about the perceptions of the quality of public services, coupled with the commitment of governments to policies geared towards improving the quality of service delivery. The scatter diagram of the GTMI and the Government Effectiveness Index – Figure 4.17 – shows a positive correlation across 196 economies.

Figure 4.17: Comparison of GTMI with WGI Government Effectiveness Index (196 economies)

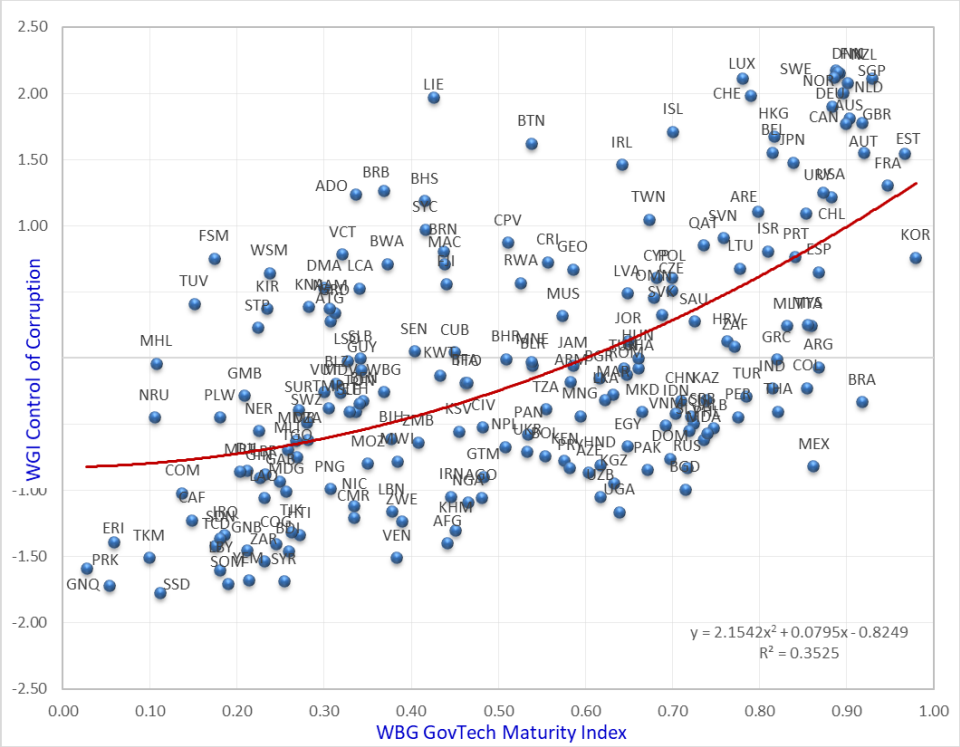
Source: World Bank data.

[42] The Worldwide Governance Indicators (WGI) reports aggregate and individual governance indicators for over 200 countries and territories over the period 1996–2019, for six dimensions of governance: (i) Voice and Accountability; (ii) Political Stability and Absence of Violence; (iii) Government Effectiveness; (iv) Regulatory Quality; (v) Rule of Law; and (vi) Control of Corruption. These indicators are not available for all 200 economies included in the WGI dataset. The WGI Governance Effectiveness and Control of Corruption indicators are available for 196 out of 198 economies included in the GovTech dataset; the Voice and Accountability indicator is available for all 198 economies.

This indicates that governments with a higher level of commitment to improving the quality of public services have relatively higher GTMI scores, consistent with their focus on four focus areas linked to public sector modernization.

The **WGI Control of Corruption Index** quantifies the perceptions of the degree to which public power is exercised for private gain. The scatter diagram of the GTMI and the WGI Control of Corruption Index – Figure 4.18 – indicates a positive association across 196 economies. This implies that advancement in digital transformation can improve the capability of governments to control corruption and promote inclusive prosperity.

