OECD Digital Government Studies

Assessing the Impact of Digital Government in Colombia:

TOWARDS A NEW METHODOLOGY

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Foreword

Assessing the Impact of Digital Government in Colombia: towards a new methodology is the first OECD report that takes an in-depth look at the monitoring and evaluation framework for digital government. It provides insights on digital government indicators and methodologies for assessing the impact of digital government strategies and related initiatives.

The aim of this report is twofold. First, it assesses the impact of Colombia's current Online Government Strategy, and provides recommendations to the Colombian government on how to make the strategy more effective. Second, it analyses the transitional impact assessment methodology developed and implemented so far, and provides recommendations on how to strengthen the statistical quality of the methodology and further develop it in line with the Colombia's transition to digital government.

This report shows that Colombia's Online Government Strategy has led to greater citizen satisfaction with digital services, digital citizen engagement, and the sharing and strategic use of data, information and ICT systems. These outcomes could promote public sector integrity, foster citizen engagement, help improve internal processes and contribute to achieving the sustainable development goals. It also concludes that the developed and implemented transitional methodology will require some statistical adjustments, content changes and support for public institutions' measurement capacities to be able to conduct future impact assessments of digital government in Colombia.

This report is part of the technical support the OECD has given to the Colombian government to design and implement a sustainable impact assessment methodology and business case component for digital government. As part of the study underpinning this report, the OECD held an interactive seminar and several workshops in Bogotá to gather information, raise awareness and build capacities among Colombian digital government decision-makers and ICT project managers. The seminar included presentations by the governments of Mexico and Peru on their respective impact assessment systems for digital government. The report is also based on responses to the OECD Questionnaire on the Impact Evaluation of the Online Government Strategy of Colombia, which was sent to 1 280 Colombian institutions. In addition to the insights, recommendations and practical tools offered through this report, the OECD has provided the Colombian government with the indicator formulas, the statistical software coding and the microdata to replicate the methodology in future assessments and allow for additional analysis and comparisons in the years to come.

This report draws on the OECD's most recent empirical and analytical work in areas related to digital government and digital government indicators, and is supported by the conceptual framework provided by the OECD Recommendation of the Council on Digital Government Strategies, particularly its third pillar regarding capacities to support the implementation of digital government. This work is part of the OECD cross-cutting project "Going Digital", which guides countries in developing a coherent and effective

policy framework for ensuring that the digital transformation of public sectors, economies and societies contributes to growth and well-being.

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This report was prepared by the Directorate for Public Governance (GOV) of the OECD. The mission of the Directorate for Public Governance is to help governments at all levels design and implement strategic, evidence-based and innovative policies to strengthen public governance, respond effectively to diverse and disruptive economic, social and environmental challenges and deliver on government's commitments to citizens.

The report is produced under the overall supervision and guidance of Barbara-Chiara Ubaldi, who leads the OECD's work on Digital Government, Open Government Data and Data-Driven Public Sector. Strategic guidance was provided by Luiz de Mello, Director ad interim (a.i.) of the Directorate for Public Governance, and Edwin Lau, Head of the Division for the Reform of the Public Sector (RPS). Charlotte van Ooijen, digital government policy analyst served as the overall coordinator. The report greatly benefitted from input by digital government policy analysts Reginald Dadzie, Rodrigo Mejía Ricart and João Ricardo Vasconcelos. Additional comments were provided by El Iza Mohamedou and Santiago Gonzalez from the Government at a Glance team within RPS.

Chapters 1, "The Digital Government context in Colombia" and 2, "Designing an impact assessment methodology for Colombia's Online Government Strategy" were written by Charlotte van Ooijen with significant contributions by Carla Bonina of the University of Surrey, assisted by Angeles Navarro Rueda. Chapter 3, "Results of the transitional impact assessment of Colombia's Online Government Strategy", was prepared by Arnaud Maurel, statistical analyst at New York University, under the guidance of Charlotte van Ooijen. The chapter benefitted from valuable comments by Reginald Dadzie, junior consultant. Chapter 4, "Towards a sustainable impact assessment methodology for digital government in Colombia" was prepared by Charlotte van Ooijen, Rodrigo Mejía Ricart and Arnaud Maurel.

Liv Gaunt provided support with the production process and Jennifer Allain edited the manuscript. The translation into Spanish was made possible by Colare Trading Company. Javier Gonzalez and Raquel Páramo kindly provided editorial assistance for the Spanish edition.

Through the in-depth analysis of the monitoring and evaluation framework of e-government in Colombia and the consecutive design and implementation of a transitional impact assessment methodology for digital government, this report constitutes an important building block of the OECD's work on digital government indicators, conducted under the leadership of the OECD Working Party of Senior Digital Government Officials (E-leaders). The digital government team wishes to acknowledge the fundamental role played by the government of Colombia in proving the opportunity to conduct this ground-laying study.

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Executive summary

The Colombian government is preparing a digital transformation of the public sector in order to increase the effectiveness of its policies and better serve the needs of citizens. Colombia is seeking ways to adapt its capacities for managing, monitoring and evaluating digital projects in line with the change from e-government to digital government.

The study underpinning this report examined the impact of Colombia's current strategy for e-government, the Online Government Strategy, by designing and implementing a transitional impact assessment methodology, using the existing monitoring and evaluation system as a basis. It also assessed the developed methodology in light of its first implementation and provides recommendations on how to ensure its continued value while aligning it with the strategic change towards digital government.

The analysis suggests that the system currently in place to monitor Colombia's Online Government Strategy, culminating in the annual Online Government Index, provides a good basis for an impact assessment of digital government. However, it has a strong e-government focus on measuring public institutions' implementation activities and their digital products, and does not provide insight into the impact of these initiatives on citizens and the public sector itself. The transitional impact assessment methodology developed in this study complements the current measurement efforts with an analytical model, an indicator framework and a data collection instrument capable of capturing the Strategy's chain of events leading up to impacts.

Policy recommendations

Based on the results of the first impact assessment of Colombia's Online Government Strategy, two sets of recommendations are provided to the Colombian government.

The first is related to the development of the digital government strategy and suggests where the Colombian government should focus its policy efforts to achieve greater impact. However, these recommendations should be interpreted with caution, since the results have limited explanatory power given the transitional and exploratory nature of the methodology used.

Fostering government efficiency and citizen engagement through digital government policies

- Focus on achieving high-quality digital services and ensuring the availability of an integrated digital petitions and claims system as ways to increase citizen satisfaction with digital services and promote both public sector integrity and engagement.
- Continue organising open innovation exercises, offering digital participation possibilities, and increasing the digital transparency of public information to

foster digital citizen engagement and the implementation of co-created policy solutions.

- Foster the sharing and strategic use of data, information and ICT infrastructures, business processes and services within the public sector as a means to improving internal processes and helping achieve the sustainable development goals.
- Continue developing and promoting the use of implementation guides for digital government activities across levels of government and raise awareness among public institutions of the legal framework for digital government.
- Assist Colombian public institutions in setting ambitious levels of planning for digital government and in realising related implementation activities.
- Give priority to directing the above-mentioned policy efforts at municipalities, especially those in the early and intermediate stages of sustainable development, to generate overall better outcomes, and, ultimately, impacts.
- Consider treating the governorates as a separate stakeholder group of the digital government ecosystem, and target them with a dedicated part of the Digital Government Strategy rather than addressing them together with municipalities.

The second set of recommendations concerns the future evolution of the impact assessment methodology for digital government. These are aimed at helping the government of Colombia sustain the efforts made in the first impact assessment, while strengthening the statistical quality of the transitional methodology and adapting it to the shift from e-government to digital government.

Towards a sustainable impact assessment methodology for digital government

- Improve the explanatory power of the transitional methodology by systematically including non-digital control variables into the variable correlation model, conducting yearly measurements for all indicators to gradually convert the correlation model into a time-series analytical tool, and enhancing the time-sensitivity and time lag consideration of the model by analysing inputs and activities in year x in relation to outputs in year x+1, outcomes in year x+2 and impacts in year x+5;
- Support public institutions in developing their capacities to collect, manage, analyse and share relevant evaluation data to increase the data availability for certain indicators, notably for information security and privacy outputs and outcomes, and as part of broader efforts to foster a data-driven public sector in Colombia;
- Adapt the communication strategy towards Colombian public institutions on the monitoring and evaluation of digital government, focusing on conveying the strategic value of these activities instead of ranking institutions. Such change is likely to stimulate public institutions to report the data they have and at the same time increase awareness about the shift from e-government to digital government.
- Complement quantitative impact assessment methods with qualitative ones. The latter can help identify more relevant metrics for indicators that have proven difficult to measure quantitatively and could help foster a clearer understanding of the reasons behind certain indicator scores.
- In the longer term, increase the efficiency of the data collection process for impact assessment and alleviate the current burden on public institutions by exploring alternative data-sharing methods and sources, e.g. through open government data, interoperability platforms and automated data capturing.

- Gradually introduce more citizen-driven metrics representing actual user experiences to move from an institutional to a citizen perspective on the outcomes and impacts of digital government.
- Consider incorporating more advanced digital government indicators – such as on citizen-driven design and delivery of policies and services, strategic data use and digital government stakeholder collaboration – into the variable correlation model to ensure that the new digital government strategy of Colombia is adequately assessed.
- Adopt a business case component in the management of ICT projects throughout the Colombian public sector to support a culture of monitoring and data-driven performance management. Such a component should include a project profile, strategic and normative alignment, cost-benefit analysis, service commissioning, and risk assessment and management.

Chapter 1. The digital government context in Colombia

This chapter offers an overview of the evolution and current status of Colombia's Online Government Strategy and related policies. It reviews the government's programme design and implementation. The aim is to understand the history, scale, context, declared objectives and operating environment of Colombia's Online Government Strategy to inform the parameters of the transitional impact assessment methodology discussed in Chapter 2. In light of the broader strategic goals of the Colombian government, the chapter sets out the areas and expected impacts on which to focus the assessment of digital government.

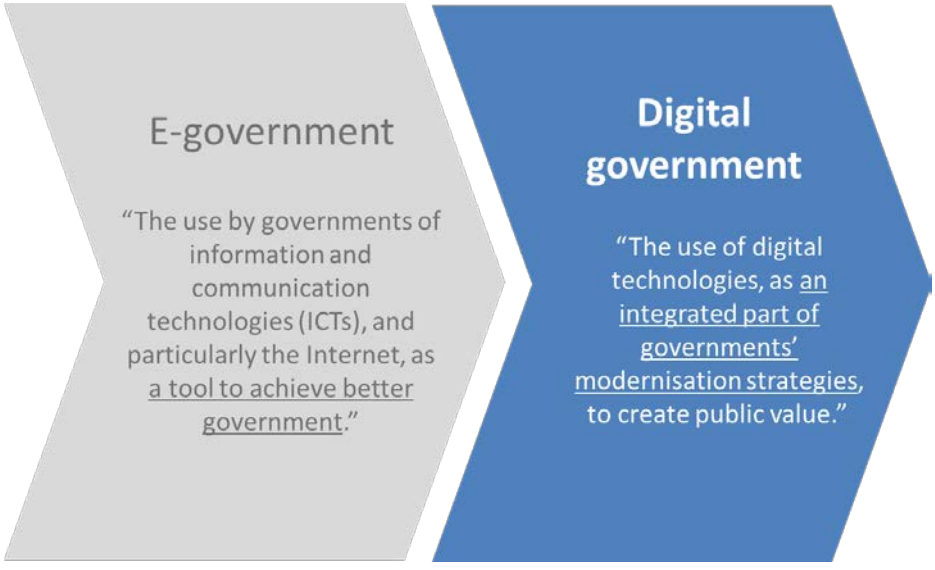
Setting the stage for an impact assessment of digital government

Colombia is preparing for the digital transformation of its public sector, thereby changing its approach to the use of information and communications technologies (ICTs) in government activities. This change can be characterised as a shift from **e-government**, with a focus on ICTs for better government, to **digital government**, putting public value creation at the core of digital government strategies.

Given the procedural nature of many government tasks, the use of the Internet and related ICT provides an attractive strategy to reorganise tasks, routines and internal processes, as well as a low-cost and convenient medium to interact with citizens. Arguably, for the last two decades, ICT adoption in the public sector (known as "e-government") has been used as an avenue for making government action more efficient and responsive as well as accountable to citizens. The latest developments in the use of ICTs in the public sector, including the widespread importance of open government data, show that digital technologies can also be a catalyser for innovation, economic growth and social development. These changes point to a transition from e-government, which is essentially oriented towards efficiency gains, to digital government, encompassing a broader transformation of public sector activities focused on the sound functioning of a country's digital government ecosystem consisting of government actors, non-governmental organisations, businesses, citizens' associations and individuals which supports the production of and access to data, services and content through interactions with the government (OECD, 2014).

Figure 1.1. The digital transformation of the public sector

Fostering the shift from e-government to digital government



Source: Adapted from OECD (2014), *Recommendation of the Council on Digital Government Strategies*, www.oecd.org/gov/digital-government/recommendation-on-digital-government-strategies.htm.

In proactively adhering to the OECD *Recommendation of the Council on Digital Government Strategies* (2014) Colombia has taken an important step towards fostering the digital transformation of the public sector. The Recommendation constitutes a *de jure* reference for digital government drawing on best practices in OECD countries. Moreover,

through its 12 guiding key recommendations it provides the basis for an international agenda for action. This report aims to assist Colombia in reinforcing its institutional capacities to manage and monitor its digital government policies and initiatives, thereby supporting the application of Key Recommendation 10 of the Recommendation (Box 1.1).

Box 1.1. Key Recommendation 10 of the OECD *Recommendation of the Council on Digital Government Strategies*

Reinforce institutional capacities to manage and monitor projects' implementation, by:

i. adopting structured approaches systematically, also for the management of risks, that include increasing the amount of evidence and data captured in the course of project implementation and provision of incentives to augment data use to monitor projects performance
ii. ensuring the availability at any time of a comprehensive picture of ongoing digital initiatives to avoid duplication of systems and datasets
iii. establishing evaluation and measurement frameworks for projects' performance at all levels of government, and adopting and uniformly applying standards, guidelines, codes for procurement and compliance with interoperability frameworks, for regular reporting and conditional release of funding
iv. reinforcing the public sector's digital and project management skills, mobilising collaborations and/or partnerships with private and non-governmental sector actors as necessary
v. conducting early sharing, testing and evaluation of prototypes with involvement of expected end-users to allow adjustment and successful scaling of projects.

Source: OECD (2014), *Recommendation of the Council on Digital Government Strategies*,www.oecd.org/gov/digital-government/recommendation-on-digital-government-strategies.htm.

This report identifies two main points of departure to reinforce Colombia's evaluation and monitoring capacities for digital government. First, the strategic directions embodied in its Online Government Strategy (*Estrategia de Gobierno en Línea*) should guide the formulation of evaluation criteria and indicators. Second, it is essential to align the criteria for policy evaluation with the digital government approach, emphasising the impact on public value creation rather than the level of digitisation of government activities. The set of indicators supporting the measurement is as such a way not only to monitor Colombia's progress regarding the strategy's implementation, but also its transition from e-government to digital government. On this basis, a transitional impact assessment methodology has been developed and implemented as part of this report. Since it is the first methodology of its kind to be developed and tested by the OECD, it should be considered transitional and subject to change. The insights generated from the process and results of the first implementation of this transitional methodology support the formulation of recommendations in Chapter 4 to develop a sustainable impact assessment methodology for digital government.

This chapter reviews the background, evolution and current status of the Online Government Strategy, with the objective to identify the key components to be taken into account in the development of the impact assessment methodology. Section Chapter 0. discusses the general background and historical evolution of Colombia's Online Government Strategy and its institutional framework since the year 2000. It covers the main characteristics of the strategy, its achievements from an international perspective and its governance mechanisms, and stresses the broader strategic goals the Online Government Strategy is expected to contribute to, thereby providing an important focus for the impact assessment. Section Chapter 0. offers an overview of the OECD *Recommendation of the Council on Digital Government Strategies* and a quick scan of Colombia's Online Government Strategy in view of the OECD Recommendation.

Background and institutional framework of Colombia's Online Government Strategy

From the Connectivity Agenda to the Online Government Strategy

Colombia's groundwork on e-government started in the early 2000s through the "Connectivity Agenda", which aimed to address the rapid expansion of the Internet and new ICTs into government renewal. The first strategic document released in 2000 set the Connectivity Agenda as a state policy that sought to expand the use of ICTs in the country, modernise public institutions, increase private sector competitiveness and socialise access to information. Under this agenda, the government launched an online government initiative (*Gobierno en Línea*), which aimed to improve the efficiency and performance of the state, increase the transparency and public control on public management, and strengthen the service provided to citizens by the state through ICTs.[1] The Connectivity Agenda and its different components fell under the responsibility of the former Ministry of Communications, the National Planning Department and the Presidency. Consecutive initiatives concentrated on consolidating these efforts, setting up a technological architecture for online government and the broader use of ICTs within Colombia's national development policies, mostly under the co-ordination and responsibility of the former Ministry of Communications (OECD, 2013).[2]

The main advances for the period 2002-08 entailed the consolidation of an online portal providing government services to citizens, the implementation of websites for all local governments and a one-stop portal for public procurement.[3] In 2003, the government also created the Intersectoral Commission for Policy and Management of Public Administration Information, responsible for the co-ordination of programmes and initiatives required for the production of digital information, online services and the promotion of common standards.[4]

From 2008 onwards Colombia consolidated its efforts into the Online Government Strategy, with a comprehensive policy framework including legislation on digital signatures, an access to information law, regulations on privacy and personal data protection, and a general legal framework of national digital government compliance. The Online Government Strategy is complemented and triggered by a broader policy initiative, the Live Digital Plan (Plan Vive Digital), which was launched in 2010 as part of the first President Santos administration (2010-14) and continued for a second four-year period (2014-18) with the Live Digital Plan for the People (Plan Vive Digital para la Gente). The Live Digital Plan focuses on reducing the digital divide, addressing digital literacy and creating the country's ICT ecosystem more broadly.

Both the Online Government Strategy and the Live Digital Plan confirm the commitment that the government has stated in terms of the use of ICTs for strategic development, as expressed in the two latest National Development Plans (NDP), which in Colombia have the legal status of a law. In section 0, the linkages between the Online Government Strategy, the Live Digital Plan and the National Development Plan will be discussed in more detail.

The efforts that the government of Colombia started in the 2000s have been accompanied by a series of norms and regulations to help consolidate the policy design and implementation of the Online Government Strategy over time. Table 1.1 summarises the most important legal foundations that advanced the policies and guidelines for the use of digital technologies within government and the general ICT uptake in the country.

Table 1.1. Chronology of Colombia's digital government policies

Year	Event	Description	Legal foundation
1999	Electronic Commerce Law	Definition and regulation of the access and use of data messages, electronic commerce and digital signatures as well as the establishment of certification bodies and other provisions	Law 527/1999
2000	Connectivity Agenda	Included the first e-government initiative: Online Government (*Gobierno en línea*)	CONPES 3072/2000
2000	Action Plan for Online Government	Action Plan for the Online Government Strategy	Directive 02/2000
2000	Certification entities, certificates and digital signatures	Partially regulates Law 527 of 1999, in relation to certification bodies, certificates and digital signatures	Decree 1747/2000
2003	Intersectoral Commission for Policy and Management of Public Administration Information (COINFO)	Co-ordination of digital Online Government Strategy	Decree 3816/2003
2005	Administrative Procedure Law	Rationalisation of administrative procedures	Law 962/2005
2008	Online Government Strategy (I)	Online Government Strategy with updated guidelines and goals	Decree 1151/2008
2009	Information and Communications Technology (ICT) Law	Mechanisms and conditions to guarantee access to ICTs and online government	Law 1341/2009
2010	Live Digital Plan (2010-14)	Government's ICT uptake plan for 2010-14 (including online government)	Based on ICT Law 1341/2009
2011	Code of Administrative Procedures and Disputes		Law 1437/2011
2012	Online Government Strategy (II)	Online Government Strategy with updated guidelines and goals	Decree 2693/2012
2012	CIO E-Gov Office	E-Gov Office as a branch of the Vice-Ministry of IT under the Ministry of ICT	Decree 2618/2012
2013	National Commission for Digital and State Information (CNDIE)	Provides guidelines and co-ordinates multiple agencies with responsibility in the Online Government Strategy (replaces the former COINFO created in 2003)	Decree 32/2013
2014	Online Government Strategy (III)	Online Government Strategy with updated guidelines and goals	Decree 2573/2014
2014	Live Digital Plan for the People (2014-18)	Government's ICT uptake strategy for 2014-18	
2014	Transparency Law and the Right to Access to National Public Information	Regulation of the right of access to public information, the procedures for the exercise and guarantee of the right and exceptions to openness of information	Law 1712/2014

Year	Event	Description	Legal foundation
2015	Regulation of Transparency Law	Guidelines regarding standards for publication and dissemination of information, electronic media accessibility for people with disabilities, an electronic form for receipt of requests for access to public information, open data and security conditions in electronic media	Resolution 3564/2015
2015	Online Government Strategy compendium	Gathers all previous regulations on online government and telecommunications	Decree 1078/2015
2016	Guidelines for ICT Management	Provides guidelines to strengthen ICT management in the public sector	Decree 415/2016
2016	National Digital Security Policy	Provides principles and strategic dimensions to manage digital security risks	CONPES 3854/2016

Source: Based on OECD (2013), *Colombia: Implementing Good Governance*, http://dx.doi.org/10.1787/9789264202177-en and additional comments provided by the Colombian government.

Online Government Strategy: Evolution, phases and objectives

As stated above, the current Online Government Strategy is the result of a long-standing effort that the government of Colombia has been putting in place over the last 15 years. It has evolved over time, with a constant adjustment of targeted goals. Three periods can be identified in the strategy since 2008 in light of the legal foundations that supports it (2008-12, 2012-14 and since 2014).

Table 1.2. Evolution of the Online Government Strategy

Year	Legal foundation/ time frame	Main objective	Principles	Model	Implementation tools
2008	Decree 1151/2008 Five-year timeline	Construction of a more efficient, transparent and participative state, delivering better services to citizens and businesses, through ICTs.	1. Unified vision of the state 2. Equal and multichannel access 3. Protection of personal information 4. Trust in and credibility of online government	5 phases: 1. Online information 2. Online interaction 3. Online transaction 4. Transformation 5. Online democracy	*Online Government Manual 1.0* and *2.0*
2012	Decree 2693/2012 2012-15 (national) 2012-17 (territorial)	Construction of a more efficient, transparent and participative state, delivering better services in collaboration with society.	1. Collective construction 2. Innovation 3. Network neutrality 4. Trust and security	6 components: 1. Transversal elements 2. Online information 3. Online interaction 4. Online transaction 5. Transformation 6. Online democracy	*Online Government Manual 3.1*
2014	Decree 2573/2014 Decree 1078/2015 2015-20	To contribute to the construction of an open, more efficient, more transparent and participatory state, that provides better services in collaboration with the whole society.	1. Outstanding service delivery to citizens 2. Openness and reuse of public data 3. Standardisation 4. Interoperability 5. Network neutrality 6. Innovation 7. Collaboration	4 components 1. ICTs for services 2. ICTs for open government 3. ICTs for management 4. Information security and privacy	1. *Online Government Manual* 2. IT Management Enterprise Architecture Framework (*Marco de referencia*) 3. Interoperability Framework 4. Excellence Route 5. Seal of excellence in online government

In the first period (2008-12), the main objective of the Online Government Strategy was the construction of a more efficient, transparent and participative state, capable of delivering not only more, but also better, services to citizens and businesses through ICTs. In 2008, the government set ambitious targets and provided guidelines and tools for the implementation of the strategy with a five-year horizon. A series of principles was formulated to realise a transition from the previous "Connectivity Agenda" to the new Online Government Strategy: a unified vision of the state, with equal and multichannel access, and the protection of personal information, with the vision that trust in and credibility of online government is key for the success of the strategy.[5] The underlying model of the Online Government Strategy in 2008 suggested a framework with five phases based on different stages of availability of online information and digital interaction:

1. online information: the government provides basic informational portals and websites, a one-way channel from government to citizens
2. online interaction: enables a two-way communication interface so that citizens and businesses can interact with and reach out to public servants
3. online transaction: entails the provision of government services on line

4. online transformation: the government transforms its operations, including the provision of one-stop shops and adopts a governmental intranet
5. online democracy: citizens are able to participate actively in policy-making processes through the use of digital technologies.

The strategy also envisioned the creation of an online government manual to provide guidelines for the design and implementation of the model, as well as the targets to be achieved. During this time, a milestone project was the launch of the Crystal Urn (*Urna de Cristal*), a multichannel platform for civic participation that integrates traditional communication channels (i.e. radio and television) with digital channels such as social media to promote dialogue with citizens.

During the second period (2012-14), a new decree established Version 3.1 of the *Online Government Manual*, which updated the guidelines, time frames and targets to be achieved by the central and territorial units of the government. It also introduced the following themes:

- the delivery of procedures and services through multiple channels and mobile devices, as well as the use of ICTs
- a focus on interoperability, procedural chains and a one-stop shop for administrative procedures
- technology and environment
- open government and open data
- a collective construction.

The *Online Government Manual 3.1* outlined a set of six hierarchical components, which contained the five elements of the 2008 Strategy (previously referred to as phases), and added a new layer called "transversal elements". The transversal elements consisted of the activities that government entities needed to implement to ensure online interaction with citizens – that is, to institutionalise the Online Government Strategy, to implement a user-centred approach and information security systems, among others. In addition, the manual set specific targets and percentages to be achieved by 2015 at the national government level (Table 1.3), and by 2016 and 2017 for the different territorial governments.[6]

Table 1.3. Implementation targets of the *Online Government Strategy Manual 3.1* for government entities at the national level

Components	Activities	Weight	2013 target	2014 target	2015 target
Transversal elements	*Institutionalising the Online Government Strategy:* Steering committee, planning, approval of strategy, monitoring and evaluation	30%	75%	95%	100%
	Focusing attention on users: User characterisation, strategy promotion, accessibility, usability	30%			
	Implementing an IT management system: Planning and adjusting technology, IPv6 protocol	15%			
	Information security management: Implementing an information security management system	25%			
Information on line	*Publishing information:* Political editorial, publishing of information, multichannel access	57%	80%	95%	100%
	Publishing open data: Information repository, opening up public data	43%			
Interaction on line	*Establishing interaction spaces:* Interactive consultation of information	50%	80%	95%	100%
	Establishing electronic spaces to make requests: Contact system, mobile contact system, integrated contact system	50%			
Transactions on line	*Making administrative procedures and services available on line:* Exemption rules, certificates and authentications, procedures and processes, one-stop shops	100%	70%	95%	100%
Transformation	*Using electronic communication channels in internal processes and procedures:* Good practices, file management system, authorisation of processes	45%	70%	95%	100%
	Exchange of information between public entities: Process design, information exchange services	55%			
Democracy on line	*Defining the participation strategy:* Strategy for participation through electronic media	15%	80%	95%	100%
	Constructing participatory policy making and strategic planning: Normativity and regulation, strategic planning	40%			
	Opening up space for social control: Accountability	20%			
	Opening up spaces for open innovation: Promotion of open data, problem solving	25%			

Note: The table illustrates national targets only. Targets for the territorial levels of government for 2013-17 can be found in the decree.
Source: Adapted from OECD (2013), *Colombia: Implementing Good Governance*, http://dx.doi.org/10.1787/9789264202177-en and Ministry of Information and Communications Technologies (2012), *Estrategia de Gobierno en Línea* (in Spanish), http://programa.gobiernoenlinea.gov.co/apc-aa-files/eb0df10529195223c011ca6762bfe39e/manual-3.1.pdf

In 2014, with the re-election of President Santos, the strategy entered a new phase with a time frame extending to 2020. The overall objective in this phase is to contribute to the construction of an open, more efficient, more transparent and participatory state thanks to

the use of ICTs.[7] Consequently, the strategy is expected to support the government in delivering the best online services to citizens, achieving management excellence, empowering citizens and generating public trust, and promoting and facilitating the actions required to advance on the United Nations Sustainable Development Goals (SDGs).[8]

The new strategy redesigned the previous six components of the model into four, with specific targets to be achieved by 2020:

1. **ICTs for services**: provide better online procedures and services to respond to the needs of citizens and businesses
2. **ICTs for open government**: build a more transparent, participative and collaborative state, where citizens take part in the decision-making process
3. **ICTs for management**: foster the strategic use of digital technology and information for improved decision making and more efficient administrative management
4. **Information security and privacy**: protect information and information systems from unauthorised access, use, disclosure, disruption or destruction.

By redesigning the main components of the new strategy, a better balance was sought between front office and back office elements, whereas the previous strategy was mainly focused on the front office of digital government. Table 1.4 summarises the targets to be achieved by 2020, with respect to the four components of the strategy established in the online government guidelines of 2014 and asserted in Decree 1078/2015.

Table 1.4. Implementation targets for government entities at the national level

Components	2015	2016	2017	2018	2019	2020
ICTs for services	90%	100%	Maintain 100%	Maintain 100%	Maintain 100%	Maintain 100%
ICTs for open government	90%	100%	Maintain 100%	Maintain 100%	Maintain 100%	Maintain 100%
ICTs for management	25%	50%	80%	100%	Maintain 100%	Maintain 100%
Information security and privacy	40%	60%	80%	100%	Maintain 100%	Maintain 100%

Source: Republic of Colombia (2015), Decree 1078/2015 (in Spanish), www.mintic.gov.co/portal/604/articles-9528_documento.pdf.

At the time of writing this report, there are nine active initiatives within the portfolio of the Online Government Strategy.[9] These are:

- **Open Government Data** (*Datos Abiertos*): based on the Open Government Partnership, it aims to release open government data on strategic sectors and build apps through ICT entrepreneurship.
- **Crystal Urn** (*Urna de Cristal*): citizen participation website with a multichannel platform to provide information and responses to citizens.
- **Digital Citizen Services** (*Servicios Ciudadanos Digitales*): as part of this initiative, a Citizen Folder is developed, allowing Colombians to file and consult key documents for their interactions with the state (e.g. birth certificate, military card and medical history). To ensure its reliability and security, the Citizen Folder will be supported by an electronic and biometric authentication system, and an interoperability model for data exchange and systems integration between public institutions.
- **No More Queuing** (*No más filas*): national e-services portal. Online and centralised information platform that contains governmental procedures.

- **Co-financing** (*Cofinanciación*): a financial resource project to promote technological solutions, automation of procedures and digital-related projects with the private sector to strengthen the efficiency of public administration in territorial entities.
- **Territorial Platforms** (*Plataformas Territoriales*): design and implementation of technological solutions to help enhance the execution of the online government strategy in the departments and municipalities (i.e. information platforms, digital tools to enable transactional services and digital communication channels).
- **Excellence Route** (*Ruta de la Excelencia*): project to prioritise procedures and services that citizens need to be available on line.
- **Online Government Excellence Program** (*Programa para la Excelencia en Gobierno Electrónico*) (in partnership with the UNDP): aims to strengthen the state's e-government capacity and promote an innovation culture within public management.
- **Seal of Excellence** (*Sello de Excelencia*): a certificate that distinguishes the high quality of procedures, services and products available through electronic means in the Colombian state, as well as the IT management capabilities of a public institution.

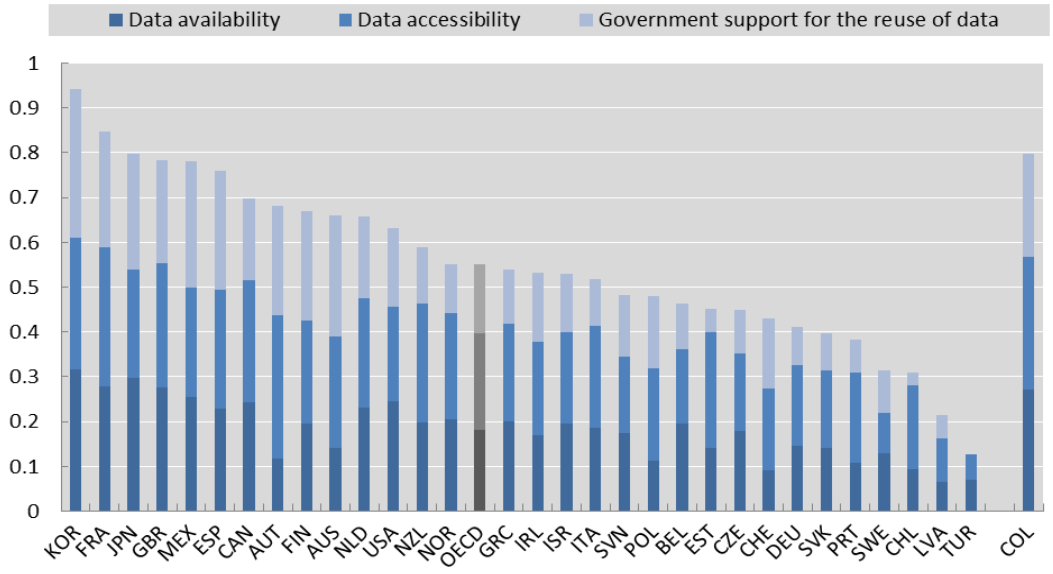
The results of the Online Government Strategy from an international perspective

The efforts made in Colombia's Online Government Strategy have paid off in OECD rankings as well as other international comparisons. Colombia can count itself among the top-performing countries in the UN Online Service Index (UN, 2016).

In terms of electronic participation (e-participation), Colombia is also among the highest ranking (> 0.75 out of 1.00) countries in the UN E-Participation Index. The online public consultation portal Crystal Urn, in combination with the use of social media and the publication of more than 5 000 open government datasets makes the Colombian open government initiative an exemplar in the region.

Regarding Colombia's efforts in the field of open government data (OGD), the 2017 OECD OURdata Index shows that Colombia can measure itself among the top five OECD countries.

Figure 1.2. Open-Useful-Reusable Government Data Index (OURdata), 2017



Note: Data for Hungary, Iceland and Luxembourg are not available. Denmark does not have a central/federal data portal and is therefore not displayed in the index.
Source: OECD Survey on Open Government Data in OECD (2017), *OECD Government at a Glance 2017*, http://dx.doi.org/10.1787/gov_glance-2017-en.

The OECD OURdata Index assesses governments' efforts in relation to three fronts: increasing data availability on the national portal, increasing data accessibility on the national portal and providing active support for the reuse of data (OECD, 2017).[10] Data accessibility and availability are necessary, but insufficient, conditions to ensure the reuse of data, thereby possibly limiting the capturing of OGD benefits, from socio-, economic and good governance perspectives (e.g. transparency, integrity, accountability). Reuse of data by the public sector, civil society organisations, the private sector and a host of other actors is a *sine qua non* condition to deliver the benefits of open data. In this sense, the OURdata Index aims to help strengthen governments' focus on effective outcomes and to remember that the overall objective should not be on increasing data availability, but on actively fostering stakeholders' engagement in the reuse of data. The OURdata Index is based on the OECD methodology for measuring open government data (Ubaldi, 2013) and on the International Open Data Charter, encapsulating an internationally agreed-upon set of principles on open data. Ultimately, the OURdata Index aims to support governments in designing and implementing OGD strategies that deliver value to the public.

Colombia's score on the OURdata Index shows that its efforts regarding availability, accessibility and re-usability are well balanced, but could still be reinforced on all fronts in the years to come.

The latest Global Open Data Index published by the Open Knowledge Foundation places Colombia as the 14th best performing country in the world for 2016, well ahead of others in the region and other OECD countries.[11] This index, however, does not take into account the element of stimulating the reuse of OGD.

The salient performance from the supply side of open data in Colombia is also reflected in the readiness part of the Open Data Barometer,[12] another global index that compares

countries in terms of the availability of open datasets, as well as their reuse and potential impacts. The Open Data Barometer places Colombia in the 24th position out of 114 countries surveyed for 2016, an improvement of 4 positions compared to 2015 and of 12 positions compared to 2014 and 2013. According to the Barometer, Colombia belongs to the group of emerging and advancing countries, which have established programmes that deliver open data policies with great potential to develop innovative approaches to the use and reuse of data, but that still face challenges to make open data mainstream within government and institutionalising it as a sustainable practice.[13] Judging by these different international rankings, Colombia is well on its way to establishing itself among the leading countries in the field of open data if it continues its efforts to make more government data freely available in accessible formats while actively stimulating the reuse of OGD.

Governance and co-ordinating mechanisms of the Online Government Strategy

Digital government strategies are the result of transversal co-ordination and collaboration among many agencies, and Colombia is not an exception. Currently, the main actor in terms of co-ordination, design and responsibilities regarding digital policies is the Ministry of Information and Communications Technologies (MinTIC), which leads the policy design and implementation of both the Online Government Strategy and the Live Digital Plan. Table 1.5 summarises the other actors involved with these initiatives and policies.

In 2012, the government created the office of the national Chief Information Officer (CIO), represented by the IT Vice-Minister of MinTIC. The IT Vice-Minister and CIO of Colombia is responsible for the design, implementation and evaluation of ICT policies; the development of standards and IT architecture within the state; and the development of online government (OECD, 2013). Since its creation, a CIO network has also been established, with the aim of accelerating and co-ordinating the efforts of the transversal ICT policies, covering the territorial level as well. At the territorial level, CIO positions have been created under the names of ICT secretary or (senior) ICT advisor. Currently there are 286 CIOs at the territorial level.[14]

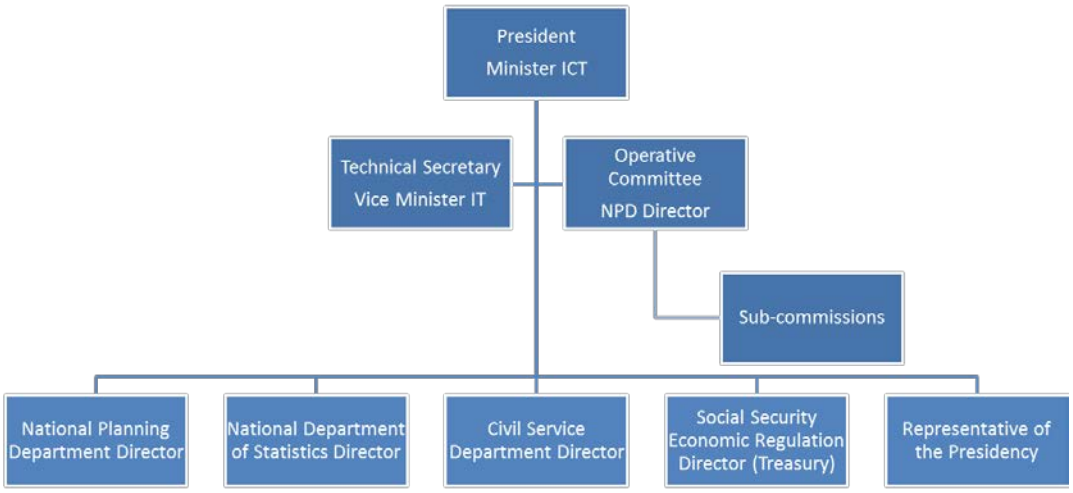
Table 1.5. Key actors, policy alignment and initiatives of Colombia's Online Government Strategy

Digital government policy: Responsible agency	Other actors with responsibility/co-ordination duties	National Development Plan 2014 and transversal policies	Examples of relevant initiatives
Ministry of Information and Communications Technologies (MinTIC) Vice-Ministry of IT (CIO office, 2012)	National Commission for Digital and State Information (2013) (includes the National Planning Department., National Statistics Department, Public Service Department, Treasury, Presidency) Centre for Digital Public Innovation (Collaboration between MinTIC, UNDESA and the UNDP) Cybernetic Emergency Response Team High Advisory for Good Governance and Administrative Efficiency Public Service Bureau National Archives National Procurement Office Data Protection and Privacy Delegation (2011)	Innovation, growth and competitiveness Inclusive development Effectiveness and transparency of government Accountability Fight against corruption	Open government Data portal (1 600+ datasets) Civic participation platform (Crystal Urn) No More Queuing (*No más filas*) Access to Information Law (2014) Privacy and personal data protection (2012) Electronic Authentication (2012 and in progress) Governmental intranet

Source: Based on OECD (2013), *Colombia: Implementing Good Governance*, http://dx.doi.org/10.1787/9789264202177-en and government documents.

Later in 2013, Decree 32/2013 established the National Commission for Digital and State Information (CNDIE), with the objective to articulate all government information systems and the effectiveness of state information management policies at the national level. Its main function is to provide co-ordination and orientation in ICT policies that are transversal to several ministries, administrative departments and decentralised entities – that is, the use of technology infrastructure for interaction with citizens, digital platforms within the government, and the effective use of information and data of the state. The CNDIE is mandated to ensure national and sector-specific co-ordination and to provide recommendations to the government on the use of ICTs (OECD, 2013).

Figure 1.3. Structure of the National Commission for Digital and State Information



Source: Based on Decree 32/2013.

MinTIC chairs the meetings of the commission and the National CIO acts as the technical secretary.

The specific objectives of the CNDIE include:[15]

- articulating the functions of the state institutions in charge of public policies regarding state information
- fixing the strategic vision of information management
- establishing policy guidelines with respect to technology infrastructure management, public information and cyber security and cyber defence
- establishing guidelines for the Cybernetic Emergency Response Team
- promoting agreements to guarantee the interoperability and integration of all information systems (intra- and inter-sectorial)
- establishing guidelines for the acquisition of software and hardware
- establishing guidelines for access to and management of public information for open government.

The creation of a national CIO signals an important commitment towards Colombia's Online Government Strategy and has been crucial in providing the political support needed for the many initiatives described in the previous sections. However, there are a number of areas that could be improved to ensure the effectiveness of efforts to implement policies, mainly in the area of co-ordination and enforcement mechanisms, but also for evaluation and monitoring practices. Examples include the need to move from voluntary to mandatory requirements in the compliance of ICT policies, more broadly including the other ministries with key roles in the implementation of national policies, ensuring a stronger role of digital leaders in supporting progress, pursuing a multilevel policy dialogue inclusive of local and civil society stakeholder engagement, and developing effective funding mechanisms for ICT spending nationally and at subnational levels of the government (OECD, 2013: 446-449).[16]

Expected impacts of Colombia's Online Government Strategy

The transitional methodology to realise a first assessment of the Online Government Strategy's impacts shall be structured according to the four components of the Online Government Strategy: "ICTs for services", "ICTs for open government", "ICTs for management" and "Information security and privacy" and their expected contributions to relevant broader strategic goals of the Colombian government. These strategic goals, and thereby key elements of the impact assessment, can be found in a number of sources: Decree 1078 of 2015 stating the strategy's overall objective and component-specific goals, the strategy's website providing additional precisions, the National Development Plan and the Live Digital Plan. Table 1.6 gives an inventory of these strategic goals, highlighting key words on the basis of which six clusters of expected impacts have been derived to guide the impact assessment.

Table 1.6. Strategic objectives and expected impacts related to the Online Government Strategy

Source	Strategic objectives	Expected impacts
National Development Plan	To integrate the territory and its communities, to contribute to reducing social gaps, enhancing connectivity for productive inclusion and **access** to public goods, social services and information.	1. Efficiency gains for citizens and better access to services 2. Improvement of internal processes, responsiveness and greater government efficiency 3. Contribution to the Sustainable Development Goals 4. Increase in public trust 5. Increase in transparency and public sector integrity 6. Higher citizen participation
Live Digital Plan	To achieve a more **efficient** and **transparent** government thanks to ICTs.	
Online Government Strategy – overall objective	To contribute to the construction of an **open**, more **efficient**, more **transparent** and **participatory** state, thanks to ICTs.	
Online Government Strategy – strategic precisions	Delivering the best online services to citizens, achieving **management excellence**, empowering citizens and generating **public trust**, and promoting and facilitating the actions required to advance on the **Sustainable Development Goals**.	
Online Government Strategy – component-specific goals	1. ICTs for services: provide better online procedures and online services to respond to the needs of citizens and businesses. 2. ICTs for open government: build a more **transparent**, **participative** and **collaborative** state, where citizens take part in the decision-making process. 3. ICTs for management: foster the strategic use of digital technology and information for **improved decision making** and more **efficient administrative management**. 4. Information security and privacy: protect information and information systems from unauthorised access, use, disclosure, disruption or destruction.	

Source: Decree 1078 of 2015, http://legal.legis.com.co/document?obra=legcol&document=legcol_b87872e6937248f3aa0491beec905dde; Online Government Strategy website, http://estrategia.gobiernoenlinea.gov.co/623/w3-propertyvalue-7650.html; Ministry of Information and Communications Technologies (2014), *Plan Vive Digital 2014-2018*, www.mintic.gov.co/portal/604/articles-5193_recurso_2.pdf; National Planning Department, Bases for the National Development Plan 2014-2018, https://colaboracion.dnp.gov.co/cdt/prensa/bases%20plan%20nacional%20de%20desarrollo%202014-2018.pdf (in Spanish), p10.