Figure 4.18: Comparison of GTMI with WGI Control of Corruption Index (196 economies)

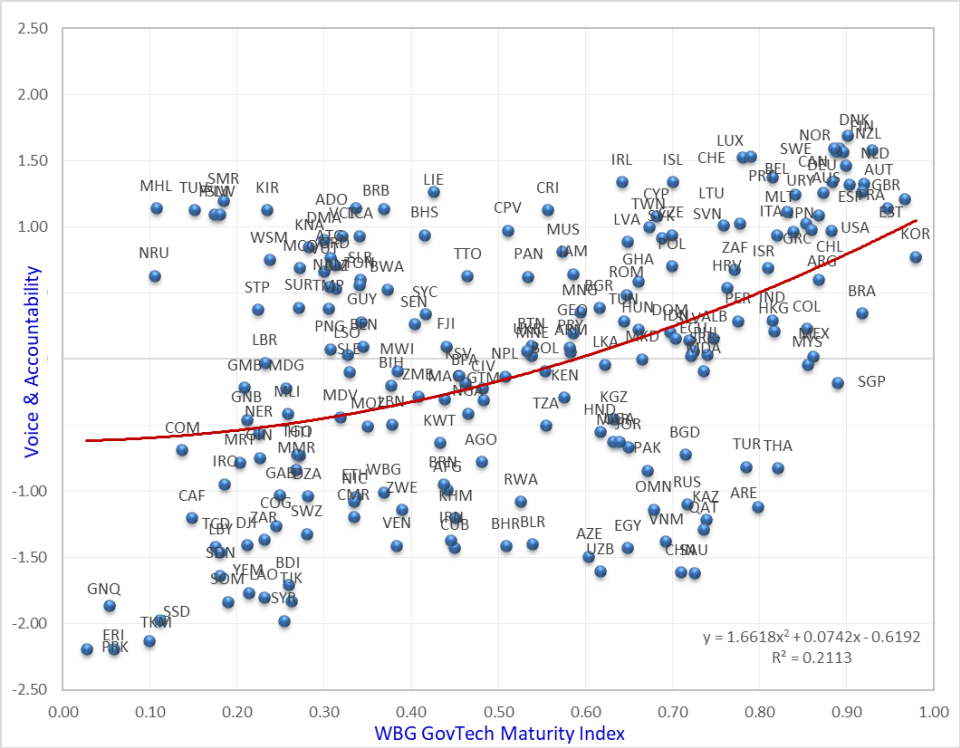


Source: World Bank data.

The **WGI Voice and Accountability Indicator** presents the views regarding the degree to which citizens can participate in electing their government, together with their enjoyment of the freedom of expression and association. The relationship between the GTMI and the WGI Voice and Accountability indicator, denoted by Figure 4.19, shows a positive correlation across 198 economies.

The pattern for the relationship of the Voice and Accountability indicator with the GTMI is similar to that for the WGI Control of Corruption indicator Most of the 18 countries with high Voice and Accountability scores between 1.25 and 2.5 also have high GovTech scores; 15 are in Group A, two in Group B, and one in Group C.

Figure 4.19: Comparison of GTMI with WGI Voice and Accountability Index (198 economies)



Source: World Bank data.

Improvements in public sector digital transformation can promote inclusive governance by providing greater opportunities to citizens not only to periodically elect governments, but also to voice their concerns or participate in major decisions that are important to them.

Appendix D: Weight Calculations

To construct the GTMI and make it policy-relevant, six primary steps were followed.[43] The first step involved defining the phenomenon being measured, which is GovTech – comprising four focus areas. The second step determined the primary purposes and objectives of the index. This informed the choice of mostly actionable indicators for the construction of 48 indicators to help policymakers not only to identify gaps but also to act on them. Considering the purpose of the index also helped in determining the unit of analysis for data collection, as well as the reporting of analyzed results. The third step entailed the identification of a set of desirable characteristics that the index should exhibit. These include: (i) simplicity in understanding and description; (ii) coherence and conformity with the measured phenomenon; (iii) fitness for purpose and ultimate use; (iv) rigor or technical soundness; and (v) actionability.[44] The fourth step considered the conceptual domains of the index and determined areas with relatively greater importance which was followed by the fifth step: the choice of indicators and aggregation method. In the fifth step, a weighted average approach was selected (with differential weights at the indicator level) to construct sub-indices for the four GovTech focus areas that were further aggregated into a GTMI as a simple average.