Colombia's most important objectives are stated in the National Development Plan. For 2014-18, the overall objective of the National Development Plan is to build a peaceful, educated and equitable Colombia, in harmony with the intentions of the national government, with international best practices and standards, and with a long-term planning vision towards the United Nations' Sustainable Development Goals.[17]

As part of the efforts aimed at the consolidation of peace in Colombia, the government has formulated a specific objective to which the Online Government Strategy and the Live Digital Plan are expected to contribute: integrate the territory and its communities, contribute to reducing social gaps, enhance connectivity for productive inclusion and access to public goods, social services and information.[18]

The Live Digital Plan can be considered as the broader framework for the information society, through which the Online Government Strategy is developed further. The first Live Digital Plan (2010-14) was launched in 2010, resulting from the earlier ICT Law and the government's aim to provide access to the Internet and digital technology to millions of Colombians, and aiming to strengthen ICT policies that would support the implementation of the Online Government Strategy.[19]

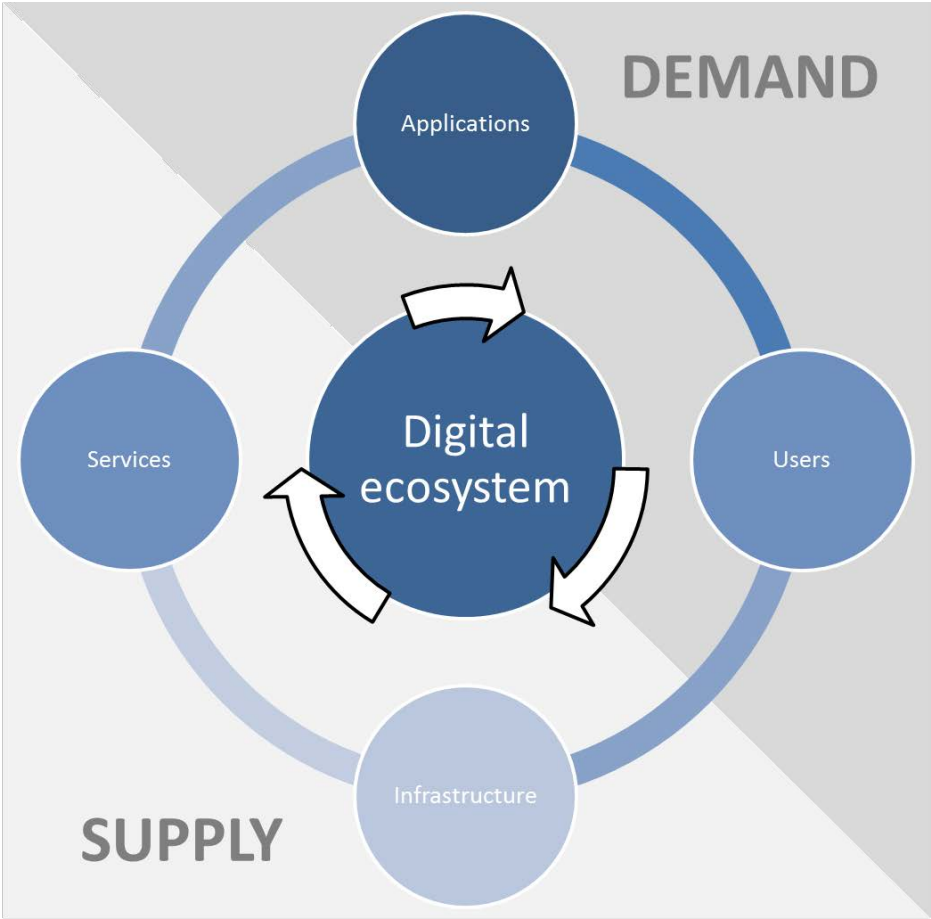
The main objective of the Live Digital Plan is to boost the mass use of the Internet, to make a leap towards democratic prosperity. The policy context that motivated the plan was the fact that Colombia significantly lagged behind other countries in the region in terms of Internet access, while dealing with relatively low investments in digital technology and poor uptake of ICTs among the population and businesses. The foundations of the plan were therefore based on studies which suggested that access to and use of the Internet could help fight poverty and foster economic growth (Molano Vega, 2013).

Since its beginning, the Live Digital Plan has been organised around four main themes that work as overarching objectives:

- expanding ICT infrastructure
- creating services at lower prices
- developing applications and digital content
- fostering ICT adoption and use.

These four elements – infrastructure, services, applications and users – are conceived as the basis for a virtuous cycle to foster, develop and sustain Colombia's digital ecosystem. Thus, the assumption is that a better digital technology infrastructure will allow for more and better services to be offered at lower prices, which in turn can stimulate the development of applications and content, and increase demand by growing the number of users in the system, especially among the groups that were underserved.

Figure 1.4. The digital ecosystem in Colombia



Source: Ministry of Information and Communications Technologies (2014), *Plan Vive Digital 2014-2018*, www.mintic.gov.co/portal/604/articles-5193_recurso_2.pdf.

Since its launch and during the first period (2010-14), the most important goal was to foster access to and development of ICT infrastructure. As the government emphasised, the plan had three specific targets for this period (Molano Vega, 2013):

- triple the number of municipalities connected to the national fibre-optic network information highway (1 053 municipalities)
- go from 7% to 50% of micro, small and medium-sized enterprises and from 27% to 50% of homes connected to the Internet
- increase the number of Internet connections fourfold, reaching 8.8 million by 2014.

The second phase of the plan was launched in 2014. While the overarching objectives are similar, for the new four-year period the government emphasised:

- becoming the world leader in social apps development for the poor
- achieving a more efficient and transparent government with ICTs.

Therefore, while from 2010 to 2014 the emphasis was on fostering access to ICT infrastructure and building services, in 2014 the focus switched to applications and users, making the efforts within the Online Government Strategy a priority within the plan.

Consequently, several indicators for the evaluation of the Live Digital Plan are equally indicators for the Online Government Strategy, as will be discussed in more detail in Chapter 2.

The current Live Digital Plan also intends to align its targets with the objectives of the NDP in key areas like education, health, social development and inclusion, employment, justice, transport, and agriculture. Article 45 of the NDP, for example, mentions the adoption of the IT Management Enterprise Architecture Framework, which is a key component of the Online Government Strategy. At the time of writing, the Live Digital Plan contains 42 initiatives, each targeting different parts of the 4 components of the digital ecosystem.[20]

The government of Colombia has understood clearly that it is essential to focus on citizens' needs to make its online government efforts successful. The path of Colombia's Online Government Strategy, which is supported in the latest Live Digital Plan, shows not only a combination of political support and continuity for more than a decade, but also success in expressing the use of ICTs as a state policy. Chapter 2 explores in more detail how the expected impacts as identified in this section can be operationalised into concrete indicators and through what methods the contribution of the four strategic components can be assessed.

Colombia's Online Government Strategy and the OECD Recommendation of the Council on Digital Government Strategies

A final point in the exploration of the digital government context of Colombia is a quick scan of the Online Government Strategy in light of the OECD *Recommendation of the Council on Digital Government Strategies*, which Colombia adheres to. The OECD Recommendation emphasises "the crucial contribution of technology as a strategic driver to create open, innovative, participatory and trustworthy public sectors, to improve social inclusiveness and government accountability, and to bring together government and non-government actors to contribute to national development and long-term sustainable growth" (OECD, 2014: 4). Table 1.7 summarises the 12 key recommendations of the Recommendation and the preliminary status of Colombia, according to the evidence gathered for this tentative analysis. A more profound analysis will be realised in the *OECD Digital Government Review of Colombia* in 2018.

Table 1.7. Colombia's progress in aligning with the OECD *Recommendation of the Council on Digital Government Strategies*

Pillar	Key recommendation	Description	Preliminary status Colombia
I	*1 Openness, transparency and inclusiveness*	Legal and regulatory framework to guarantee transparency and access to information (ATI), with exceptions for security and privacy	In place
		Law: transparency and ATI	In place
		Authority Transparency and ATI	In place. Secretaría de Transparencia
		Open by default standard	N/A
		Inclusive compulsory policy mechanisms	*
		Publish high-value open government data (consulted with users) and performance data including key performance indicators	In place (no consultation process) Performance data not yet available
		Open Government Strategy and action plan	In place. 2nd National Action Plan
		Open government data (OGD) portal	In place
		Highly ICT skilled population and civil service	Training programmes in progress (*Vive Digital*)
		Reduction of digital divide	In progress (*Vive Digital*)
	2 Engagement and participation	Legal framework enabling engagement and participation	In place. Legal framework regulating, promoting and protecting the right to democratic participation (Statutory Law 1757/2015 and Law 134/1994, modified by Law 741/2002)
		Sensitise stakeholders	In progress
		Use of ICTs as a communication channel with citizens	In place. Several initiatives
		Publication of OGD	In place and in progress
		Citizen-centered approach	In progress. Element in the ICTs for services component of the Online Government Strategy
		Citizen-/user-driven approach	*
		Consultation instruments	In place. Crystal Urn
	3 Creation of a data-driven culture in the public sector	Assign a national chief data officer and office	In place. Chief information officer (Vice Minister, Ministry of Information and Communications Technologies) No chief data officer figure
		Data Management Policy	In place. Covered by the information domain within the IT Management Enterprise Architecture Framework[1]
		Unit responsible for data use across the public sector	*
		OGD repository	In place. www.datos.gov.co
		Harmonised administrative data and interoperable data platforms	In place. Interoperability framework
		Increase data literacy and analytical capacities of civil servants	In progress
		Leverage to subnational government	In progress. Infrastructure, CIO network and subnational CIOs (Decree 415 of 2016)
	4 Protecting privacy and ensuring security	Privacy and security enforcement authority	In place. Privacy and Data Protection Delegation
		Security enforcement authority (Computer Security Incident Response Team, CSIRT)	In place. www.colcert.gov.co
		Privacy enforcement authority	In place. Superintendence of Industry and Commerce through a Delegation for Personal Data Protection (Art. 19 Statutory Law 1581/2012)

Pillar	Key recommendation	Description	Preliminary status Colombia
		Privacy and Security Risk Assessment and performance indicators	Guidelines to be determined by the Digital Commission
II	*5 Leadership and political commitment*	National Digital Strategy	In place. Online Government Strategy
		ICT national co-ordination unit, Inter-ministerial and subnational	In place. National Digital Commission
		Central and territorial co-ordination mechanisms	In progress. Ministry of Information and Communications Technologies co-ordinates the central and territorial implementation
		Operational co-ordination mechanisms (implementation)	In progress, not fully developed
	6 Coherent use of digital technology across policy areas	National Digital Strategy with common vision and objectives	In place. Online Government Strategy
		ICT co-ordination unit/function at central government	In place. Ministry of Information and Communications Technologies and National Digital Commission
		Co-ordination mechanisms with subnational levels of government	In place. Ministry of Information and Communications Technologies co-ordinates the implementation with subnational level entities.
	7 Effective organisational and governance frameworks	Defined governance structure with clear roles and responsibilities	*
		Co-ordination mechanisms for integration and interoperability	In place. Interoperability framework
		OGD unit	In place. CIO office
	8 Strengthen international co-operation with other governments	Participation in international co-operation mechanisms	In place. OECD, Open Government Partnership, UNDESA-UNDP, RedGealc, Organization of American States
		Adhesion to international instruments	In place. OECD *Recommendation of the Council on Digital Government Strategies* (2014); Open Government Partnership 2011; International Council for Information Technology in Government Administration
		Participation in development of international principles and standards	*
		Process for staff exchanges with other governments to share experiences	Agreement in place with Korea and in progress with the United Kingdom
		Implementation of cross-border services	*
III	*9 Development of clear business cases*	Centralised review mechanisms for ICT projects above a certain threshold	*
		Standardised and mandatory models for structuring business cases of ICT projects	*
		Business case body in charge of overseeing, preparing and updating standardised models	*
	10 Reinforced ICT project management capacities	Project management models to identify responsible actors for every stage of the implementation	*
		Strategy to develop skills and attract qualified professionals	Excellence programme on Online Government; ICETEX condonable credits for public servants
		Mechanisms to ensure visibility of all digital government initiatives	GEL portals and Indigo+ prizes for digital public innovation
	11 Procurement of digital technologies	ICT procurement policy	In place. Policy for optimisation of IT investments;[2] Guidelines for Technology Purchases (IT MEA Framework); Law 1150 of 2007
		Procurement rules that support the use of use of Open Source Software and enhance	*

Pillar	Key recommendation	Description	Preliminary status Colombia
		competition	
		Single authority for ICT procurement	National Public Contracting Agency: Colombia Compra Eficiente; Decree 4170 of 2011
		ICT procurement policy for agile delivery methods	In place. Framework agreements for prices, part of Colombia Compra
		Central repository of ICT contracts and digital government initiatives	SECOP
		Database for existing assets and historical supplier performance	*
	12 Legal and regulatory framework	Right to online communications in all cases	In place. Not enforced
		Key digital enablers in place: eID and electronic signatures	In progress. *Autenticación Electrónica*
		Legal framework encouraging resource and data sharing across public sector	In place. Legal framework encouraging resource and data sharing (Decree 235/2010)

* No practices or current actions have been found. The quick scan is based on an analysis of the regulatory framework of the Online Government Strategy; key policy documents such as the Live Digital Plan, the *Online Government Manual* and the online government implementation guides; supplemented by comments received from the Colombian government.
1. For more information, see: www.mintic.gov.co/arquitecturati/630/w3-propertyvalue-8083.html (in Spanish).
2. For further information, see: www.mintic.gov.co/gestionti/615/w3-propertyvalue-6268.html (in Spanish).

The Colombian Online Government Strategy shows an evolution towards achieving alignment with the 12 key recommendations of the Recommendation, notably, in the first pillar of openness and engagement. The third pillar, capacities to support implementation, appears to be the one that needs further development. For example, developing and using common business case approaches for ICT projects, and in particular for procurement of ICTs, has already been noted by the OECD as an area for improvement in the next implementation phases (OECD, 2013).

Notes

[1] See the three goals as stated by CONPES 3072/2000.

[2] See Decree 1620 and Decree 3107 of 2003.
[3] See Informe de Gobierno en Línea, 2008-2009, MinTIC.

[4] See Decree 3816 of 2003.
[5] See Decree 1151 of 2008.
[6] For some territorial governments the targets finished in 2016.

[7] See Decree 1078 of 2015.

[8] See Ministry of Information and Communication Technologies (n.d.).

[9] For more detailed information on these initiatives, see: http://estrategia.gobiernoenlinea.gov.co/623/w3-propertyvalue-14676.html.

[10] See OECD (2015).

[11] The Global Open Data Index collects and presents information on the current state of open government datasets released around the world; it is run by Open Knowledge International leveraging a community of volunteers and reviewers for each country. The report and index are available at: http://index.okfn.org (accessed 25 August 2017).
[12] Developed by the World Wide Web Foundation.

[13] Other countries included in this cluster and in rank order according to the Barometer are: Spain, Chile, the Czech Republic, Brazil, Italy, Mexico, Uruguay, the Russian Federation, Portugal, Greece, Ireland, Hungary, Peru, Poland, Argentina, Ecuador, India (all above Colombia), and Costa Rica, South Africa, Tunisia, the People's Republic of China, the Philippines and Morocco (below Colombia). *Source:* Open Data Barometer key findings: www.opendatabarometer.org/report/summary/index.html (accessed 30 November 2015).
[14] According to information provided by the Colombian government in November 2016.

[15] Main functions as per Decree 32/2013. For more detailed information about responsibilities and key roles see OECD (2013: 435).
[16] See also Decree 1078 of 2015, which specified the structure of the ICT sector for the country; it establishes the Ministry of Information and Communications Technologies as the head of the sector, and the Committee for Administrative Development (Comité Institucional de Desarrollo Administrativo) and the CNDIE as the two entities responsible for the advice and co-ordination of transversal ICT policies.
[17] Law 1753/2015, National Development Plan.

[18] National Planning Department, *Bases for the National Development Plan 2014-2018*, https://colaboracion.dnp.gov.co/cdt/prensa/bases%20plan%20nacional%20de%20desarrollo%202014-2018.pdf (in Spanish), p.10.

[19] ICT Law (1341/2008).
[20] The initiatives are available at: www.mintic.gov.co/portal/vivedigital/612/w3-propertyname-509.html (accessed 5 December 2015).

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Chapter 2. Designing an impact assessment methodology for Colombia's Online Government Strategy

This chapter provides a technical note to support the full development of the digital government impact assessment methodology for Colombia's Online Government Strategy, comprising three components: 1) an indicator framework; 2) a variable correlation model; and 3) a data-collection instrument. This chapter builds on the background work conducted in Chapter 1, which has provided a comprehensive scoping study mapping the evolution and programme components that drive Colombia's Online Government Strategy. The proposal for a transitional impact assessment methodology takes into account Colombia's current context, policy design and implementation as well as the existing evaluation and monitoring tools and governance structure.

Introduction

Building on the insights presented in Chapter 1 on the context for digital government in Colombia, this chapter will first discuss the overall approach and design choices for the impact assessment. It then proposes a variable correlation model and indicator framework for Colombia's Online Government Strategy. With the indicator framework in mind, the final section deals with the data sources, information and indicators currently available to monitor and evaluate Colombia's Online Government Strategy and assesses which other data need to be collected for the purpose of the impact assessment methodology.

Overall approach and design choices for the impact assessment methodology

The characteristics of impact assessments

Impact assessments are part of a broader agenda of evidence-based policy making, a growing global trend that is expressed by a shift in focus from inputs to outcomes and results of policies (Gertler et al., 2011). Evaluating the impacts of policy interventions is challenging. Most of the time, it is not a lack of understanding of its importance, but rather the lack of resources, time or availability of methods that inhibit the production of conclusive studies that are able to disentangle the causalities that trigger the impacts on a given population. An impact assessment is defined as the "systematic analysis of the lasting of significant changes – positive or negative, intended or not – in people's lives brought about by a given action or series of actions" (Roche, 1999: 302). In other words, the aim of an impact assessment is to uncover causal mechanisms and to be able to identify what causes a change and with what effects.

Impact assessments use rigorous methodologies and tools enabling the discovery of causalities. The most well-known methodology for impact evaluations is the randomised control trial (RCT). RCTs are experiments where members of treatment and control groups are assigned to the groups randomly, ensuring the same characteristics in the two groups, and comparing the results afterwards. As such, an impact assessment involving RCTs would entail designing the evaluation from the very early stages, even before the start of the intervention. Furthermore, RCTs are difficult to apply at the macro level and in complex policy interventions.[1] Given the fact that the Online Government Strategy concerns the scale of an entire country and is well beyond its early stages, it is not possible to apply RCTs under the present circumstances. Besides RCTs, impact evaluations can range from large-scale sample surveys in which project populations and control groups are compared before and after (as in randomised control trials) to small-scale, rapid assessment and participatory appraisals in which estimates of impact are obtained from combining group interviews, key informants, case studies and available secondary data (Wagner et al., 2005).

Impact assessments may vary depending on the nature of the policy under review and the purpose of the assessment. The assessment can, for example, be carried out as part of policy design, planning and approval of an intervention (*ex ante*), or carried out retrospectively (*ex post*) with the aim to evaluate actual impacts. In addition, a vision and scoping exercise is needed to understand the logic of the evaluation. Such an exercise identifies the main components, background, history and stakeholder views regarding the aims of the policy intervention.

The purpose of assessing the Online Government Strategy is twofold:

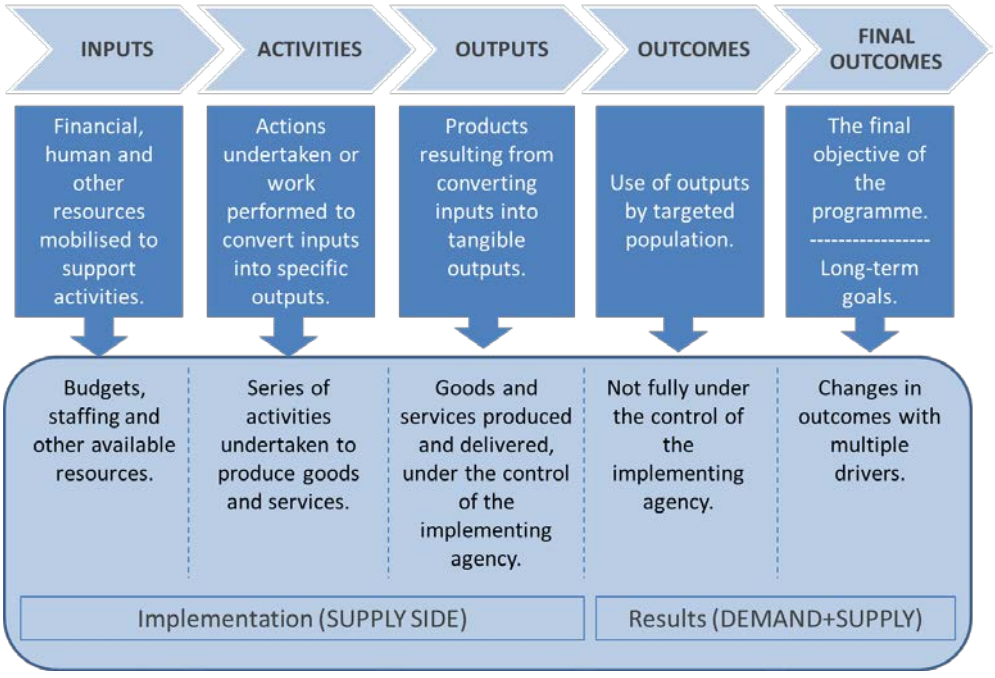
- support reporting to stakeholders on the accomplishments of the implementation of the Online Government strategy
- facilitate policy learning and support evidence-based policy making for the transition towards digital government.

Measuring the impact of the Online Government Strategy is not only about assessing to what extent the expected results have been accomplished, but also involves gaining an understanding about the mechanisms that led to results and the ones that didn't. The proposed assessment follows a theory-based approach, which means that the expected impacts are based on a specific understanding of a theory of change. A definition of a theory of change is provided as follows:

A theory of change is a description of how an intervention is supposed to deliver the desired results. It describes the causal logic of how and why a particular project, program, or policy will reach its intended outcomes. A theory of change is a key underpinning of any impact evaluation, given the cause-and-effect focus of the research. (...) Theories of change depict a sequence of events leading to outcomes. (Gertler et al., 2011)

A logic model, sometimes also referred to as a results chain, is a useful tool to model a theory of change. In such a model, the concepts of inputs, activities, outputs, outcomes and final outcomes/impact are employed to assess the contribution, relevance and performance of policy instruments.[2] Figure 2.1 offers an example of the logic model in the context of development policies.

Figure 2.1. Basic logic model for a policy intervention



Source: Gertler, P.J. et al. (2011), *Impact Evaluation in Practice*, p.25, https://openknowledge.worldbank.org/handle/10986/2550. © World Bank

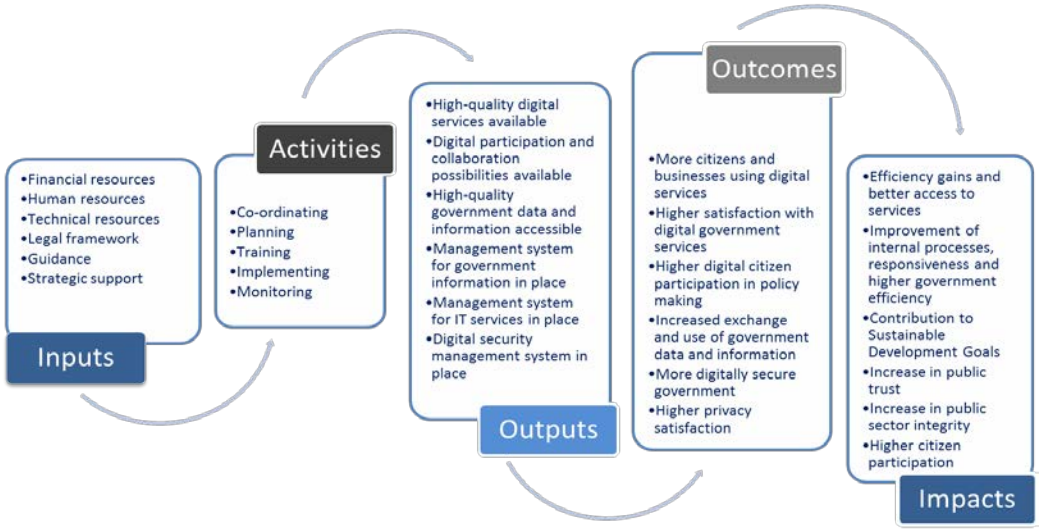
Devising a conceptual framework in the form of a logic model is useful to make the theory of change explicit. It helps to understand how and why an initiative will work by uncovering the relationships among resources available to implement the intervention, the activities planned and the sought-after results. The logic model also helps to visualise how the outputs of the intervention will lead to beneficial outcomes both in the short and longer term and its fundamental impacts.