The sixth and final step noted the invariance axioms that the index should satisfy to meet its objectives over time and assure consistency. The GTMI satisfies four main axioms. First, the index satisfies monotonicity, meaning that, all else being equal, an increase in the score of one indicator increases the overall score of the index. Second, the index satisfies subgroup decomposability, implying that it can be decomposed into subgroups for further analysis. Third, the index satisfies the replication axiom such that if a set of indicator scores is formed by replicating the existing set and order of scores an arbitrary number of times, the GTMI score would remain the same. Fourth, the index is non-negative and equal to zero if and only if all indicators record zero scores.

To find the best fit for the calculation of four key component indices used in GovTech Maturity Index (GTMI) calculations, the following options were considered:

- **GT0** (No weights): Simple arithmetic average of four component index scores – CGSI, PSDI, CEI, GTEI – without any weight calculation.
- **GTE** (Using weights based on *expert opinion*): Average of the four weighted component index scores using specific weights identified by experts involved in DG/GovTech projects for selected key indicators that are not measured in well-known surveys/indices.

[43] Similar to the construction of the updated Statistical Capacity Index (also called the Statistical Performance Index), as explained in the "Measuring the Statistical Capacity of Nations" by Cameron et al (2019).

[44] It is worth noting that, in terms of conformity with GovTech, the weighted average is linear in nature; as such, it does not describe non-linear changes in the GovTech status. Furthermore, it assumes that the indicators capture separate phenomena although, in reality, some indicators may interact.

- **GTC** (Weights based on *correlation analysis* with standardized scores):[45] Average of the four weighted component scores using correlation analysis applied to all key indicators.
- **GTF** (Weights based on *factor analysis* with standardized scores): Arithmetic average of the four weighted component scores using factor analysis applied to all key indicators.

GT0 and GTE options were explained in Chapter 2.

The details of GTC and GTF are explained in this section. These options were considered to allocate differential weights to indicators depending on the degree to which they explain variation among the indicators or are associated with changes in the overall composite GovTech Maturity Index across countries. A key advantage of these approaches is that weights can be endogenously generated or computed from the data itself; as such, the weights would differ depending on the variation or information in the available data.

GTC: Correlation Analysis

Correlation analysis of the unweighted GovTech scores was performed (conditional on the raw data) using the standardized indicator Z-scores. First, a simple average of the GovTech Maturity Index was computed using the raw scores from the data collection exercise. Subsequently, the raw scores for each indicator are standardized using the formula:

$$(1): \quad z_{i1} = \frac{x_{i1} - \mu_1}{\sigma_1}$$

Equation (1) means that, to obtain the standardized score of indicator 1 for country i denoted as z_{i1}, the mean value of indicator 1 (across all countries), μ_1, is subtracted from the raw score of indicator 1 for country i, x_{i1}, and then divided by the standard deviation of indicator 1 (across all countries), σ_1. The purpose of the standardization is to place all indicators on equal footing or a common scale with the same mean (= 0) and variance (= 1). A critical practical implication of this transformation is that outlier values in the raw scores are accounted for and, therefore, do not unduly skew the results of the composite index.

The weight for indicator 1, for instance, is calculated using the formula:

$$(2): \quad r_1 = \frac{\sum_{i=1}^{n}(z_{i1} - \bar{z_1})(y_i - \bar{y})}{\sqrt{\sum_{=1}^{n}(z_{i1} - \bar{z_1})^2}\sqrt{\sum_{=1}^{n}(y_i - \bar{y})^2}}$$

where:

r_1 = correlation coefficient or weight of indicator 1 (measures its degree of association with y).

z_{i1} = represents the standardized score of indicator 1 for country i.

$\bar{z_1}$ = mean of the standardized values of indicator 1 across countries.

y_i = denotes the score of the unweighted GovTech Maturity Index for country i.

$\bar{y}$ = mean of the values of the unweighted GovTech Maturity Index across countries.