The logic model approach is in line with the latest trends in international evaluations related to digital government. The interest in assessing impacts is now much more relevant than assessing readiness or uptake. This is exemplified in the international e-government indexes compiled by international organisations such as the International Telecommunications Union or the United Nations, which have turned to elements that go beyond the level of access to ICTs over the years. This suggests that while readiness is still important, nowadays the focus is on trying to understand what expected results emerge from digital government initiatives. The OECD OURdata Index, for example, includes the measurement of the reuse of open government data (OECD, 2017). As such, it could be used as an impact indicator and its changes over time could be used to capture the results of a given intervention or policy on open government data.

Establishing a theory of change for the Online Government Strategy

The OECD has analysed policy documents related to the Online Government Strategy (e.g. decrees and implementation guides) and collaborated closely with MinTIC to formulate the theory of change for the Online Government Strategy, specifying the intended outputs, outcomes and impacts which should result from the activities undertaken by public institutions while leveraging the available inputs (Figure 2.2). In what follows, the five stages in the theory of change are discussed in more detail and some thought is given to the design of indicators to measure these. It should be noted that given the theory-based approach, the measurement of unintended results is beyond the scope of this assessment.

Figure 2.2. Theory of change for the Online Government Strategy



Inputs: Resources mobilised to support online government activities

Inputs are the resources – intended in a broad sense – that must be put in or invested in order for activities to take place (UNDP, 2009: 60). In the Online Government Strategy, the resources include the financial, human, technological and institutional context elements that would enable the policy design and implementation over time. The institutional context includes the political support and leadership building, the available legal framework, and the guidance that is provided on the implementation of the various elements of the strategy.

Devising input indicators requires thought on what resources are required and how these resources can be assessed. It is important to have indicators in place that help to identify whether resources are available or what factors may cause a shortfall in the accomplishment of the intervention. The majority of input indicators is expected to be similar for each strategy component, with the exception of the guidance provided by MinTIC and the legal framework, for which inputs might differ per strategy component.

Activities: Actions taken or work performed to convert inputs into specific outputs

The activities consist of the specific initiatives put in place to achieve the objectives of the strategy, such as increasing the provision of online services, implementing a user-centred approach to deliver what citizens and businesses need, releasing open government data and encouraging its reuse, enabling online participatory channels, training public servants on digital government applications, developing plans and policies to ensure data protection, and deploying ICT security systems.

A good practice for devising sound activity indicators entails linking a set of activities to a specific output. In this sense, it helps to link specific initiatives to outputs within the same strategy component. For example, initiatives in online procedures have a specific set of activities that can be measured in order to achieve better online government services.

Outputs: Products resulting from converting inputs into tangible outputs

The outputs are short-term results produced by the implemented activities. Output indicators, thus, focus on describing what an intervention produces; output indicators show whether the immediate targets of the intervention are being met – whether in quantitative or qualitative terms. The combination of inputs, activity and output metrics offers the first important picture to assess the gains and efficiency of an intervention. Relevant indicators for outputs in the context of the Online Government Strategy include, for example, the number of public services that are available on line and the number of available open datasets.

Outcomes: Use of outputs by the targeted population

The outcomes, in turn, are related to medium-term intended changes in knowledge, attitudes and behaviour of citizens, businesses and public servants as a result of the implementation of the policy. Outcome indicators provide the basis to assess what the intervention is actually achieving. Outcome indicators increase in complexity compared to outputs as they typically need to combine qualitative and quantitative measures to describe the target population that benefits from a project and the nature of the benefits.

There can be confusion when it comes to distinguishing outputs from outcomes. While outputs describe and count the products or services that are the result of an intervention, outcomes try to answer what difference the intervention makes to a given group. For example, the number of (new) online services offered at a given time is a typical output measure that helps to assess whether the intervention is producing results. But the number of online services alone does not provide an indication of the extent to which citizens or businesses are actually using them and benefiting from the reduction in efforts (e.g. costs and time) that they may bring. Expected outcomes for the Online Government Strategy would include an increase in the online interactions of citizens and businesses with government, and increases in digital civic participation and engagement.

Impacts: The final objectives or long-term strategy goals

The actual impact of the Online Government Strategy involves the difference it has made to the lives of the citizens, businesses and other collective groups at which the strategy was aimed as well as those delivering public services and decision makers. As highlighted in Chapter 1, consideration should be given to the strategy's ultimate impact in the wider context of the intervention: its contribution to the country's overall competitiveness, reduction of poverty, and economic and development goals. In fact, the latest Online Government Strategy includes adherence to the Sustainable Development Goals (SDGs) while pointing to ICTs as enablers of poverty reduction.

Overall, while it may be difficult to trace cause and effect directly from a digital government intervention to broader strategic goals, it is certainly possible to explore specific outcomes that may relate to impacts. Some expected impacts for the strategy's ICTs for services component include a contribution to the reduction of poverty due to an improvement in the coverage of public services and the decrease in costs to comply with public procedures. Through ICTs for open government, the increased openness of governments' actions and processes would expect to boost the overall level of participation in policy-making initiatives, public consultations and government transparency. The ICTs for management component is expected to have a positive impact on the productivity and efficiency of government through an increase in the use of digital means for cost savings, an increase of data sharing across agencies, and broader use of

data for evidence-based policy making. Additionally, a contribution to the SDGs, such as responsible consumption and reduction of waste, is expected as well. By strengthening the information security and privacy component, the trust of citizens in their digital engagement with government could be improved through an assurance of digital and personal rights of individuals. The impacts for this component are also transversal. For example, better information security and privacy assurance mechanisms in place can also help foster the expected outcomes in open government initiatives, as citizens would also feel more encouraged to participate.[3]

Because these goals are high-level and strategic in nature, it is unlikely that a single project or intervention will cause an impact without the effects of other, non-digital variables. The issue of non-digital control variables is discussed in more detail in Chapter 3. While causality may not be easily attributable to the impact indicators as defined in this chapter, they do provide an important milestone that can serve to plan a co-ordinated approach with other transversal policies.

Operationalising the approach and criteria for assessment

From a theory of change to concrete indicators

In order to measure to what extent these expected impacts occur in Colombia and can be attributed to the implementation of the Online Government Strategy, the theory of change needs to be operationalised into a variable correlation model and indicator framework containing concrete and measurable indicators for each of the identified elements. A key starting point is defining the universe or population that is the focus of the assessment. This study aims to trace the inputs, activities, outputs, outcomes and impacts of Colombian public institutions concerning the implementation of the Online Government Strategy. Therefore, all national and territorial public institutions that are required to implement the strategy are considered the universe of analysis.

Devising an indicator framework for the assessment does not solely depend on the policy expectations as expressed in the theory of change. Existing evaluation systems and indicator frameworks should be taken into account in the impact assessment methodology to:

- ensure strategic and operational alignment with existing efforts
- avoid duplication of efforts, both for the assessors and the public institutions as subjects of the assessment.

Leveraging existing evaluation frameworks and initiatives

The assessment framework requires different types of data and information, some of which already exist and are collected through diverse monitoring and evaluation mechanisms in the government of Colombia. Although the design of the indicators will require more development, the next sections cover the sources and mechanisms that have already been identified in the government of Colombia, which mainly correspond to inputs, activities and outputs of the assessment.

The monitoring and evaluation of ICT policies in Colombia is currently carried out through different processes and governmental offices:

- On one hand, the central government has a system in place, SINERGIA, to monitor whether national and territorial entities are performing their objectives in alignment with the national priorities set in the National Development Plan.

- On the other hand, the implementation of the Online Government Strategy is measured by MinTIC through the Online Government Index (GEL Index). The GEL Index is calculated based on data from two different questionnaires:
  - For national government institutions, the FURAG questionnaire is administered by the Public Service Department (Departamento Administrativo de la Función Pública).
  - For territorial government institutions (governorates and municipalities), the Territorial Form (TF) is directly administered by MinTIC.
- MinTIC supplements the insights gathered through the GEL Index with citizen polls, commissioned studies and performance rankings of electronic government carried out by international organisations. Table 2.1 summarises these evaluation and monitoring tools that are relevant to the Online Government Strategy.

Table 2.1. Summary of Colombia's Online Government Strategy monitoring and evaluation tools

General: Central government	Specific: Online Government Strategy
National Planning Department – SINERGIA **Public Service Department** – Questionnaire for civil servants (FURAG) to feed the Government Target Monitoring Integrated System (MIPG)	**Online Government Index (GEL)** – Calculated on the basis of data obtained through FURAG and the Territorial Form **Citizen polls and commissioned studies** **International Indices** – OECD OURdata Index – UN E–Government Development Index – UN E-participation Index – ITU ICT Development Index

Next, these existing instruments will be assessed in terms of their potential use for the impact assessment methodology.

SINERGIA

SINERGIA is a system of Colombia's National Planning Department (Departamento Nacional de Planeación) that is deployed to monitor and evaluate the performance of national entities in regard to their progress towards policy-related targets and goals (OECD, 2013). Developed with exceptional quality and exacting standards, the system provides performance information on whether and how public policy objectives are reached. SINERGIA measures progress through three main tools: 1) monitoring; 2) evaluation; and 3) perception surveys.

i. **SINERGIA monitoring**: the tool is called SISMEG (Sistema de Seguimiento a Metas de Gobierno). With performance indicators that measure policy outputs and outcomes identified by the National Development Plan, according to their periodicity, it offers a series of indicators divided into strategic, sectorial and management themes. Scorecards are given to every government unit, which are revised by the National Planning Department. The indicators are updated at least once a year; and biannually or on a trimestral basis for some indicators.
ii. **SINERGIA evaluation** (known as SISDEVAL): a system to evaluate the outcomes of the main public policies and programmes that are elected by a Committee of the National Planning Department; the evaluations are conducted in partnership with a third party to guarantee objectivity.
iii. **Perception surveys**: these are polls, normally conducted via commissioned studies, that compare public perceptions and government results regarding the

level of achievement of the National Development Plan; the results are posted periodically on SINERGIA's website.

SINERGIA reports 12 indicators that are related to the Online Government Strategy, falling under 3 broader MinTIC programmes monitored in the SINERGIA system (Table 2.2).

Table 2.2. Online Government Strategy indicators in SINERGIA

Programme	Indicator name	Public institution as unit of analysis
Promotion of apps, software and content	Citizens and businesses using the digital public folder (Carpeta Ciudadana Digital)	No
ICT infrastructure	Government sectors adopting the IT Management Enterprise Architecture Framework	No
	Trained civil servants to strengthen ICT management in the state	No
	National public entities benefited from price agreements for ICT goods and services contracting	Yes
	National public administration entities adopting ICT management instruments	Yes
	National and territorial public administration entities publishing interoperable services on the state's platform	Yes
Promotion of ICT service development	Public administration sectors adopting the state's information privacy and security model	No
	Citizens interacting on line with governmental entities	No
	Businesses interacting on line with governmental entities	No
	Citizens participating with the state through electronic means	No
	Social impact services and procedures available on line (Excellence Route)	No
	Products, services and procedures certified on online government (Seal of Excellence)	Yes

Source: Based on information obtained from the SINERGIA website, http://sinergiapp.dnp.gov.co/#ProgEntidad/37/23/26 (in Spanish) (accessed 30 January 2016).

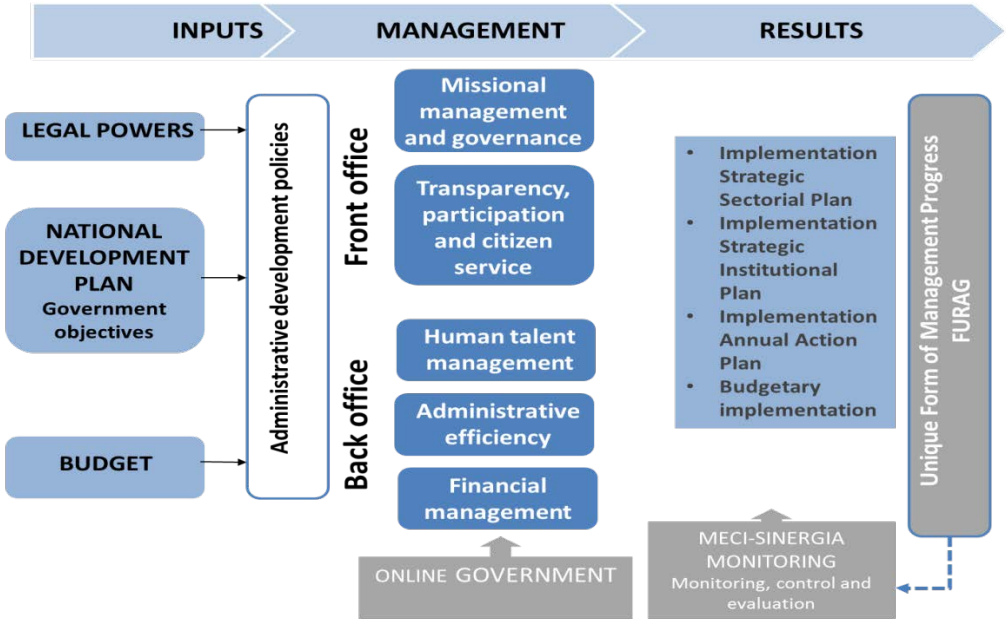
The OECD has recognised SINERGIA as one of the most advanced systems of "whole-of-government performance monitoring" in Latin America and the OECD (OECD, 2013: 170). However, most of the indicators are reported at the country or sectoral level, not for each single public institution, which might make them unsuitable to be included in the impact assessment methodology. For instance, the number of trained civil servants in the area of ICTs is for all public institutions taken together. If only one data point is available at a given moment in time, correlations with other indicators can only be calculated through a time series analysis. However, if data were available for each Colombian institution on how many employees receive training, this would enable the calculation of correlations with other institutional-level indicators at the same moment in time.

Online Government Index – GEL

The Online Government Index (Índice de Gobierno en Línea) is a quantitative tool that shows how entities advance towards achieving the online government implementation targets. The index is calculated for two levels of government: 1) national; and 2) territorial (governorates and municipalities), which show those institutions, sectors and departments that have advanced the most. The Online Government Index is calculated by MinTIC based on self-reporting data that national institutions provide on a yearly basis when completing the online survey "Unique Form of Management Progress" (FURAG), administered by the Public Service Department and territorial institutions through the Territorial Form, administered by MinTIC.

FURAG doesn't solely contain questions related to the Online Government Strategy, but to broader public management areas as well. The Public Service Department uses FURAG to feed the "Planning and Management Integrated Model" (MIPG; Figure 2.3). The initiatives in the Online Government Strategy are considered a transversal component of the integrated model that cuts across the policies for public management.

Figure 2.3. Integrated Model of Planning and Management (MIPG)



Note: Model translated from Spanish by the OECD.
Source: Government of Colombia (2012), "Integrated Model of Planning and Management", General Accounting Office of the Republic website, http://www.contaduria.gov.co/wps/wcm/connect/ccea2fde-84c1-4b1d-9264-4255f1bc9728/1/Modelo+Integrado+de+planeaci%C3%B3n+y+gesti%C3%B3n.jpg?MOD=AJPERES&CACHEID=ccea2fde-84c1-4b1d-9264-4255f1bc9728/1

Through FURAG, which contained 460 questions for 2016 edition, specific sections assess the progress and performance of the Online Government Strategy. For example:

- Section 1.1 requests whether any e-government topics are discussed in the committees (sectorial and institutional) included in the action plans, and if they are monitored/evaluated and by whom
- Section 1.2 asks if there is any type of characterisation of citizens, users and interest groups
- Section 1.3 inquires which type of information is published and available to citizens through the entities' websites.

The survey, which entities are obliged to fill out, is the basis for the generation of the Online Government Index.[4]

The Online Government Index is subdivided into four main sub-indices, which match the components of the Online Government Strategy that the most recent regulation of 2015 outlines: ICTs for open government, ICTs for services, ICTs for management, and information security and privacy (Table 2.3).[5]

Table 2.3. Composition of the Online Government Index 2016

ICTs for services sub-index (25%)	
Result-oriented indicators (50%)	
	User satisfaction regarding online services and procedures
	Online transactions
Process-oriented indicators (50%)	
	Achievements regarding user-centred services
	Achievements regarding PQRD (petitions, complaints, suggestions)
	Achievements regarding online services and procedures
ICTs for open government sub-index (25%)	
Result-oriented indicators (50%)	
	Published open datasets
	Open data-based applications and publications
	Implemented solutions based on open innovation exercises using electronic media
	Consultation or decision-making exercises using electronic media
Process-oriented indicators (50%)	
	Achievements regarding transparency
	Achievements regarding collaboration
	Achievements regarding participation
ICTs for management sub-index (25%)	
Result-oriented indicators (50%)	
	Realisation of strategic objectives stated in the strategic IT plan
	Information services provided by the interoperability platform of the Colombian state
	Compliance with IT governance indicators against the strategy set
	Audit and traceability to information systems
	Compliance of information components with quality and security standards
	Compliance with support and maintenance of technological services
	Compliance of information systems with quality and security standards
	Technological services that meet service-level agreements and security requirements
	Compliance with the realisation of the objectives set out in the Strategy of Use and Appropriation
	Institutional capacities to increase efficiency in the provision of services
	Improvement in the use of resources
Process-oriented indicators (50%)	
	Achievements regarding the IT strategy
	Achievements regarding the IT governance
	Achievements regarding information
	Achievements regarding information systems
	Achievements regarding technological services
	Achievements regarding use and appropriation
	Achievements regarding institutional capacities
Information security and privacy sub-index (25%)	
Result-oriented indicators (50%)	
	Identification of critical information assets
	Time of exposure to vulnerabilities
	Effective information exchange on incidents
Process-oriented indicators (50%)	
	Definition of the Framework for Information Security and Privacy and Information Systems

Table 2.4. Composition of the Online Government Index 2016 *(continued)*
Implementation of the information security and privacy plan and information systems
Monitoring and continuous improvement

Note: The precise formulas for the calculation of those GEL indicators that have been taken into account for the transitional impact assessment methodology can be consulted in Annex A.
Source: Based on the technical file specifying the GEL indicator calculations as provided by MinTIC.

The Online Government Index is calculated as the weighted average of the four sub-indices. The score for each sub-index is based on a 50% weight for result-oriented indicators and 50% for process-oriented indicators. The index ranks the top 20 entities and sectors in the general ranking, then highlights the top five sectors and entities on each of the 4 sub-indices.

Another tool that complements the GEL Index comes from the perception polls commissioned by the Online Government Directorate. These studies[6] enquire among citizens and businesses on several aspects of the strategy, such as the percentage of citizens interacting with the state via electronic channels, or the perceptions towards the usefulness of open government data. The obtained user-based information complements the administration-based information available through SINERGIA and the GEL Index. However, the irregular frequency and the fact that these data are not available at the institutional level makes the perception polls unsuitable to be included in the impact assessment methodology.

Data sources and type of indicators

Indicators can either be quantitative or qualitative. Quantitative indicators are statistical measures that capture results in terms of numbers, percentage or a scale. Qualitative indicators reflect attitudes, people's judgements and opinions, or perceptions and regarding a given situation or subject. They are normally expressed in terms of "compliance with..., quality of... or level of…". Qualitative indicators can also be converted into a quantitative measurement (i.e. scales in a perception question). Both quantitative and qualitative indicators are used in the impact assessment methodology.

The choice of data sources depends on the available resources, their potential to be attainable and the focus of the policy. Table 2.4 gives an overview of the different sources of data, a description of them, and whether they contain quantitative or qualitative measures. The third column shows the sources that the government of Colombia already has in place to assess relevant aspects of the Online Government Strategy.

Table 2.5. Types of data sources

Data source	Description	Quantitative measure	Qualitative measure	Online Government Strategy
Administrative data (AD)	Quantitative and qualitative information compiled routinely by government institutions, international organisations and civil society groups	✓	✓	SINERGIA (12 indicators for online government) GEL Index 2016 SUIT (Public Service Department): for the entire catalogue of procedures
Public surveys (PS)	Information gathered through surveys of the general public to generate ratings for indicators based on public perceptions or experiences	✓	✓	Commissioned studies conducted annually to assess online interactions of citizens and businesses, open data, digital culture, and online participation See surveys commissioned by the government in 2015
Expert surveys (ES)	Information gathered confidentially from individuals with specialised knowledge based on their experience or professional position; the choice of experts is crucial and must be tailored to the questions being asked	✓	✓	Commissioned studies conducted annually to assess online interactions of citizens and businesses, open data, digital culture, and online participation See surveys commissioned by the government in 2015
Focus groups (FG)	Focus groups to gather perceptions in an interactive group setting where participants can engage with one another; normally quicker and less costly than large representative surveys		✓	Commissioned studies to assess online engagement, open data, online participation and digital culture See surveys commissioned by the government in 2015
Observations (OB)	Data gathered by researchers or field staff; collected through in-depth case studies or systematic observations of a particular institution or setting	✓	✓	Not in place
Documents and legislation (DR)	Information from written documents to verify the existence of certain laws and procedures and to understand the powers of a particular institution		✓	*Online Government Strategy Manual 3.1* Decree 2573/2014 Decree 1078 / 2015 Budget data (to collect) Other legal documents

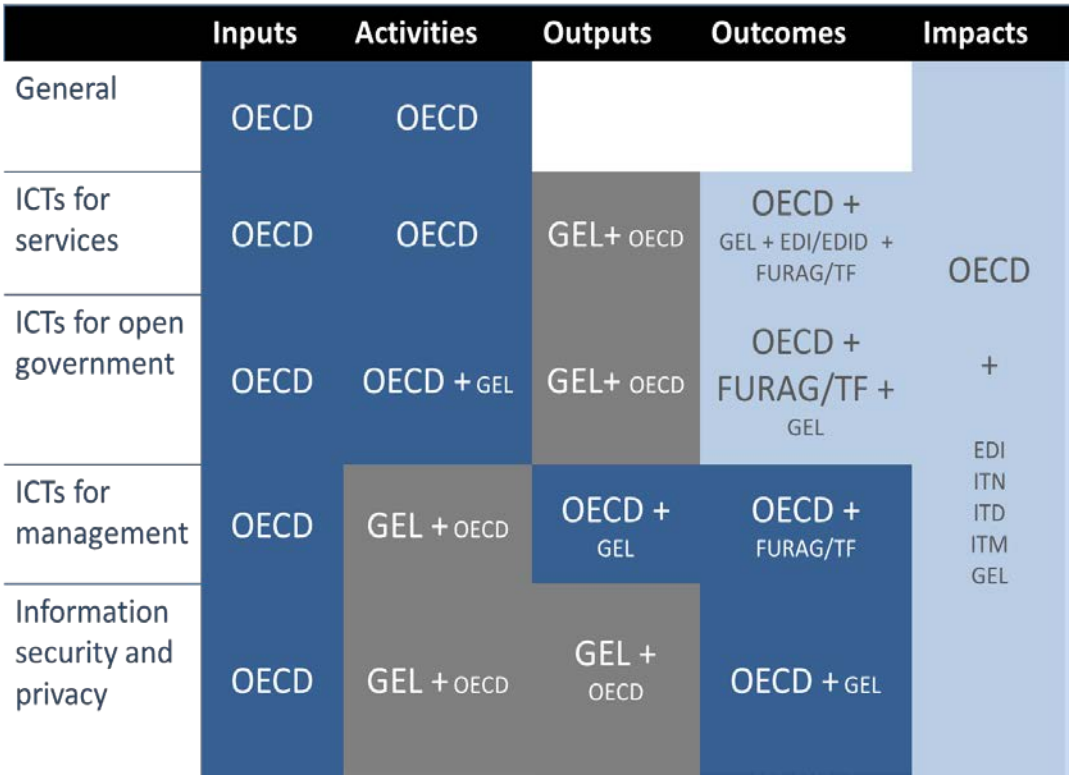
Source: Adapted from UN (2011). *The United Nations Rule of Law Indicators*, United Nations, New York.