[45] The Z-score standardization procedure is implemented for each component indicator to ensure that the overall GTMI is equally decided by the four component indices, that is, each component index presents comparable variance after the Z-score standardization (similar to UN EGDI calculations).

For example, correlating the standardized values of the e-Service portal indicator (eSrv) with the unweighted GTMI across 198 economies in the GovTech dataset (using the command "correlate GTMI eSrv") in Stata produces the correlation matrix:

```
. correlate GTI eSrv
(obs=198)

             |      GTI     eSrv
-------------+------------------
         GTI |   1.0000
        eSrv |   0.7482   1.0000
```

This means that the GTMI is correlated one-to-one with itself and likewise eSrv with itself, but the degree of association between eSrv and GTMI is 0.75, which was used as the weight for the indicator e-Service portal for all countries. The intuition is that the more closely associated an indicator is with the unweighted GTMI measure, after placing all indicators on a common scale, the more likely it is to explain variation in the composite index across countries and, therefore, the more weight it is assigned.

GTF: Weights calculated by Factor Analysis (Principal Components Method)

Factor analysis estimates a model that explains the variation of a set of observed indicators by a set of fewer unobserved factors that are common to the observed indicators. In other words, it assumes that for a set of indicator values for different individuals or countries, there is a set of unobserved variables called factors – fewer than the observed indicators – that can explain the interrelationships among the observed indicators. This is achieved by estimating the following model:

$$(3): \quad Z_{(N\,X\,V)} = F_{(N\,X\,f)}\,\boldsymbol{\alpha}'_{(f\,X\,V)} + \mathcal{E}_{(N\,X\,V)}$$

Where Z is a matrix representing the standardized indicator scores covering N=198 economies and V=48 indicators in our case. F represents the principal factors to be constructed that are retained, with α denoting the factor loadings. These loadings are coefficients that illustrate the degree of association between the unobserved factors and the observed indicators. The error term is denoted as $\mathcal{E}$.

Unlike a typical regression analysis where the independent variables are observed, the factors are not observed in this case. They are constructed through linear combinations of the indicator values:

$$(4): \quad \begin{aligned} F_1 &= a_{11}z_1 + a_{12}z_2 + \cdots + a_{1v}z_v \\ F_2 &= a_{21}z_1 + a_{22}z_2 + \cdots + a_{2v}z_v \\ &\ldots \\ F_{(v)} &= a_{v1}z_1 + a_{v2}z_2 + \cdots + a_{vv}z_v \end{aligned}$$

To create these factors, the set of factor loadings must be chosen. The factor loadings are chosen such that the factors are uncorrelated (orthogonal) with each other. Secondly, the

first principal factor explains the maximum possible proportion of the variance of the set of indicators values, and the second principal factor subsequently captures the maximum of the remaining variance. This continues until the final principal factor absorbs all the remaining variance not accounted for by the preceding principal factors. The third condition for the choice of loadings is that, for each principal factor, the sum of the squares of the loadings should equal 1, which is equal to the unit variance of the standardized scores.

The factors are first created to be equal to the number of indicators (V=48), after which P < V=48 factors that are *principal* to explaining the variation of the observed data are selected. The OECD (2008) handbook on the construction of composite indicators suggests retaining principal factors/components that: (i) have associated eigenvalues > 1; (ii) contribute individually to the explanation of overall variance by more than 10 percent; and (iii) contribute cumulatively to the explanation of the overall variance by more than 60 percent. An eigenvalue measures the extent of the variance in the indicators that a factor explains. If a factor has an eigenvalue > 1, it implies that it explains more variance than a single indicator.

The *factor* command in Stata with the option *pcf* is used to estimate and subsequently rotate the factors and the loadings (with orthogonal varimax rotation) to obtain a simple structure of the unobserved factors and observed indicators. The weights will then be computed as squared factor loadings normalized by the variance explained by the factor. This is illustrated by the partial output in Table 4.7.

In the GTF analysis, seven factors were used that have eigenvalues > 1 and explain about 64 percent of the cumulative variance in the indicator scores, although the factors individually explain ≥ 6 percent of the overall variance – see Table 4.6 below. Table 4.7 further presents a partial output of the weights corresponding to each indicator. For example, the weight for the Government Enterprise Architecture (GEA) indicator is calculated by first identifying the maximum factor loading (0.712) and squaring it: 0.712^2 = 0.507. The result is normalized by the variance explained by its factor: Factor 3 (3.979) in Table 4.6 to obtain the weight of 0.13.

Details of the GTMI calculations with or without weights (total number of economies and average scores for each group) are shown in Tables 4.8a to 4.8f. GT0 represents the distribution of countries based on GTMI calculations with no weights. GTE option is filtering ongoing GovTech activities using some weights and resulting in fewer countries in Group C compared to the GT0 option. GTC and GTF are based on weights from correlation and factor analyses using the standardized scores. GTC option results in a similar grouping of countries compared to the GTE with some differences in Groups C and D countries. The GTF option produces a distribution substantially different than other options and the number of outliers increases.

Table 4.6: Explained Variance by Each Retained Factor

Factor	Variance	Proportion	Cumulative
Factor1	8.798	0.183	0.183
Factor2	5.909	0.123	0.306
Factor3	3.979	0.083	0.389
Factor4	3.840	0.080	0.469
Factor5	2.848	0.059	0.529
Factor6	2.549	0.053	0.582
Factor7	2.548	0.053	0.635

Table 4.7: Rotated Factor Loadings (Pattern Matrix): Selected Indicators

Variable	Factor1	Factor2	Factor3	Factor4	Factor5	Factor6	Factor7	Max	Max^2	Weights
GEA	0.324	0.202	**0.712**	0.073	0.108	0.042	-0.021	**0.712**	0.507	**0.13**
Tax	0.244	0.055	0.040	0.292	0.098	**0.673**	0.196	**0.673**	0.453	**0.18**
TaxS	0.330	0.211	0.307	0.302	-0.015	**0.594**	0.135	**0.594**	0.352	**0.14**
Cust	0.037	0.088	0.209	**0.556**	-0.065	0.350	0.552	**0.556**	0.309	**0.08**
HRM	0.190	0.114	0.033	**0.824**	0.173	0.057	0.018	**0.824**	0.680	**0.18**
Payr	0.135	0.061	0.050	**0.881**	0.139	0.085	0.028	**0.881**	0.776	**0.20**
PSI	0.385	0.237	0.413	0.105	**0.550**	0.112	0.095	**0.550**	0.303	**0.11**

Table 4.8: Comparison of GTMI calculations

Table 4.8a: GT0 (Without Weights)

Group	GT0	CGSI	PSDI	CEI	GTEI
A	**44**	60	76	26	65
B	**61**	96	58	42	53
C	**74**	27	48	33	49
D	**19**	15	16	97	31
Totals	**198**	198	198	198	198

Table 4.8b: GTE (Weights: Expert Opinion)

Group	GTE	CGSI	PSDI	CEI	GTEI
A	**43**	34	73	52	56
B	**59**	57	63	31	45
C	**63**	77	43	42	56
D	**33**	30	19	73	41
Totals	**198**	198	198	198	198

Table 4.8c: GTC (Weights: Correlation Analysis)

Group	GTC	CGSI	PSDI	CEI	GTEI
A	**42**	58	65	24	59
B	**62**	87	78	41	49
C	**71**	40	43	36	48
D	**23**	13	12	97	42
Totals	**198**	198	198	198	198

Table 4.8d: GTF (Weights: Factor Analysis)

Group	GTF	CGSI	PSDI	CEI	GTEI
A	**45**	103	59	20	87
B	**75**	67	84	40	69
C	**66**	20	44	21	28
D	**12**	8	11	117	14
Totals	**198**	198	198	198	198

Table 4.8e: Comparison of GTMI Calculations

Group	UN EGDI	GT0	GTE	GTC	GTF
A	57	44	**43**	42	45
B	69	61	**59**	62	75
C	59	74	**63**	71	66
D	8	19	**33**	23	12
	193	198	**198**	198	198

Table 4.8f: UN EGDI vs. GTE (193 Economies)

Group	UN EGDI	GTE
A	57	43
B	69	57
C	59	60
D	8	33
	193	**193**

Source: World Bank data.