Identifying missing indicators and designing a new data-gathering instrument

In order to assess to what extent existing evaluation and monitoring initiatives and indicators can be leveraged for the impact assessment, they need to be mapped according to the logic model of inputs, activities, outputs, outcomes and impacts while considering the four strategic components of the strategy (Figure 2.4). Colombia has a strong baseline system in place to perform high-level monitoring and evaluation, which provides a good basis to assess the activities undertaken for ICTs for management and information security and privacy, and some ICTs for open government activities. The GEL Index also contains indicators related to outputs for services, open government, and information

security and privacy, and to a lesser extent for the management component. For the transitional impact assessment methodology, new OECD indicators have been developed for inputs, outcomes and impacts.

Figure 2.4. Distribution of data sources in the indicator framework



The previous considerations helped identify the final data sources to be leveraged for the first implementation of the transitional impact assessment methodology (Table 2.5).

Table 2.6. Data sources for the impact assessment

Short name	Full name	Data processor	Administered to	Evaluated period	Frequency
National GEL	National Online Government Indicators	Ministry of Information and Communications Technologies (MinTIC)	National government institutions	2016	Annual
FURAG	Unique Form of Management Progress	Public Service Department	National government institutions	2016	Annual
Territorial GEL	Territorial Online Government Indicators	Ministry of Information and Communications Technologies (MinTIC)	Governorates and municipalities	2016	Annual
TF	Territorial Form	Ministry of Information and Communications Technologies (MinTIC)	Governorates and municipalities	2016	Annual
OECD	OECD questionnaire	OECD	National government institutions	2016	
ITN	National Transparency Index	Transparency Colombia	National government institutions	2015-16	Biannual
ITD	Departmental Transparency Index	Transparency Colombia	Governorates	2015-16	Biannual
ITM	Municipal Transparency Index	Transparency Colombia	Municipalities	2015-16	Biannual
EDI	Survey on National Institutional Environment and Performance	National Statistics Department (DANE)	National government institutions	2016	Annual
EDID	Survey on Departmental Institutional Environment and Performance	National Statistics Department (DANE)	Governorates	2016	Annual

Source: GEL indicator scores as well as data from the FURAG and TF were provided to the OECD by MinTIC. Indicator scores of the Transparency Index are available in Excel format at: http://indicedetransparencia.org.co/2015-2016/ITN/EntidadesNacionales (national institutions), http://indicedetransparencia.org.co/ITD/Gobernaciones (governorates) and http://indicedetransparencia.org.co/ITM/Alcaldias (municipalities). EDI and EDID data are available in Excel format under the heading "Anexos por entidades" at: https://www.dane.gov.co/index.php/estadisticas-por-tema/gobierno/encuesta-sobre-ambiente-y-desempeno-institucional-nacional-edi/edi-2016-anexos (national institutions) and https://www.dane.gov.co/index.php/estadisticas-por-tema/gobierno/encuesta-sobre-ambiente-y-desempeno-institucional-departamental-edid/edid-2016-anexos (governorates).

The OECD developed a questionnaire to complement existing data sources and enable the calculation of missing indicators. To probe its applicability in the Colombian context, a first version of the transitional impact assessment methodology, including the new questionnaire, was tested in early November 2016 among a select number of public institutions and discussed in the field at a number of policy seminars held at MinTIC on 21, 22, 23 and 24 November 2016 (Box 2.1). The results of the pilot and discussion held

at the seminars were taken into account for the finalisation of the instrument by early 2017.

Box 2.1. Probing the applicability of the impact assessment methodology in the field

The OECD carried out a four-day mission to Bogotá, during which it held an interactive seminar and several workshops to raise awareness and build capacities among Colombian digital government decision makers and ICT project managers to support the implementation of the impact assessment methodology.

In November 2016, the pilot questionnaire was sent to Colombian public institutions for testing. Eleven organisations responded, representing all levels of government. The direct feedback on the pilot questionnaire as well as the discussions during the policy seminars constituted information on the clarity, relevance and feasibility of the questions and provided suggestions for the reformulation of questions.

To determine what adaptations should be made to the pilot questionnaire to develop it into a full-fledged component of the transitional impact assessment methodology of the Online Government Strategy, both the comments provided by institutions and the way they answered the questions were taken into account. These two types of inputs were analysed according to three aspects:

- Availability of data: Do institutions have the necessary data and information available to answer the questions? This aspect was evaluated by looking at: 1) questions with a response rate less than 70%; and 2) explicit comments about the (un)availability of the requested data.
- Clarity: Do institutions understand the questions as they are formulated in the pilot questionnaire? This aspect was evaluated by looking at: 1) the appearance of multiple interpretations in the provided responses; and 2) explicit comments about the (lack of) clarity of certain questions.
- Relevance: Does it make sense to institutions that a particular question is being asked? This aspect was evaluated by looking at explicit comments about the (ir)relevance of certain questions.

On the basis of these criteria, questions and their corresponding indicators were treated as follows:

- Keep: Questions to keep as they are
- Eliminate: Questions to be eliminated
- Reformulate: Questions to be reformulated
- Adjust: Questions to which content should be added or removed
- Add: New questions to be added on missing topics.

An iterative process of assessing the existing data sources, the theory of change, and the formulation and testing of a new questionnaire has led to the variable correlation models

presented in the next section and the complete indicator framework as displayed in Annex A. The indicator framework displays the following elements for each (sub-)indicator:

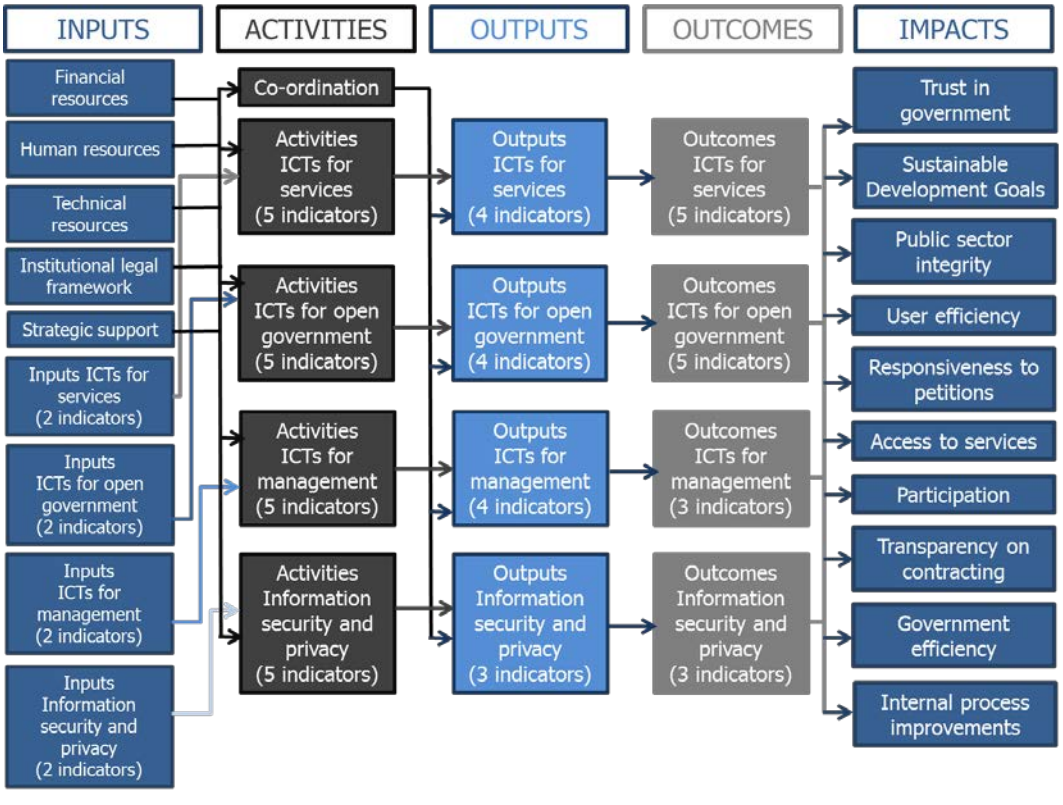
- code: starting with either INP, ACT, OUP, OUC or IMP
- indicator name; description or names of sub-indicators
- data source: general source name
- source indicator/question: precise source indicator name or question(s) analysed to calculate the indicator
- response options: answering options for the questions used to calculate the indicator
- score calculation: formula indicating how the indicator is calculated.

Defining the variable correlation model

In order to assess the relations between the indicators in the framework, a more sophisticated version of the logic model, a variable correlation model, has been developed, detailing the precise indicators for the different elements and the expected relations between them, to be analysed in the impact assessment. Annex A specifies the precise data sources and formulas to calculate the indicators shown in the variable correlation models in this section.

Figure 2.5. General variable correlation model for the Online Government Strategy

From inputs to activities, outputs, outcomes and impacts



The general variable correlation model is complemented by four component-specific variable correlation models (Figures 2.6, 2.7, 2.8 and 2.9), which will jointly guide the data analysis through the hypotheses embodied in them. Each arrow represents a

hypothesis pointing to the expected relationship between one (group of) indicators and another. All resources available as inputs to an institution are expected to influence the activities it deploys. For instance, the financial resources available to an institution are expected to have an effect on the level of co-ordination it can realise, and the activities it manages to put in place for the implementation of the four strategy components. It is supposed that the level of co-ordination influences the extent to which an institution manages to produce outputs for all strategy components, while component-specific activities are only expected to have an effect on the outputs, and in turn the outcomes, within the same component. Finally, a less solid theoretical basis is available to formulate hypotheses regarding the link between outcomes and impacts, leading to a more exploratory approach for the analysis of these relationships. Consequently, the model supposes that all outcomes might have an influence on all impacts.

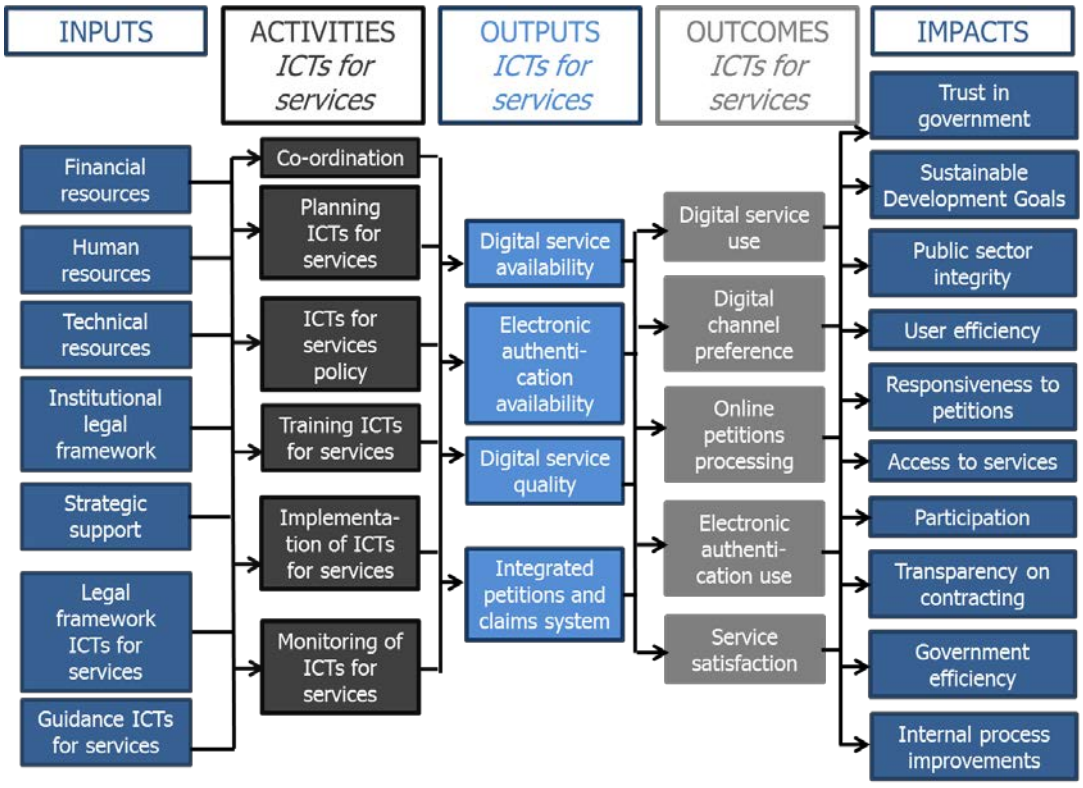
As will be explained in more detail in Chapter 3, the analysis for the first impact assessment will start by exploring correlations between the online government outcomes and the expected impacts. For those outcomes that prove to have a statistically strong relationship with the impacts in the model, the outputs, activities and inputs connected to these will be further analysed. Consequently, not all hypotheses represented in the general and component-specific variable correlation models are tested. This is only the case for those with statistically strong connections to the expected impacts.

ICTs for services indicators

The government services area comprises programmes and initiatives that provide better procedures and online services to respond to citizens' and business' needs using ICTs. An example of a hypothesis to be tested related to this strategy component is: the extent to which citizens make use of the digital services available to them is connected to the level of trust in government.

Figure 2.6. ICTs for services variable correlation model

From inputs to activities, outputs, outcomes and impacts

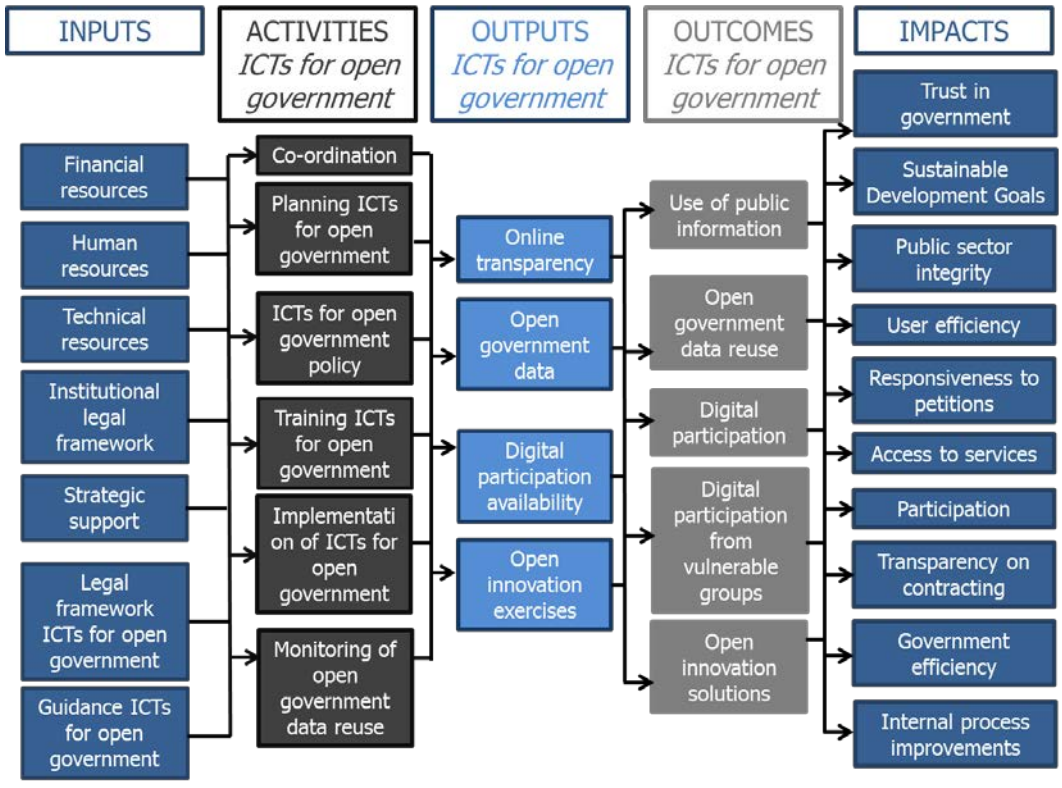


ICTs for open government indicators

The ICTs for open government component includes programmes and initiatives that use ICTs to build a more transparent and collaborative government, where citizens take part in decision-making processes. An example of a hypothesis to be tested related to this strategy component is: the extent to which citizens make use of the digital participation possibilities available to them is connected to the level of citizen participation in general.

Figure 2.7. ICTs for open government variable correlation model

From inputs to activities, outputs, outcomes and impacts

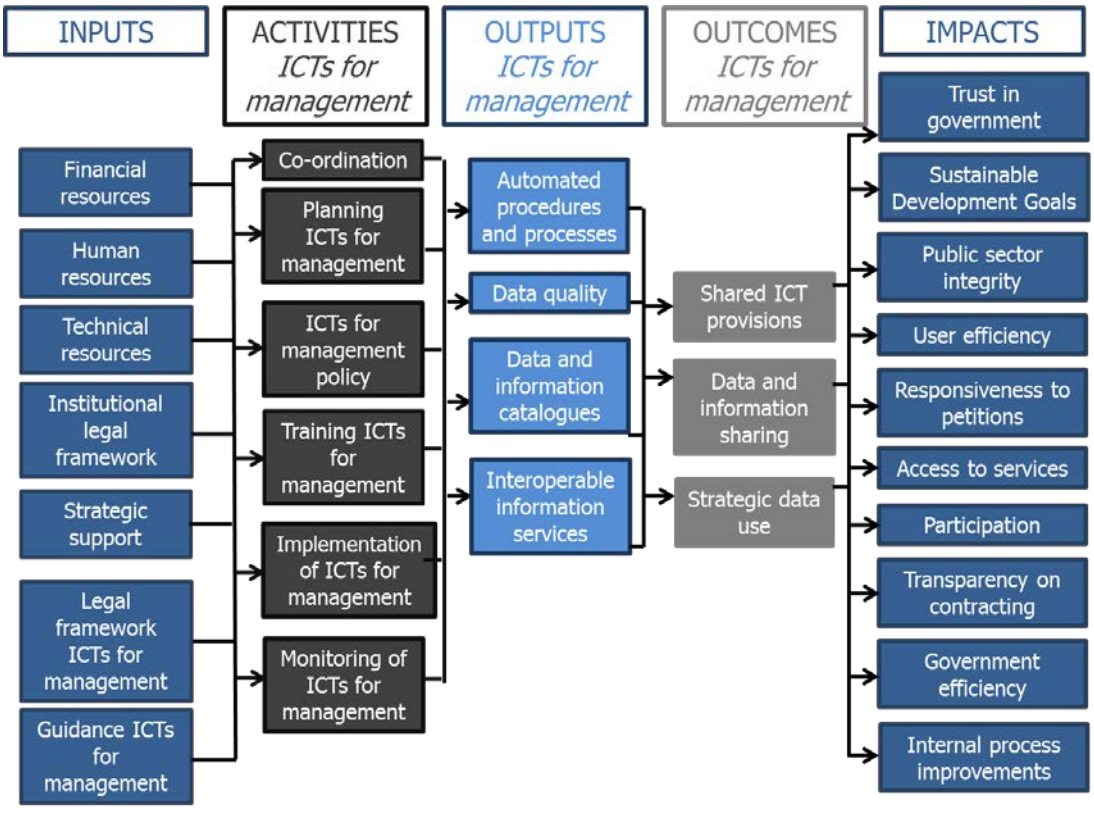


ICTs for management indicators

The ICTs for management component includes programmes and initiatives that foster the strategic use of digital technologies to make government's administration more efficient, effective and fair. An example of a hypothesis to be tested related to this strategy component is: the level of data and information sharing between public institutions is connected to the number of internal processes that are improved involving ICTs.

Figure 2.8. ICTs for management variable correlation model

From inputs to activities, outputs, outcomes and impacts

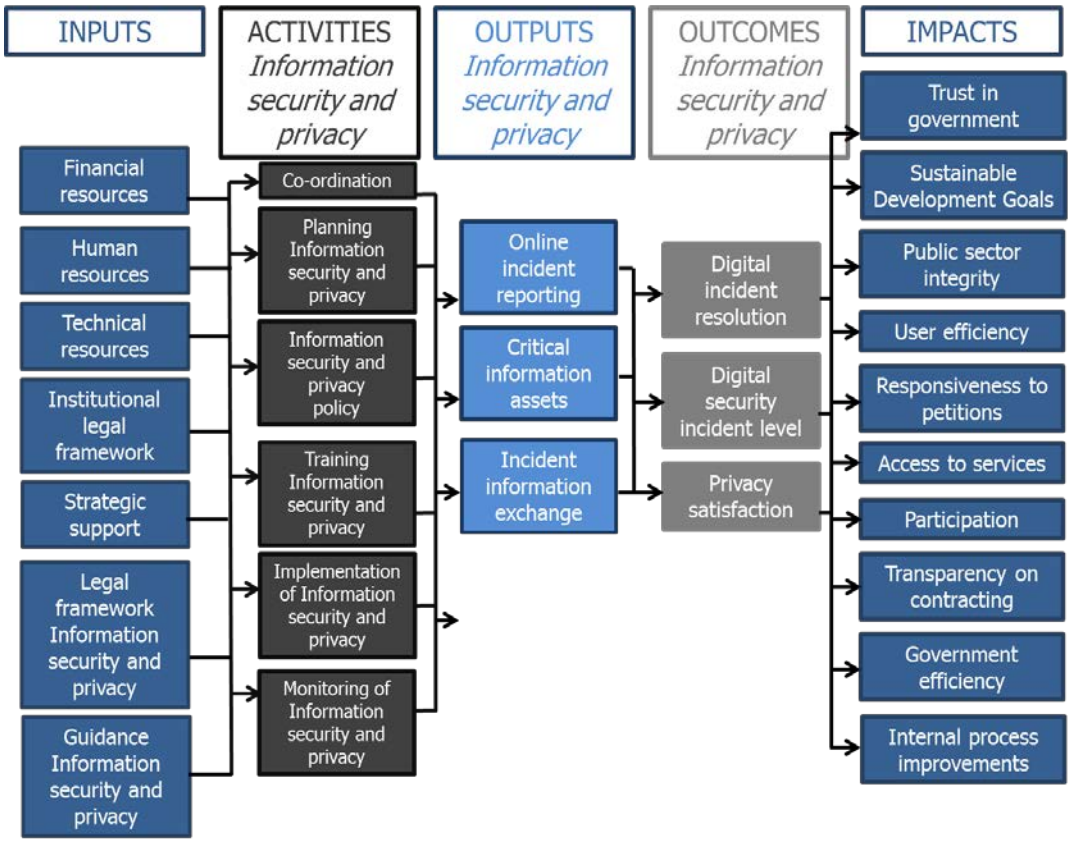


Information security and privacy indicators

Finally, the information security and privacy area comprises programmes and initiatives that protect citizens' personal data in the digital age and that guarantee the security of their information. More recently, it has adopted a risk management approach towards digital security issues.[7] An example of a hypothesis to be tested related to this strategy component is: the time a public institution needs on average to solve incidents related to digital security is connected to the level of trust that citizens have in government.

Figure 2.9. Information security and privacy variable correlation model

From inputs to activities, outputs, outcomes and impacts



The final variable correlation model is composed of 75 indicators and 109 sub-indicators.

Treatment and analysis of the data

Generating descriptive results

Several steps have been followed to generate descriptive results for all indicators:

1. **Creating one single database:** As a first step in the analysis of the data, the relevant data from the different sources have been merged into one single database. This involved the homogenisation of the names of public institutions.
2. **Calculating indicator scores per institution:** A score between 0 and 100 was established for each indicator. There are three types of calculations:
   - **a. Simple indicators:** These are the indicators which are copied directly from the source and don't require any additional treatment (e.g. *OUC 5 – Service Satisfaction* is taken directly from GEL indicator RC 2.1).
   - b. **Composed indicators:** Scores for this type of indicator are calculated based on a formula involving at least two source variables (e.g. *OUC 4 – Electronic Authentication Use* is calculated by dividing OECD question 38b "The total number of transactions carried out using electronic authentication for services and other administrative procedures that the institution has registered in the SUIT system" by question 39c "The total number of transactions carried out for services and other administrative procedures that the institution has

registered in the SUIT system – total for all channels used: face-to-face, telephone or Internet" and multiplying by 100).

c. **Scaled indicators**: These indicators are based on open-ended questions requiring the creation of a scale (e.g. *ACT 4a – Frequency of training sessions on making services and procedures available online* is calculated by recoding the answers to OECD question 16a "How many awareness and/or training sessions did the public servants of your institution attend regarding the following topics of the online government strategy? – ICTs for services" into three categories: 0, 50 and 100).

3. **Assessing missing data:** To ensure the external validity of the mean indicator scores, that is, the extent to which they adequately represent the intended population, and the significance level of correlations calculated to analyse the relationships between indicators, indicators for which more than 75% of data is missing are not taken into account for further analysis.
4. **Calculating aggregated indicator scores:** For the following categories and sub-categories mean scores are calculated (see Annex C for more details on the categorisation):
   a. **Institutions at the national level of government (1 score)**
      1. Sector scores (24 scores)
   b. **Institutions at the territorial level of government (1 score)**
      2. governorates (1 score) and municipalities (1 score)
      3. regions (5 scores)
      4. development environment (3 scores).

Analysing the relationships between the indicators

The descriptive results make it possible to compare the scores of Colombian institutions regarding the inputs, activities, outputs, outcomes and impacts of the Online Government Strategy. However, in order to assess the connections between the indicators and determine which inputs (independent variable) influence which activities (dependent variable), which activities (independent variable) influence which outputs (dependent variable), which outputs (independent variable) influence which outcomes (dependent variable), and which outcomes (independent variable) influence which impacts (dependent variable) and how strong these relationships are, an additional analysis is needed, as already highlighted in the earlier discussion on the variable correlation models and hypotheses.

Table A.3. Indicator relationships for analysis

	Relationship 1	Relationship 2	Relationship 3	Relationship 4
Independent variables	All outcomes	Component X outputs	Component X activities	Component X inputs
Dependent variables	All impacts	Component X outcomes	Component X outputs	Component X activities

To calculate correlations between the indicators in the variable correlation model, several regression models are used (see Box 2.2 for a more detailed explanation). Depending on the nature of the variables, different types of analytical methods have been used to calculate statistical correlations between two variables. For a majority of the correlations, a linear regression model is used. Additionally, logistic or ordinal logistic regressions were used in some cases as well.

Box 2.2. Statistical methods used in the analysis

What is a linear regression?

- A linear regression tries to mathematically model the relationship between an explained variable (or dependent variable Y) and one of several explaining variables (or independent variables X).
- More precisely, it looks at summarising their relationships in the form of a line, with $Y = aX + b$. For this, it considers all the scores for these two variables, and traces the line which better represents the relationship between Y and X using the technique of the least ordinary squares. The better the line represents the scatter plot, the more robust the statistical relationship between Y and X is.
- Other more complex regression models, such as logistic or ordinal logistic regressions, were used in the analysis. While they are quite different, they share with the linear regression the ambition to mathematically model the relationships between an explained and an explaining variable.

What are R^2, pseudo R^2 and Cramer's V?

- R^2 is a statistical indicator measuring the extent to which the line drawn to model the scatter plot is linked to this actual scatter plot. R^2 ranges from 0 to 1 – with 0 representing no relationship at all and 1 meaning that the two variables are perfectly correlated with each other. Concretely, an R^2 equivalent to 0.09 between the level of civil servants training in ICTs for services (ACT4) and the quality of digital service (OUP3) means that 9% of the variations in the quality of digital service among institutions (municipalities, governorates, etc.) could be explained by the extent to which civil servants are trained in ICTs for services. This percentage notation was preferred throughout the chapter, notably not to be confused with Cramer's V, which is also comprised between 0 and 1. Pseudo R^2 is an equivalent of R^2 created for non-linear regressions.
- For some variables, cross tables were used instead of linear regressions. In such cases, another index, Cramer's V, was used. Like R^2, Cramer's V ranges from 0 to 1 and it is commonly accepted that $V < 0.1$ indicates a very weak relationship between two variables, while $0.1 < V < 0.2$ relates to a moderate relationship, $0.2 < V < 0.3$ to a significant relationship, and $V > 0.3$ to a very strong correlation between the two variables.

What is a p-value?

Box 2.2. Statistical methods used in the analysis *(continued)*

- The p-value measures the significance of statistical models. It is a probability which measures the chances of finding similar statistical results, even if there is no correlation between Y and X (null hypothesis). For instance, if a regression shows a p-value equal to 0.02 (or also translated at "significant to the 2% level"), it means there is only a 2% chance that results of this scope could be found by chance *even if* there is actually no relationship between the two variables. As such, the weaker the p-value, the more robust the results. The threshold of $p \leq 0.05$ is traditionally considered as a reference for significance. In this study, most results are even more robust with a p value $\leq$ 0.01 (1% of chances).

Table 2.6 details the different combinations of variables encountered during the analysis and the associated correlation models and indicators. Annex F provides information on the nature of variables for all indicators in the assessment framework alongside their mean scores.

Table 2.7. Nature of variables and associated correlation models

Dependent variable	Independent variable	Correlation model	Statistical intensity	Statistical significance	Interpretation
Quantitative	Quantitative	Simple linear regression	R^2	p-value	Coefficient value
Quantitative	Qualitative ordinal	Simple linear regression with mention of the qualitative variable	R^2	p-value	Coefficient value
Qualitative ordinal/dichotomous	Qualitative ordinal	Cross tabulation	Cramer's V	p-value	Percentage differences
Dichotomous	Quantitative	Logistic regression	Pseudo-R^2	p-value	Odds ratio
Qualitative ordinal	Quantitative	Ordered logistic regression	Pseudo-R^2	p-value	Coefficient value
Qualitative ordinal	Quantitative	Generalised ordered logistic regression	Pseudo-R^2	p-value	Coefficient value

Note: The generalised ordered logistic regression method was used when the parallel regression assumption test failed for ordered logistic regression.

It should be noted that even though all indicators were converted to a 1-100 scale to ease the analysis, the dataset used for this assessment contained many categorical ordinal variables. These involve questions asking to rank levels of satisfaction (e.g. satisfied, neutral, not satisfied), evolutions (e.g. improvement, no effect, degradation) or qualities (e.g. presence, absence). Although they were coded as numeric values, they were treated as qualitative ordinal/dichotomous variables in the statistical analysis. When these variables possessed more than five different categories, classical cross tabulation became

complex to interpret and they were thus computed as quantitative variables. Also, many variables were computed by adding the scores of several qualitative sub-indicators. As they often present value structures close to continuous variables, these composed variables (see Annex A) were considered as quantitative by nature. The tables in Annex E report how variables were coded into the model.

Scope of analysis and methodological limitations

As a fundamental statistical tool, this analysis chose to report and consider in priority indexes of statistical determinations (R^2 and Cramer's V) rather than classical regression coefficients between two indicators. In many statistical analyses, writers indeed directly present regression coefficients to assess how strongly an augmentation of the independent variable (explaining variable) will impact the level of the dependent variable (explained variable). For instance, if a linear regression shows a coefficient of 2 between the number of study hours and the grade at one exam, it means that each hour spent studying will improve, on average, the final grade by two points. Only reporting the R^2 of this relation, 0.4 for instance, will allow to conclude that 40% of the variations of the grade in one class can be explained by the number of hours students of this class spent studying. While the former information seems more precise and explanatory, two characteristics of the analysis led to the preferred use of statistical determination indexes.

The scope of this transitional impact assessment was more to: 1) evaluate if the invested inputs could lead to the targeted impacts; 2) establish a preliminary and experimental methodology to assess correlations rather than a definitive causality inference tool. Therefore, the question for this assessment was more "Is there a correlation between X and Y, and if yes, is it strong, moderate or weak?", than "How many human resources (INP2) are necessary to increase the number of shared ICTs provisions (OUC11) by one point?". In sum, the preferred approach was to report more modest results enabling the evaluation of the general efficiency of a reform and allowing potential improvements of the model for the future, rather than calculating very precise correlation coefficients whose exact values can be misinterpreted as perfect predictors of policy outcomes.

Secondly, the dataset used in this analysis included many categorical variables[8], for which regression coefficients are either reported differently than the example mentioned above (odds ratios for logistic regressions) or simply irrelevant. When looking at the relationships between two categorical variables, it is possible to determine the sense of their correlations (positive or negative) and their strength (weak, moderate, strong), but quite hard to quantify the exact amount of variations induced by one on the other. In the same way, if the variable to be explained is composed of two possible values (presence/absence of open innovation exercises for instance), regression coefficients will predict the chances of having conducted open innovation exercises rather than not; and not predict the number of open innovation exercises if another variable varies. In a nutshell, the varieties in variables' natures (and thus the varieties of statistical models used) would have made coefficient correlations misleading, and sometimes irrelevant.

This does not mean that correlation coefficients were not considered at all in this study, as they are the only way to determine the sense of the relationship between two variables: as such, for each correlation analysis, the correlation coefficients allowed to determine whether the relationship between two variables was positive or negative and most importantly if the studied relationship was statistically significant. As very few *negative correlations* were found during the treatment of the data, the correlations presented in this chapter are *positive* by default, unless otherwise stated.

The size of the dataset (75 indicators) required limiting the number of correlations to be conducted in the analysis. Three measures were taken to ensure the parsimony of the explanation. First, only relationships significant at least at the 10% level were considered. However, the vast majority of the coefficients reported in this chapter are significant at the 5% and 1% level. Second, correlations between indicators were exclusively run **within** their respective components (services, open government, management and security/privacy). In other words, outcomes for services were only regressed with outputs for services, outcomes for management with outputs for management, and so on. Running statistical regressions between all indicators without any qualitative explanation of their potential link would have indeed led to the inclusion of spurious and fallacious correlations. Several indicators, classified as general – and consequently not limited to a single component – were, however, considered in relation with all four groups.

Notes

[1] See Prowse (2007) for a debate on the challenges of applying randomised control trials in international development settings.

[2] Nieminen and Hyytinen (2015) provide a good discussion on the shortcomings of this approach, which seem to suggest a linear process in the programme or policy that is being evaluated. As this work is concerned, the logic-model is preferred simply because it brings parsimony to the evaluation. But it is not intended to understand the development of the policy – in this case, the digital government strategy – as a linear process.

[3] For more details on the linkages between open government and the protection of citizen identities, see Martin and Bonina (2013).

[4] Full form available at: http://modelointegrado.funcionpublica.gov.co/portal-DAFP-portlet/archivos/documentosApoyo/FormularioUnico-Publicado_2014_1422317586226362196586812765958 3.pdf (accessed 12 December 2015).

[5] Decree 1078/2015, Article 2.2.9.1.2.1.

[6] See: http://estrategia.gobiernoenlinea.gov.co/623/w3-propertyvalue-7654.html (in Spanish) for details on the different perception polls that were conducted over the years.

[7] CONPES 3854, the 2016 digital security policy of the Colombian government, has taken into account the 2015 OECD Recommendation of the Council on Digital Security Risk Management.

[8] Categorical (or qualitative) variables are variables that can only take on a limited number of values referring to the qualitative qualities of the observations. As they refer to categories, they are labelled as qualitative because it is not possible to quantify the spread between two of their values. Examples of categorical data are a person's blood type, the place where someone lives or the subjective appreciation of an individual on a particular topic. Special categorical data include dichotomous variables (two possible values). They are often opposed to continuous (or quantitative) variables, which take an infinite number of values and where it is possible to quantify the distance between two observations.

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Chapter 3. Results of the transitional impact assessment of Colombia's Online Government Strategy

This chapter provides a detailed analysis of the most robust and statistically significant results of the first implementation of the transitional impact assessment methodology for Colombia's Online Government Strategy, along with the necessary methodological precisions to adequately interpret these statistical conclusions. Results are presented in forms of trees, which detail the correlation paths linking digital policies' inputs to activities, activities to outputs, outputs to outcomes, and finally policy outcomes to broader impacts. Impacts with the strongest statistical relationships are presented and are classified according to which component of the Online Government Strategy (ICTs for services, ICTs for open government, ICTs for management, and information security and privacy) they are most strongly linked to. These results allow for the identification of potential policy levers while descriptive data highlight where these efforts could be focused.

Introduction

This chapter describes the most robust and statistically significant results of the first impact assessment of Colombia's Online Government Strategy based on the transitional methodology described in Chapter 2. Beyond measuring the outcomes of the strategy, this publication identifies ten broader impacts digital reforms can have in Colombia (Figure 3.1). To assess the connection of the Online Government Strategy with these wider strategic goals, statistical correlation analyses were conducted to evaluate the extent to which the expected impacts were linked to the strategy's outcomes. By then connecting outcomes to outputs, outputs to activities, and activities to inputs, this analysis establishes correlation chains highlighting the Online Government Strategy levers potentially relevant to specific outcomes and impacts.

To permit an easy understanding of the correlation chains leading up to impacts, statistical correlations were modelled as "trees" throughout this chapter. In these figures, each branch represents a statistical link between two indicators of the model, along with the strength of this connection. When an indicator appears several times in a tree, it is described only once in the respective section to increase readability and to avoid duplication. Values in percentage represent the R^2, a common statistical index indicating how well a given independent variable can explain the variance of a given dependent variable (see the final section of Chapter 2 for more details). In the correlation chains, the percentage form of R^2 was systematically used, notably not to confuse it with Cramer's V, another index of statistical strength between two variables. The stars next to this R^2 percentage relate to a common notation for statistical significance (i.e. the robustness of the results. One star (*) means that the results, whether they are correlation coefficients or Cramer's V, are significant at the 10% level ($0.05 < p < 0.1$), two stars (**) at the 5% level ($0.01 < p < 0.05$) and three stars (***) at the 1% level ($p < 0.01$). The more stars are characterising a correlation, the more robust are the results.

As explained in the previous chapter, several indicators were categorical variables,[1] and had to be analysed accordingly. When the value indicated between two indicators in the causality trees is not a percentage, it relates to Cramer's V. All Cramer's V reported in causality trees are significant at the 1% level ($p < 0.01$).

This chapter only presents the strongest results highlighted by the analysis. The number of selected relations by indicator reported in the trees varies from two to four, and is based on how different groups of relationships' strengths could be identifiable. In some cases, for instance, the model emphasised four indicators with similarly strong statistical links to the independent variables (similar R^2) while in others only two indicators really stand out from the analysis and were thus reported. As such, no absolute values of R^2 or Cramer's V can be given for the indicators selected for the trees. Tables containing all of the results of the conducted regression analysis are reported in Annex G to complement this selection.

In order to adequately interpret the results of the first impact assessment as presented in the remainder of this chapter, it is of paramount importance to note four key points regarding the explanatory power of the transitional methodology.

1. The correlations highlighted by the statistical analysis in this chapter do not explain the present levels of impacts.

Because available data were limited to the years 2015 and 2016, the used dataset can only represent a snapshot of the position of Colombia on these issues at a specific time, and do

not allow for a temporal analysis of the variations of these impacts across a period of time. Indeed, there is a necessary time-lag between investing resources and measuring the outcomes and the impacts of these inputs. In other words, policies do not have immediate effects, especially when they aim – like digital ones – at fostering a deep change in government and citizen practices. Concretely, this remark implies that in building an impact assessment model controlling for this time-lag, it would be necessary to evaluate correlations between inputs invested, for instance, in 2008-09, and outcomes and impacts measured in 2016. As stated before, this publication thus cannot explain present levels of the impacts, which could be due to policies from a more or less distant past and with a digital orientation or not. By detecting statistical correlations between indicators of the same year, it can, however, highlight potential tracks on where these temporal correlations could be explored when the dataset was built over the years. As such, the observed differences between these indicators could be due to Online Government Strategy policies, but also to a multitude of other factors completely exogenous to digital government reforms. More generally, it is fundamental to not conflate statistical correlation with perfect causality. An apparent relationship between two variables does not automatically mean that the variables are causally linked.

2. The results can be more easily generalised to municipal institutions than to national ones or governorates.

While the dataset included many different administrative and political units, another limitation regarding the scope of this analysis originates from the unbalanced composition of the studied dataset, as most of its units of analysis (1 101/1 280) are municipalities. The municipal level therefore heavily influences the correlations highlighted in the subsequent analysis. Because correlation analyses are strongly influenced by the size and composition of the sample, the current recommendations mirror more closely policy outcomes and impacts at the municipal level. It does not mean, however, that the correlations emphasised in the following sections are not valid for national-level institutions. For each result it is, however, necessary to corroborate correlation results with the means and response rates provided in the annexes. Additional analysis would be required to make specific claims, notably triangulation with means and response rates. More generally, it is very important to verify the individual response rates of the indicators of interest before making a statistical inference (see Annex E), since it gives primordial information on which institutions weigh in the statistical analysis. While some were homogeneously measured among government tiers, others were indeed particularly skewed towards one of them, hampering the generalisation of the observed correlation to other administrative levels.

3. Not finding a correlation does not necessarily disprove the hypothesis.

When two variables are not correlated statistically, it does not mean that they have no relationship at all. Low response rates can, for instance, be quite deleterious to establishing robust correlations, as this statistical tool is really sensible to the size of the sample. For example, the fact that the model found it difficult to assess the effect of digital policies to transparency on contracting (IMP8) is very likely due to the fact that this impact could not be measured at the municipal level, and thus presents a very low response rate (10%). It is all the more true as this indicator presents a notable internal coherence (see Annex F).

4. The statistical analysis did not control for exogenous non-digital influences.

Evaluating how digital government policies influence multidimensional and complex indicators, such as trust in government, is extremely difficult because these indicators could be affected by many external determinants. As a matter of fact, these impacts could also be explained by many variables exterior to digital policies, like demographic (age, ethnic groups, gender, etc.) or economic determinants (employment rates, etc.). While analysis for outcomes of the Online Government Strategy stands for the same caveat, these indicators are less likely to be subjected to such exogenous effects as they are more clearly framed towards digital policies. Box 3.1 details the use and entailment of control variables, which could help overcome this caveat.

Box 3.1. The notion and use of control variables

- When evaluating the extent to which variable A causes variable B, it is necessary to isolate this specific relationship from other exogenous influences.
- For instance, if a strong correlation is found between digital transparency (A) and trust in government (B), more theoretical thought would be needed to see if this observed result is not simply due to a third variable, like political opinions (C). If, for an unknown reason, regions which strongly voted for the government in office also have high scores of digital transparency, it is indeed very likely that their high level of trust in government is not due to digital policies (A), but to political positions (C).
- To avoid making spurious causality inference and identify hidden effects, scientists usually use control variables. Control variables are variables which are held constant in an analysis to be sure that they do not have an unwanted effect on the relationship between the two studied variables.
- In the previous example, political opinions could be used as a control variable. As such, to neutralise the potential effect of political positions on government trust, it would be held constant when establishing the statistical correlations. In other words, the relationship between digital transparency and government trust would only be conducted between regions *which present the same political opinions*, and not between areas with different partisan positions.
- What does it imply for the current model?
- The absence of control variables should push the reader to interpret the following results with much care, especially for broader impacts which are more subject to external/non-digital influences.
- While its principle is quite simple, deciding *which* control variables are to be used necessitates elaborate theory building. It is indeed not possible to control for *all* exogenous factors, as it deeply complicates the statistical analysis.
- It is therefore advisable for future impact assessments to take into account the identification of the external variables most likely to exogenously influence digital policy outcomes, and impacts. This supposes including general indicators such as demographics or economic development within the dataset.

With these methodological remarks in mind, the analysis provided in this chapter can achieve two goals. By identifying impacts that are moderately or weakly associated to the outcomes of the Online Government Strategy this theoretical framework can first determine which of these impacts are very likely **not** determined by online government policies and initiatives, and as such hardly experience any positive or negative influence from the Online Government Strategy. Second, by labelling impacts strongly correlated to online government policies, policy recommendations can be formulated on how to

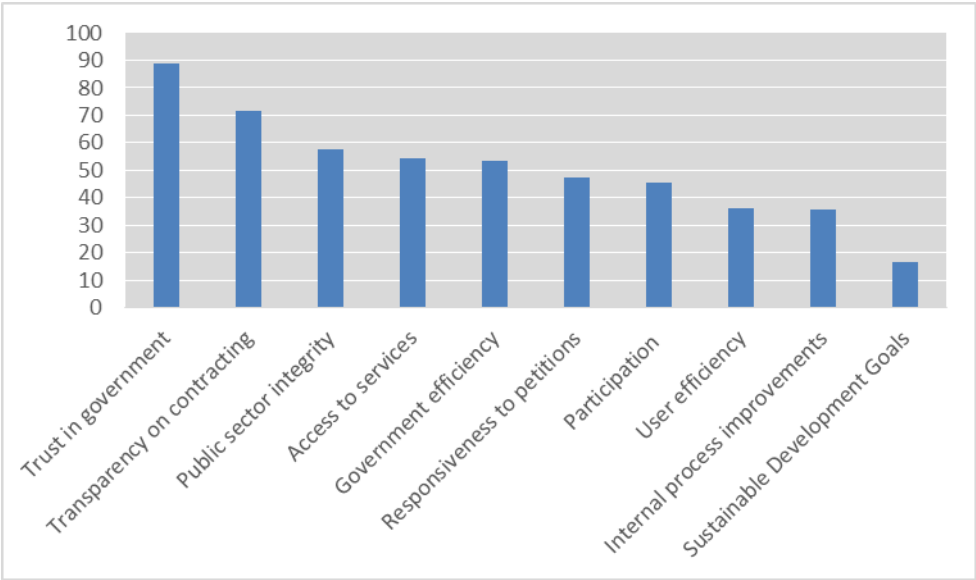
potentially improve certain impacts **in the future**, and thus how to decrease gaps between them.

These strongly correlated impacts will be subsequently discussed in four sub-sections in relation to which strategy component they are most strongly connected to (ICTs for services, ICTs for open government, ICTs for management, and information security and privacy). The presentation of the analysis of the statistical correlations will allow for the identification of policy levers, while descriptive data will permit to identify **where** these should be applied in priority. Throughout the analysis, these results will also be assessed according to the quality of the dataset on certain issues, leading to caveats or recommendations for improved data collection and policy calibration.

Results on the key expected impacts of the Online Government Strategy

When looking at the standardised averages of the expected impacts (Figure 3.1), it is striking that these impact indicators demonstrate very different achievement levels (all scored on a scale from 0 to 100). For instance, while the perceived contribution of the Online Government Strategy to trust in government is characterised by a high general average, its perceived contribution to the Sustainable Development Goals is almost six times smaller.