Note: Total number of economies in each group is shown for four GTMI calculation options and the UN EGDI.

After the comparison of results based on four different index construction options, it was realized that the scores/grouping generated through the GTF option (using weights based on factor analysis with standardized scores) were substantially different from other options and creating an unrealistic mapping of GovTech focus areas. The GTE (using weights based on expert opinion) and GTC (weights based on correlation analysis with standardized scores) options generate similar results. However, the GTC option created some unrealistic scores especially for some of the Groups A and D countries. The GT0 (no weights) option also produces similar results to the GTE option, but there were deviations in Groups C and D countries. The GTE scores produced the best fit, since the weights assigned by experts captured the less-known aspects of GovTech focus areas more accurately compared to other options.

In comparison with the UN's EGDI, the primary GTE index (which is the GTMI computed using weights based on expert opinion) recorded relatively fewer countries in Groups A and B, but more countries in C and D, as Table 4.8 indicates. This appears to be reasonable, since the UN EGDI measures a broader spectrum of e-Government systems and services, whereas the GTMI measures the state of relatively new initiatives related to digital transformation, with a focus on more advanced capabilities and a whole-of-government approach in public sector modernization.

The GTMI scores were calculated by using the weights based on expert opinion (GTE) for data analysis and presentation of findings and good practices, since this approach was the best fit to measure the maturity of four GovTech focus areas consistently.