Figure 3.1. Standardised mean scores of expected impacts of the Online Government Strategy



The ten expected impacts have been grouped into three categories according to the intensity of their statistical relationships with outcomes of the Online Government Strategy (Table 3.1). This strength was assessed based on the value of statistical correlation indexes (R^2, pseudo-R^2 and Cramer's V notably). The final section of Chapter 2 provides more details about the choice of these statistical indexes over more classical regression coefficients. Unless otherwise stated, all the correlations reported in this chapter are positive (if A and B are correlated, an increase of A will lead to an increase of B). The number of correlations an impact had with digital outcomes was also taken into account to establish these groups. To quantify these statistical relationships,

only correlations statistically significant at least at the 10% level (p-value < 0.1) were considered (for more details on the statistical significance of specific results, see the tables in Annex G). Based on these two criteria, impacts were labelled either as strongly, moderately or weakly linked to the Online Government Strategy.

Table 3.1. Impact classification according to correlations with the Online Government Strategy (GEL)

	Strong	Intermediate	Weak
Classified indicators	Sustainable Development Goals (IMP2)	Trust in government (IMP1)	Access to services (IMP6)
	Public sector integrity (IMP3)	User efficiency (IMP4)	
	Citizen participation (IMP7)	Responsiveness to petitions (IMP5)	
	Internal process improvements (IMP10)	Transparency on contracting (IMP8)	
		Government efficiency (IMP9)	
Statistical criteria	$R^2 > 0.05$ in relation to two or more outcomes	$R^2 > 0.02$ in relation to one or more outcomes	$R^2 \leq 0.02$ in relation to one or more outcomes
	OR	OR	
	$V > 0.2$ in relation to two or more outcomes	$V \geq 0.17$ AND multiple $R^2 \geq 0.01$	

The absolute values of these statistical indicators should be put into perspective. While some of the values considered here as robust could be qualified as weak in absolute, they were not relatively to others. These thresholds are in sum specific to this transitional methodology and should not be compared to more mature ones. A tripartite division was decided because the global evaluation of the results made it clear that some indicators had many statistically strong relationships while others didn't have any at all, and others were more modest. These categories should thus be handled with care as two indicators from the fringes of their respective groups could be quite close, even if they were put in different categories.

Four impacts qualify as strongly related to the Online Government Strategy: internal process improvements (IMP10), Sustainable Development Goals (IMP2), citizen participation (IMP7) and public sector integrity (IMP3). All four impacts of this group possess multiple intermediate correlations (at least two with $R^2 > 0.05$ or $V > 0.2$) with outcomes of the Online Government Strategy. This category purposely excludes trust in government and transparency on contracting, even if they have one notable relationship with $R^2 > 0.05$, because these correlations could not be detailed with correlation trees. The outcome to which they correlated could not be connected to the other layers of the analytical framework (outputs, activities and inputs). Due to the strength of their relations to the Online Government Strategy, these impacts will constitute the core of this chapter and for all of them, correlation chains allowing for the identification of potential policy levers will be presented in the next four subsections. These correlation chains were established by walking back the results for impacts to determine more precisely their origins in terms of inputs, activities and outputs. They were thus established by looking at how inputs correlated with certain activities, how these activities were tied to some outputs and how these precise outputs were articulated with the outcomes which presented the strong above-mentioned relationships with broader impacts. As mentioned earlier, however, they must be interpreted with necessary caution.

Five impacts are labelled as moderately linked to the Online Government Strategy: trust in government (IMP1). user efficiency (IMP4) responsiveness to petitions (IMP5),

transparency on contracting (IMP8), and government efficiency (IMP9). This category unites impacts with one to several minor correlations with outcomes of the Online Government Strategy (at least two with $R^2 > 0.02$ or Cramer's $V > 0.17$) and multiple weak correlations with the same outcomes ($R^2 \geq 0.02$). While correlation chains will not be established for the impacts of this second group, the links to these impacts will be touched upon in the next subsections.

Finally, one impact, access to services (IMP6), was categorised as weakly correlated to the Online Government Strategy, as it possesses only frail – though statistically significant at the 10% level – correlations with outcomes of the Online Government Strategy ($R^2 < 0.01$ or Cramer's $V < 0.1$). Reasons for the weak or moderate links to the logic model found for the last two groups will also be discussed in the next four sections.

All the previously mentioned caveats should, however, be born in mind, notably the fact that these correlations only hint at potential policy levers, but do not account for the present impact achievement level; but also that many other variables outside of digital policies are very likely to be determinant to explain these results.

Impacting public sector integrity and citizen participation through ICTs for services

Service satisfaction is linked to public sector integrity and citizen participation

The analysis points out that digital service policies of the Online Government Strategy are potentially beneficial to civil servants' perception of public sector integrity (IMP3) and general citizen participation (IMP7). More precisely, both impact indicators are quite strongly and positively correlated with the extent to which users are satisfied with the provided online services (OUC5). In other words, it seems that institutions where digital service users are the most satisfied also report the highest scores for the perceived integrity of the public sector among civil servants and the participation of citizens in the formulation or adjustment of public policies and projects. Box 3.2 summarises the main findings regarding the ICTs for services component, which will be discussed in more detail throughout this section.

Box 3.2. Key observations on the impact of the ICTs for services component

Confirmed hypotheses

i. National public institutions and governorates where users are the most satisfied with digital services (OUC5) also report the highest scores for the perceived integrity of the public sector among civil servants (IMP3).

ii. National public institutions and governorates where users are the most satisfied with digital services (OUC5) also report the highest scores on the participation of citizens in the formulation or adjustment of public policies and projects (IMP7).

iii. Public institutions with high levels of digital service quality (OUP 3) have high levels of service satisfaction (OUC 5).

iv. Public institutions with a more advanced integrated system for petitions and claims (OUP4) have higher levels of service satisfaction (OUC5).

v. Public institutions with an advanced level of planning for ICTs for services (ACT2) have a higher level of digital service quality (OUP3) and a more advanced integrated petitions and claims system (OUP4).

vi. Public institutions that use more implementation guides (INP7) have a higher level of digital service quality (OUP3) and a more advanced integrated petitions and claims system (OUP4).

vii. Public institutions that know and apply the institutional (INP4) and service-specific (INP6) legal framework have a higher level of digital service quality (OUP3) and a more advanced integrated petitions and claims system (OUP4).

Potential policy levers to increase citizens' satisfaction of digital services

viii. Digital service quality will likely be an efficient lever, while strengthening integrated systems for petitions and claims could serve as a secondary strategy.

ix. Having ambitious planning policies for services and complete implementation guides and legal framework knowledge could also reinforce both the quality of digital services and the integrated petitions and complaints system.

x. Municipalities in early and intermediate development environments and the Pacific region are the suggested focus areas to apply the identified policy levers.

Note on unconfirmed hypotheses

xi. While the analysis cannot confirm a statistical link between other outcomes related to digital services (digital service use, online petition processing and electronic authentication use) and any of the ten expected impacts, it cannot disprove their potential effect either.

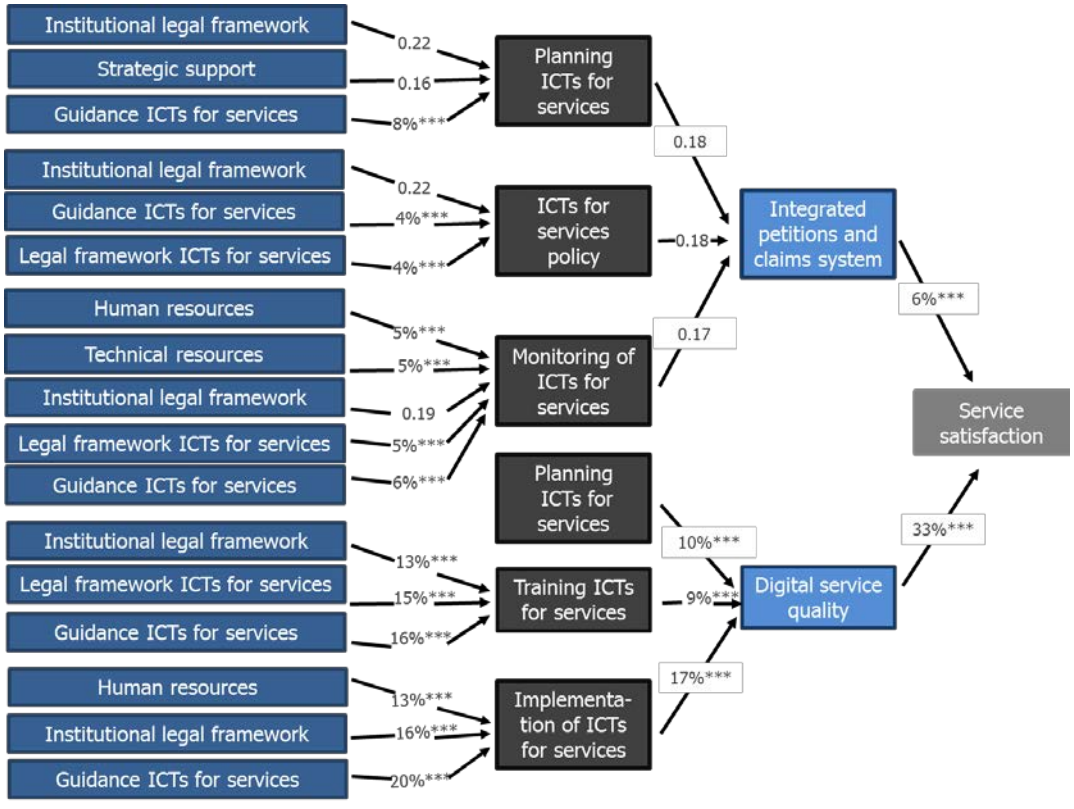
This observation seems qualitatively coherent, as citizens who are satisfied with an institution's services would be more likely to participate in the activities that the institution organises. The link between service satisfaction and perceived public sector integrity among civil servants is, however, less straightforward. It is possible that public servants think more positively about the integrity status of their institution when citizens are more satisfied with the services they provide. Witnessing user satisfaction might indeed have a positive impact on how civil servants perceive both their mission and the state administration in general. While meaningful at a general level, these two relations are, however, uniquely true for national institutions and governorates. Civil servants' opinions about public sector integrity and levels of citizen participation could not be measured for municipalities, as illustrated by the low data availability for these two impact indicators (< 200/1 400). The response rate was, however, superior to 67% for the national level and quasi-perfect for the governorates (32/32). The computed correlations thus describe predominantly what is happening in these government tiers. It does not mean that these correlations do not exist for municipalities, but rather that data are lacking to extend the inferences to that level of government. Also, this difficulty to extend the described outcome-impacts relationships to municipalities does not exclude them from all the other reported correlations leading up to the outcome of service satisfaction. In other words, the analysis gives food for thought on how to improve digital service satisfaction (OUC5) for all three levels of government, but cannot support the hypothesis that such an increase will result in a parallel growth in perceived public sector integrity (IMP3) and citizen participation (IMP7) for municipalities. As the local level is a keystone of citizen participation, it would be important to extend, in the future, the measurement of this impact to municipalities. Chapter 4 provides more insights on this question.

A second preliminary caution lies in the different strength and statistical robustness of these two outcome-impact correlations. The analysis points out that user satisfaction (OUC5) seems to be more strongly linked to citizen participation ($R^2 = 0.195$) than to public sector integrity perception by public servants ($R^2 = 0.07$). The robustness of the results is, however, the opposite of the correlation strength: the relationship found between public sector integrity and user satisfaction is more statistically robust ($p < 0.01$) than the one found with citizen participation.

Correlation chain leading up to service satisfaction

With these remarks in mind, it is possible to detail how to potentially increase public sector integrity perception (IMP3) and citizen participation (IMP7) by achieving a higher level of service satisfaction (OUC5). Figure 3.2 schematises the explored correlation chain.

Figure 3.2. Correlation chain for service satisfaction



Note: Values in percentage represent the R^2. Value in decimals represent Cramer's V. The stars next to this R^2 percentage relate to the statistical significance. One star (*) means that the results are significant at the 10% level ($0.05 < p < 0.1$), two stars (**) at the 5% level ($0.01 < p < 0.05$) and three stars (***) at the 1% level ($p < 0.01$).

To increase citizen satisfaction with digital services (OUC5), the analysis first points out that focusing on digital service quality should be a priority (OUP3; $R^2 = 0.33$). This result suggests that users strongly consider the quality of the provided digital service when expressing their level of satisfaction. This indicator would benefit from an emphasis on improving the different components of digital service quality, such as increasing the percentage of online services adhering to accessibility and usability criteria or creating a user characterisation system.

To consolidate digital service quality, the model further indicates that the provision of implementation guides for ICTs for services (INP7) and the supply of tools improving knowledge of the legal framework within public institutions – whether it be general (INP4) or more oriented towards services (INP6) – could be efficient leverages. To a lesser extent, adding human resources (INP2) could have a positive impact on activities conducive to a higher level of online service quality. Interestingly, it seems that if general inputs, such as technical or financial resources, do have a positive impact on the Online Government Strategy's achievements, they are not the main determinants of these policies.

A focus on all of these inputs will impact positively on activities themselves beneficial to online service quality. To achieve even greater scores, it could also be complemented with direct actions on certain service-related activities, such as developing dedicated

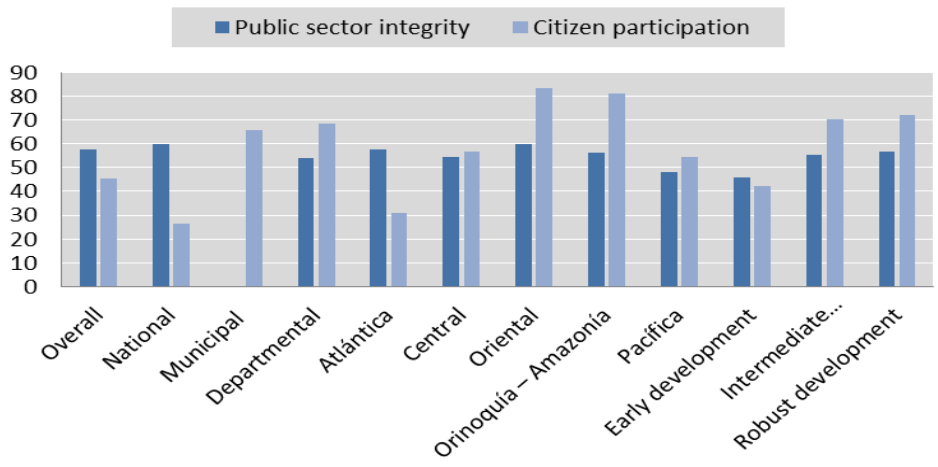
plans for digital service provision. Notably, institutions with ambitious objectives of planned service activities (ACT2), with regular training sessions for their employees (ACT4), and a higher level of implementation of online services and procedures (ACT5), produce, on average, services of higher quality (OUP3) and thus a higher level of user satisfaction (OUC5).

The analysis secondly points out that service satisfaction is, to a lesser extent, correlated to the existence of an integrated system where citizens can formulate complaints and complete petitions (OUP4; R^2 = 6%). The existence of a system offering online or mobile-friendly complaint forms could be fostered by increasing the very same inputs as the ones leading to better digital service quality (OUP3): the use of implementation guides for ICTs for services (INP7) and knowledge of the legal framework (INP4). Increasing general inputs such as human (INP2) and technical resources (INP3) could also have a positive effect on the proper working of this policy tool. Here again, if these inputs would have a positive influence through their repercussion on certain activities, activities themselves could be directly targeted as determinants of the desired output. Like for digital service quality, it indeed seems beneficial for an institution's petitions and complaints system to plan as many ICTs for services as possible (ACT2), while the institutionalisation of monitoring of online procedures and services (ACT6) further paves the way for an institution to produce an efficient digital complaints and petitions platform.

It should also be noted that investing resources to improve online petition systems (OUP4) is also likely to have a positive and secondary influence on responsiveness to petitions (IMP5). As a moderate yet positive statistical link was indeed found between online petitions processing (OUC3) and general responsiveness to petitions (IMP5; R^2 = 0.03***), the above-mentioned resources better targeting online complaint platforms (OUC3) could have a positive effect on this other impact moderately linked to the Online Government Strategy.

Focusing policy efforts for service-related outcomes and impacts

Figure 3.3. Citizen participation and public sector integrity across levels of government, regions and levels of development



Beyond determining **how** to potentially increase these impacts and outcomes, descriptive data further permit to localise **where** efforts could be focused in priority. Regarding the

average scores of public sector integrity perception (IMP3), they prove quite homogeneous among national (60.0) and departmental institutions (53.8), Differences between administrative sectors are limited, even if interior (44.3), science (45.3) and statistics (46.5) administrations score particularly low. Likewise, Colombian regions present quite homogeneous scores, with the exception of the Pacific region, which lags behind (47.9). In terms of development environment, intermediate and robust areas have very similar scores (55.2-56.9), while early development zones demonstrate weaker results (46). Once again, it is necessary to recall that these results in terms of territorial distribution only concern the governorates of these regions, not their municipalities. As explained beforehand, no significant results can be given for municipalities on this precise impact.

Scores for citizen participation (IMP7) are much more scattered. National institutions notably rank substantively lower (26.4) than departmental entities (68.3), especially among administrations related to the defence (6.7), statistics (0.0), justice (9.5) and social inclusion (14.3) sectors. In this national category, administrations linked to sports (71.4), education (57.1) and the public sector (57.1) have the highest scores on citizen participation even though it is still lower than the scores of the governorates (68.3). Like for public sector integrity, data collection for citizen participation must be implemented more systematically at the local level to be able to generalise these inferences to municipalities.

A policy aiming at improving the scores of digital service satisfaction (OUC5) without taking associated impacts into account could, however, take into account the above-mentioned correlations for municipalities. Service satisfaction is quite high for governorates (76), but lower for municipal (46.8) and national institutions (59.2). A strong difference exists between areas characterised by a robust economic environment (76.9) and those with less resources (43.1-45.9) The range of scores between regions is quite homogeneous, even if the Pacific region could be subjected to particular attention. On the contrary, there are strong inequalities between administrative sectors, culture (92.0), commerce (87.5), foreign affairs (100) and communication (100) administrations contrasting with justice (23.3), interior (42.5) and environment (40.8) institutions. As such, using digital service quality and an online complaints system as policy levers would be particularly relevant to reduce these inequalities on user satisfaction.

Secondary correlations and outcomes for ICTs for services

Another outcome for services – digital channel preference (OUC2) – seems to have a positive and significant influence on two general impacts. This latter indicator is indeed positively correlated with both public sector integrity (IMP3; $R^2 = 0.054$) and responsiveness to petitions (IMP5; $R^2 = 0.04$). It hints to the fact that the more civil servants perceive the Internet and e-mail as the most preferred channels for citizens to realise government services, the better is their perception of public sector integrity and the higher is their capacity to respond to complaints. Interestingly, however, a more precise correlation chain detailing the determinants of digital channel preference (OUC2) could not be established, as this outcome does not correlate with any outputs within its strategy component. As it is already difficult to speak of causality in general, this latter result should be considered with great care because the theoretical model cannot provide a clear explanation on why such a relationship exists.

None of the other outcomes related to services (digital service use, online petition processing and electronic authentication use) demonstrated a strong correlation with any

of the expected impacts (see Annex H). While it does not mean that they are not relevant at all – as they could have transversal influence on outcomes outside of their component – their leverage power seems much more uncertain.

Achieving results on digital participation and collaboration through ICTs for open government

Digital participation and open innovation solutions impact internal process improvements

The regression analysis points out that institutions which report a higher percentage of participation exercises realised through digital means (OUC8) and a high level of implemented open innovation solutions (OUC10) also demonstrate more efficient internal processes, such as the budget cycle, contracting and evidence-based policy making (IMP10). Digital participation and open innovation solutions seem to have comparably strong statistical links to internal process improvements. Their R^2 (7% for OUC8 and 10% for OUC10) and statistical significance (both have a p-value < 0.01) are indeed quite close.

Even through this observation is in line with expected goals of the digital transformation of the public sector, where digital technologies and citizen-driven contributions are meant to support the reform of basic government functions for public sectors that are more open, innovative and participatory, it isn't in line with the expectations of the Online Government Strategy. According to the strategy, participation and collaboration activities are generally aimed at addressing societal challenges rather than internal management issues. For that reason, the discussion in this section will focus on the outcomes that have been realised within the ICTs for open government component and not on the impact indicator of internal process improvements. The latter will prove to be more relevant to the ICTs for management component, as explained in Section 3.5. Box 3.3 summarises the main findings regarding the ICTs for open government component, which will be discussed in more detail throughout this section.

Box 3.3. Key observations on the impact of the ICTs for open government component

Confirmed hypotheses

i. Public institutions which conduct more digital participation exercises (OUC8) comparatively improve more internal processes (IMP10) than others.

ii. Public institutions which implement more solutions from digitally enabled collaboration exercises (OUC10) comparatively improve more internal processes (IMP10) than others.

iii. Public institutions which organise more open innovation exercises (OUP8), offer more digital participation (OUP7) possibilities and have a higher level of online transparency (OUP5) implement more solutions resulting from open innovation exercises (OUC 10).

iv. Public institutions that organise more open innovation exercises (OUP8), offer more digital participation (OUP7) possibilities, and have a higher level of online transparency (OUP5) realise more public consultation or decision-making exercises through digital means (OUC 8).

v. Public institutions that have a more advanced level of planning (ACT7), training (ACT9), implementation (ACT10) and monitoring (ACT11) of ICTs for open government activities have a higher level of online transparency (OUP5).

vi. Public institutions that have a more advanced level of planning (ACT7) and monitoring (ACT11) of ICTs for open government activities organise more open innovation exercises (OUP8).

vii. Public institutions that have a more advanced level of planning (ACT7) and implementation (ACT10) of ICTs for open government activities offer more digital participation (OUP7) possibilities.

viii. Public institutions that use more implementation guides (INP9), and know and apply the institutional (INP4) and open government-specific (INP8) legal framework have a more advanced level of planning (ACT7) of ICTs for open government activities.

ix. Public institutions that use more implementation guides (INP9) and technical resources (INP3) and know and apply the institutional (INP4) and open government-specific (INP8) legal framework have a more advanced level of training (ACT9) on ICTs for open government activities.

Box 3.3. Key observations on the impact of the ICTs for open government component *(continued)*

x. Public institutions that use more implementation guides (INP9) and technical resources (INP3) have a more advanced level of implementation (ACT10) of ICTs for open government activities.

xi. Public institutions that use more implementation guides (INP9), and know and apply the institutional (INP4) legal framework have a more advanced level of monitoring (ACT11) of ICTs for open government activities.

Potential policy levers to increase digital participation and collaboration

xii. Focus on the organisation of easier to access collaboration exercises along with the reinforcement of online transparency.

xiii. Ensure the use of implementation guides and technical resources, and fostering the knowledge and application of the legal framework (INP4/8).

xiv. Municipalities in early and intermediate development environments, the Pacific and Amazonian regions, and certain central institutions on a one-on-one basis are the suggested focus areas to apply the identified policy levers.