Appendix E: GovTech References

- GovTech website: https://www.worldbank.org/en/programs/govtech.
- GovTech Launch Report and Short-Term Action Plan; GovTech Global Partnership (GTGP), 2020.
- GovTech: The New Frontier in Digital Government Transformation; WBG GovTech Guidance Note 1, November 2020.
- GovTech State of Play: Challenges and Opportunities; WBG GovTech Guidance Note 2, November 2020.
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- World Development Report 2021 on Data for Better Lives, 2021.
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- World Bank Open Data portal: http://data.worldbank.org.
- WBG Digital Government Readiness Assessment Toolkit: Guidelines for Task Teams, 2020.
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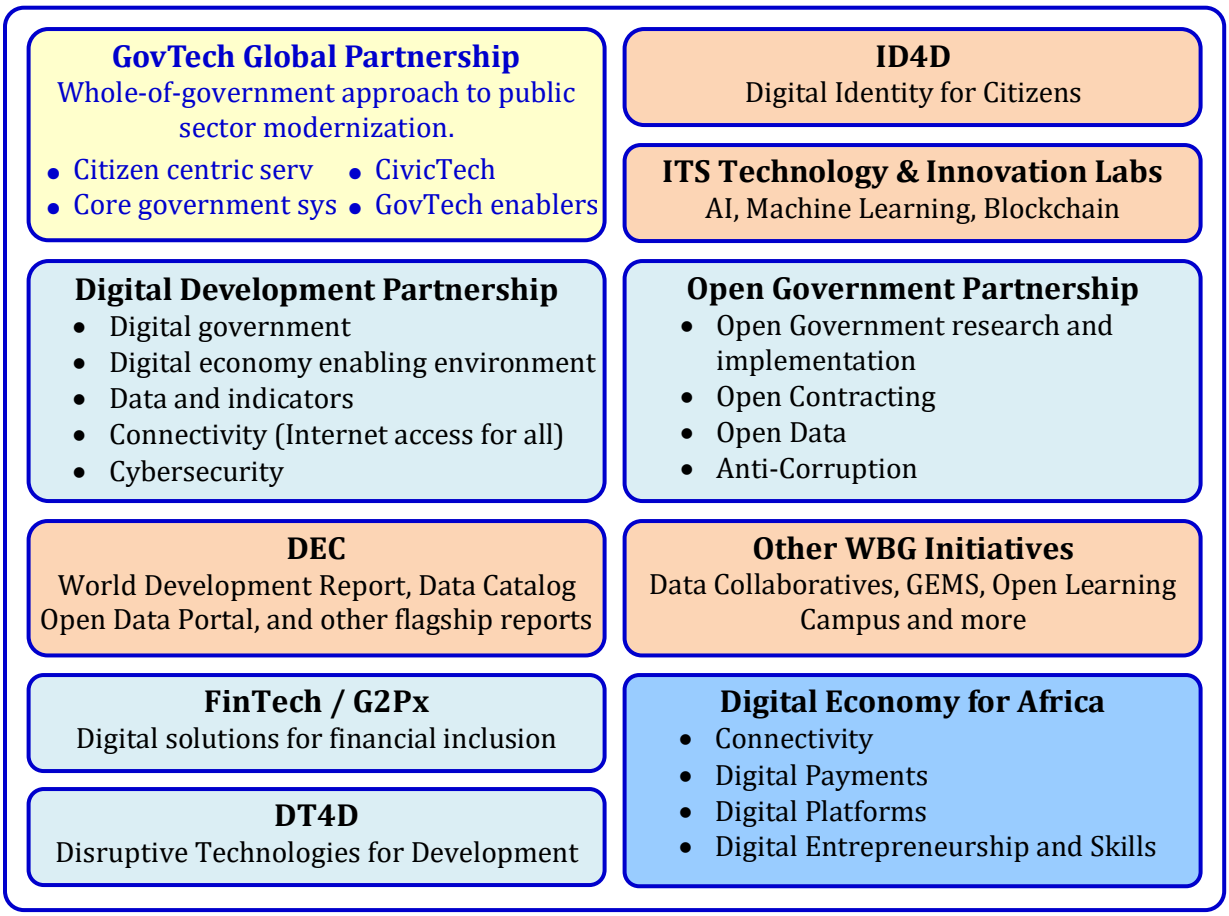
- UN DESA : The Compendium of Digital Government Initiatives in response to the COVID-19 Pandemic, 2020.
- OECD, Digital Government Index: 2019 results, OECD Public Governance Policy Papers, No. 03, OECD Publishing, Paris, 2020.
- OECD : Observatory of Public Sector Innovation, Since 2013.
- EU: eGovernment Benchmark 2020 Insight Report, 2020.
- EU : Exploring Digital Government transformation in the EU, 2019.
- Evaluating Digital Citizen Engagement: A Practical Guide; WBG, February 2016.
- Enhancing Government Effectiveness and Transparency: The Fight Against Corruption; EBG Report, 2020.
- Achieving Integrated Government-to-Business Service Delivery: A Planning Guide for Reformers, WBG, 2020.
- IADB: Social Services for Digital Citizens: Opportunities for Latin America and the Caribbean, 2018.
- The ICT Opportunity for a Disability-Inclusive Development Framework; ITU Report, September 2013.
- Digital ID and the Data Protection Challenge: Practitioner's Note, WBG, 2019.
- Privacy by Design: Current Practices in Estonia, India, and Austria, WBG, 2018.
- World Bank Group Policy on Personal Data Privacy, 2020.

In addition to the GovTech initiative, there are other World Bank programs focused on important aspects of the GovTech agenda as presented below:



Source: World Bank data.

Note: Web links to the World Bank Group initiatives in the GovTech domain:

- GovTech Global Partnership (GTGP).
- Identification for Development (ID4D).
- ITS Technology & Innovation Labs (Internal).
- Development Economics (DEC).
- WBG Open Data Portal (ODP).
- WBG Data Catalog.
- Digital Development Partnership (DDP).
- Open Government Partnership (OGP).
- Development Data Partnership / Data Collaboratives.
- Geo-Enabling initiative for Monitoring and Supervision (GEMS).
- Geospatial Portal (internal); GEMS (internal).
- Open Learning Campus (OLC).
- Financial Technology (FinTech).
- Government-to-person payments (G2Px).
- Disruptive Technologies for Development (DT4D) Challenge.
- Digital Economy for Africa (DE4A).

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