Note on unconfirmed hypotheses

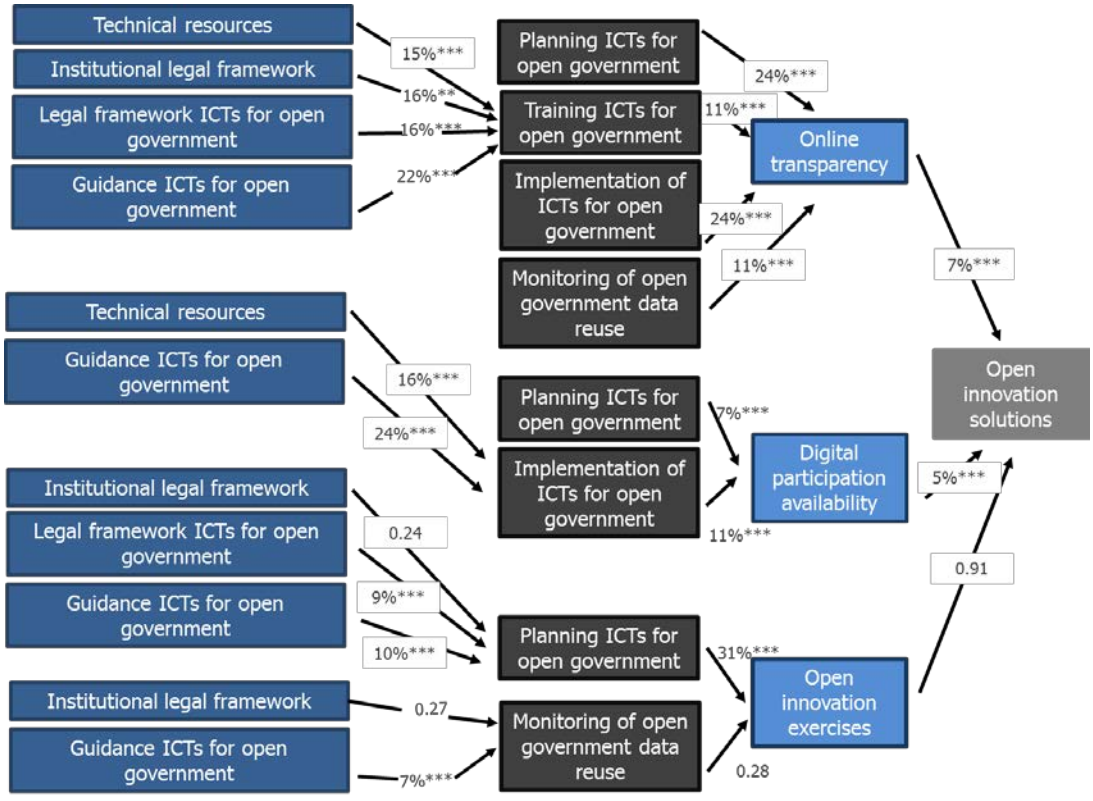
xv. While the analysis cannot confirm a statistical link between digital participation and the implementation of open innovation solutions on the one hand and general citizen participation on the other, it cannot disprove their potential effect either.

Digital citizen participation (OUC8) and open innovation solutions (OUC10) demonstrate very solid response rates among the three government tiers. On the one hand, these excellent results demonstrate an efficient way of calibrating these two indicators, while also translating a widespread understanding of their meaning among Colombian institutions. Contrary to the last subsection, such response rates hence allow for all the conclusions developed here to be extended to municipalities, as well as to national institutions and governorates. As mentioned earlier, however, such a high response rate of municipal entities strongly weighed on the results which will be discussed later, and must thus be considered more cautiously when applied to other government levels.

Correlation chain leading up to open innovation solutions and digital citizen participation

After these preliminary remarks, it is possible to detail **how** to reinforce digital citizen participation and the consideration of open innovation solutions. Figure 3.4 schematises the explored correlation chain of open innovation solutions (OUC10).

Figure 3.4. Correlation chain for open innovation solutions



Note: Values in percentage represent the R^2. Value in decimals represent Cramer's V. The stars next to this R^2 percentage relate to the statistical significance. One star (*) means that the results are significant at the 10% level ($0.05 < p < 0.1$), two stars (**) at the 5% level ($0.01 < p < 0.05$) and three stars (***) at the 1% level ($p < 0.01$).

The analysis shows an extremely strong correlation between the score of implemented open innovation solutions (OUC10) and the level of open innovation exercises (OUP8). While it seems theoretically coherent to find a strong relationship between these indicators, a Cramer's V with such a high value (0.91/1) reveals a quasi-perfect correlation between them – meaning that open innovation exercises almost always produce the same number of implemented open innovation solutions. Whether this translates an accurate fact or whether respondents conflated exercises and solutions as a same and unique thing is ambiguous and would necessitate further investigation. However, this does not prevent the model from suggesting that an apparently efficient way to enhance open innovation solutions (OUP8) is to multiply open innovation exercises. The activities (ACT7/10/11) and inputs (INP4/8/9/10) at the origins of this output are interestingly shared with other outputs strongly linked to the level of implemented open innovation solutions.

While the number of implemented open innovation solutions (OUC10) is strongly determined by the number of exercises designed to produce them (OUP8), it is, to a lesser extent, also linked to the level of online transparency and accessibility (OUP5) and to the number of ICT-enabled participation activities offered by the institution (OUP7). This last relationship between open innovation solutions and the percentage of participation activities that were offered through ICT (OUP7) seems quite coherent, as the priority use of digital channels has the potential to amplify the production of open innovation

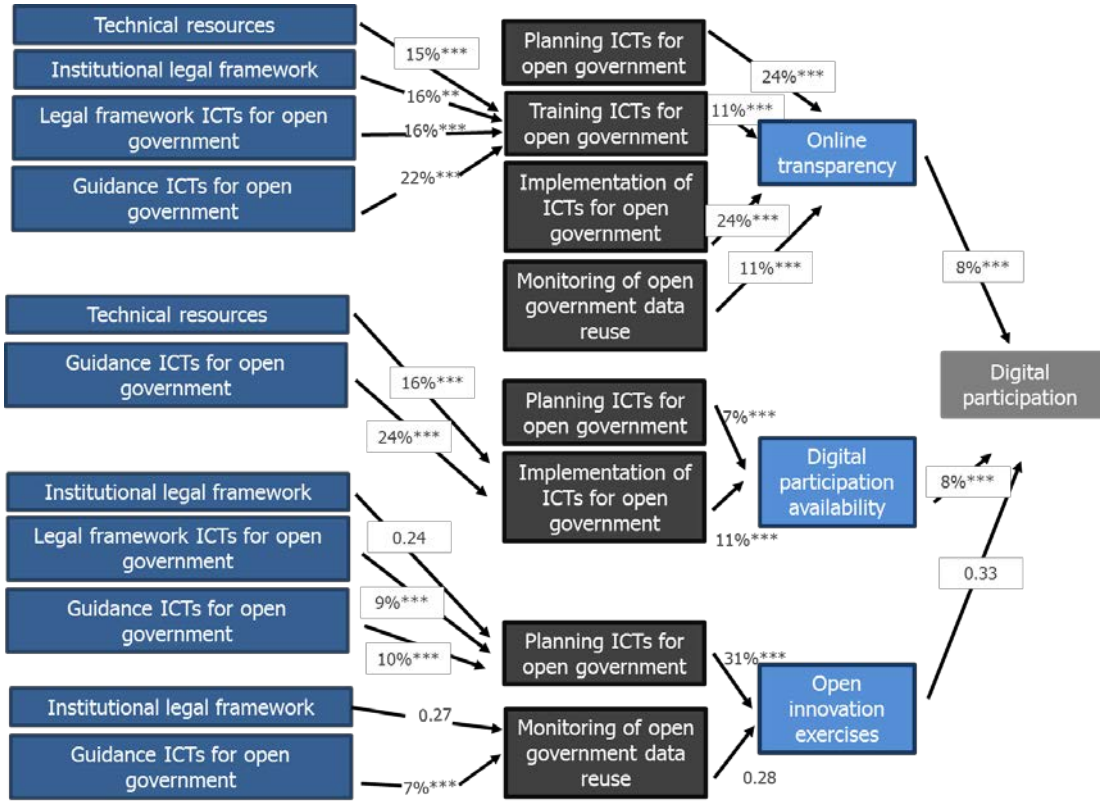
solutions and exercises by facilitating the consultation and engagement of citizens by crowdsourcing their inputs to solve problems. Likewise, the correlation found between online transparency (OUP5) and the production of open innovation solutions (OUC10) seems quite logic, as the more institutional websites are accessible and transparent to citizens, the easier it is for external stakeholders and citizens to promote informed open innovation solutions. In sum, increasing the level of open innovation solution produced supposes to consolidate online transparency (OUP5) and to generalise open innovation exercises (OUP8) while increasing the availability of ICT-enabled participation possibilities (OUP7).

The model further indicates which activities and inputs could act positively on these three output indicators (OUP5/7/8). Among them, planning as many ICTs for open government activities as possible (ACT7) could have a strong and positive impact on the three outputs described earlier. Similarly, the more systematically an institution implements open government activities (such as digital participation activities or online digital collaboration tasks) (ACT10), the more open innovation exercises it realises (OUP8), the better its online transparency (OUP5), and the greater the share of its collaboration activities that are promoted through ICTs (OUP7). To a lesser extent, these last two outputs seem to be also comparatively higher when an institution systematically monitors the reuse of open government data (ACT11).

To produce and implement more open innovation solutions (OUC10), an institution should not only focus on the specific activities highlighted above, but also on increasing certain institutional resources. First and foremost, the use of implementation guides for open government activities (INP9) seems to be of paramount importance in this strategy, as it appears to improve **all** the activity levels mentioned in the previous paragraph. This result parallels what was previously highlighted for services, where implementation guidance was also of high importance. Like for services, the mastery of the legal framework specific to this component (INP8), but also of the general legal corpus of the Online Government Strategy (INP4), looks quite central to producing solid open government activity and output levels. Finally, while online services were more likely to benefit from an increase in human resources, open government activities seem to be more closely determined by the extent to which institutions use the **technical resources** provided by the Ministry of Information and Communications Technologies (INP3), such as the portals for Open Data and *Sí Virtual*. The use of technical resources indeed appears to positively influence the level of implementation of ICTs for open government activities and the provision to public servants of more frequent and elaborated training sessions to make the most of the available data.

Regarding digital citizen participation for the definition of future policies, plans and programmes (OUC8), several resources could be mobilised, as exemplified by the correlation chain below.

Figure 3.5. Correlation chain for digital participation



Note: Values in percentage represent the R^2. Value in decimals represent Cramer's V. The stars next to this R^2 percentage relate to the statistical significance. One star (*) means that the results are significant at the 10% level ($0.05 < p < 0.1$), two stars (**) at the 5% level ($0.01 < p < 0.05$) and three stars (***) at the 1% level ($p < 0.01$).

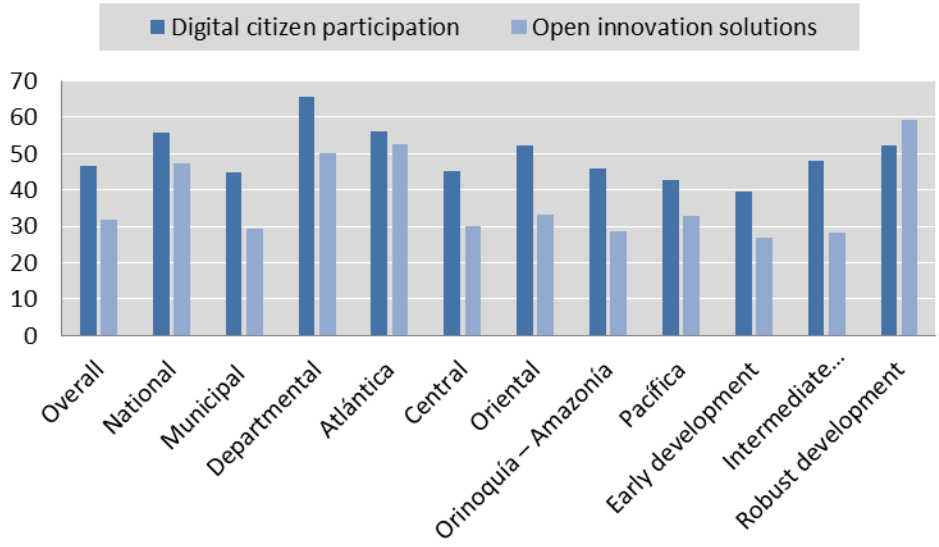
The first and most fundamental remark regarding this correlation chain is that it is almost identical in its composition to the one described earlier for open innovation solutions (OUC10). Except for variations in the strength of the relations between its components, the leverages previously highlighted to potentially increase the implementation of an open innovation solution (OUC10) are the very same, which could fuel more solid scores regarding the online participation of citizens (OUC8).

In a nutshell, conducting more open innovation exercises (OUP8) can also contribute to enhancing online citizen participation. Similarly, the results suggest that improving the accessibility and usability of institutional websites (OUP5) and prioritising ICTs to conduct collaboration exercises (OUP7) are likely to produce incentives for citizens to take part in open government activities and increase their online participation (OUC8). Central to the improvement of these outputs is to engage in ambitious planning policies (ACT7) and more systematic training of civil servants (ACT9), while ensuring that such activities are monitored at a sufficient level (ACT11). To support and complement these efforts, a particular emphasis must be put on the use of implementation guides by institutions (INP9), and on the legal training of civil servants on general and component-specific juridical issues (INP4/8). These efforts could also be complemented with the support of additional technical resources (INP3).

Focusing policy efforts for open government-related outcomes

Beyond determining how to potentially increase digital citizen participation and the implementation of solutions developed in open innovation exercises, descriptive data further help to determine on which areas to focus efforts.

Figure 3.6. Open innovation solutions and digital citizen participation across government levels, regions and levels of development



For open innovation solutions, national (47.1) and departmental (50.0) institutions score quite homogeneously, while municipalities lag behind (29.3). On the contrary, online citizen participation is quite higher in governorates (65.6) than in national (55.8) and local (44.9) institutions. Open innovation solutions present quite homogenous results among regions (around 30), with the Atlantic region scoring significantly higher (52.4). The same holds true for citizen participation, while the Pacific region scores a bit lower than its counterparts (42.6). While the impact of the development environment is real but reasonable for citizen participation (between 39.5 and 52.1), open innovation solutions present a clear split between early and intermediate development areas (26.8-28.4) and economically robust zones (59.2). For both outcomes, averages among administrative sectors vary quite significantly.

Impacting internal processes and sustainable development through ICTs for management

Data sharing, strategic data usage and shared ICT provisions as levers for internal process improvements and Sustainable Development Goals

The analysis suggests that the more an institution uses shared ICT provisions (OUC11), shares data with other institutions (OUC12) and uses data for strategic purposes (OUC13), the more it could improve its internal processes (IMP10) and link its online government activities to sustainable development goals such as reducing inequalities and fighting poverty (IMP2). Box 3.4 summarises the main findings regarding the ICTs for management component, which will be discussed in more detail throughout this section.

Box 3.4. Key observations on the impact of the ICTs for management component

Confirmed hypotheses

i. Public institutions which demonstrate a high use of strategic data (OUC13), a strong level of shared ICT provisions (OUC11) and with a solid amount of data exchanged among public sector institutions (OUC12) comparatively improve more internal processes (IMP10) than others.

ii. Public institutions which demonstrate a high use of strategic data (OUC13), a strong level of shared ICT provisions (OUC11) and with a solid amount of data exchanged among public sector institutions (OUC12) comparatively contribute more to the Sustainable Development Goals (IMP2) than others.

iii. Public institutions which have a higher level of data quality (OUP 10) and a larger range of data and information catalogues (OUP11) have a higher use of shared ICT provisions (OUC 11).

iv. Public institutions which have better quality data (OUP 10) and a larger range of data and information catalogues (OUP11) are more strategic in the use of data (OUC 13).

v. Public institutions which have better quality data (OUP 10), a larger range of data and information catalogues (OUP11), and a higher availability of interoperable information services (OUP12) share more data and information in the public sector (OUC12).

vi. Public institutions that have a more advanced level of planning (ACT12), training (ACT14) and implementation (ACT15) of ICTs for management activities have better quality data (OUP10).

vii. Public institutions that have a more advanced level of implementation (ACT15) and monitoring of ICTs for management activities (ACT16) have a larger range of data and information catalogues (OUP11).

viii. Public institutions that have a dedicated policy for ICTs for management (ACT13), a more advanced level of implementation (ACT15) and monitoring of ICTs for management activities have a higher availability of interoperable information services (OUP12).

ix. Public institutions that use more implementation guides (INP11), and know and apply the institutional (INP4) and management-specific (INP10) legal framework have a more advanced level of planning of ICTs for management activities (ACT12).

Box 3.4. Key observations on the impact of the ICTs for management component *(continued)*

x. Public institutions that use more implementation guides (INP11), and know and apply the institutional (INP4) and management-specific (INP10) legal framework have a more advanced level of implementation (ACT15) of ICTs for management activities.

xi. Public institutions that use more implementation guides (INP11), know and apply the management-specific (INP10) legal framework, and have more human resources (INP2) have a more advanced level of monitoring of ICTs for management activities (ACT16).

xii. Public institutions that use more implementation guides (INP11), know and apply the institutional (INP4) and management-specific (INP10) legal framework, and have more human resources (INP2) are more likely to have a dedicated policy for ICTs for management (ACT13).

xiii. Public institutions that use more implementation guides (INP11), know and apply the institutional (INP4) and management-specific (INP10) legal framework have a more advanced level of training (ACT14) for ICTs for management activities.

Potential policy levers to increase digital participation and collaboration

Strategic data use (OUC13), shared ICT provision (OUC11) and data exchange within the public sector (OUC12) could all be positively influenced by strengthening data quality (OUP10) and information catalogues (OUP11).

These latter outputs would benefit from formulating ambitious planning objectives within institutions (ACT12), generalising monitoring practises for ICTs for management (ACT16) and ensuring that online management policies of the Online Government Strategy are thoroughly implemented by administrative entities (ACT15).

xiv. Enhancing knowledge of the legal framework (INP4/10) and implementation capacities of stakeholders (INP11) could further prove to be efficient levers to achieve such increased activity levels.

xv. Municipalities in early and intermediate development environments are the suggested focus areas for an emphasis on internal process improvements (IMP10), data sharing within the public sector (OUC12) and strategic data use (OUC13).

xvi. National-level institutions provide the suggested focus area for an emphasis on shared ICT provisions (OUC11).

On the one hand, the positive and strong correlation between strategic data use (OUC13) and data exchange between institutions (OUC12), and internal process improvements (IMP10) seems quite logical. Indeed, data sharing between public sector institutions and the strategic use of data can help entities to streamline their internal functioning.

On the other hand, the relations between these outcomes of digital management policies and the perception of digital government as beneficial to broader sustainable goals (IMP2) is quite hard to grasp. A possible explanation could be that sharing and analysing data on sustainable development issues such as poverty, hunger and health could increase the institutional knowledge on these topics, which in turn could support evidence-based policy making to contribute to the SDGs.

It should also be noted that the impact indicator related to sustainable development is among the weakest of the ten expected impacts, with a general mean of 16.6/100. To be more explicit, this score can also be translated by saying that, on average, institutions only selected 2 or 3 development goals (out of 17) that they think were positively impacted by the Online Government Strategy – demonstrating a fragile penetration of this connection between digital policies and sustainable development in the Colombian context.

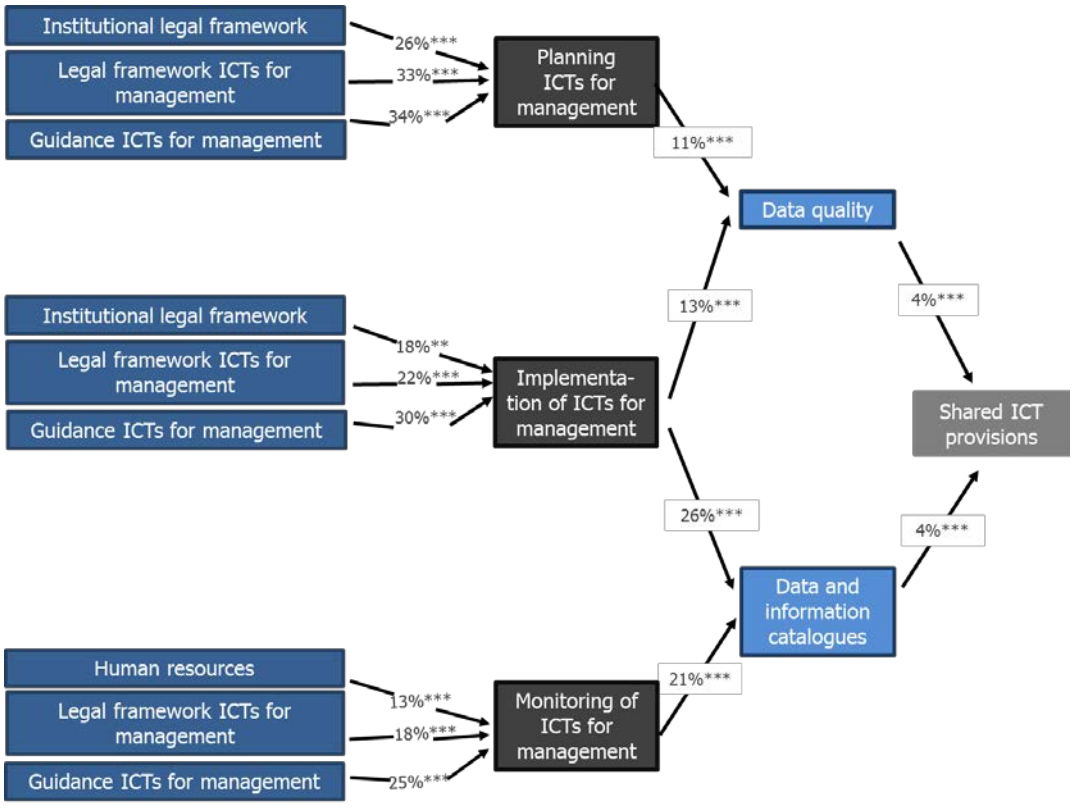
The result concerning the SDGs should, however, be handled with great care as it is very complex to measure such an impact and which is very likely to be influenced by non-digital factors. Studying it could thus highly benefit from the creation of control variables, as explained at the beginning of this chapter.

Internal process improvements (IMP10), along with the perceived contribution to the SDGs (IMP2), the use of shared ICTs (OUC11), data sharing (OUC12) and strategic data use (OUC13) all present very solid response rates for each of the three government levels. As stated in the previous section, these scores present both positive and negative aspects. One the one hand, they demonstrate a very efficient way to measure these three indicators, and also a probable widespread understanding of their significance among Colombian institutions. Such response rates hence allow for all the conclusions developed in this section to apply to municipalities, as well as to national institutions and governorates – while taking into account the disclaimer previously mentioned on the fact that the high response rate of municipal entities strongly weighed on the reported results. Looking for more information on the descriptive data, even if national institutions have corresponding higher scores for internal process improvements (IMP10) and strategic data use (OUC13) coherent with the positive correlations described earlier, they also associate their good results in terms of internal process improvements with unexpected low levels of shared ICT provisions (OUC11) – which goes against the previously stated positive relationship between this outcome and its associated impact (IMP10). Regarding national scores for the perception of the SDGs, national entities also combine counterintuitive high scores for outcomes (OUC12 and OUC13 notably) with a low average for this particular outcome, indicating a potential decorrelation (or negative correlation) of these two components; here again, against the results described earlier. These descriptive data should further call for caution when interpreting the very complex results regarding the SDGs, but also when generalising the following results to national actors. On the contrary, descriptive data for governorates seem to confirm the positive correlations previously described, as high scores in outcomes for management echo solid averages for both considered impacts.

Correlation chain leading up to data sharing, strategic data usage and shared ICT provisions

This section provides more details on how to potentially improve internal processes within an institution (IMP10) and how to strengthen its perception of digital policies as beneficial to the SDGs (IMP2) through policy levers in the ICTs for management component. Both impacts are affected by several management outcomes, like the level of shared ICT provisions (OUC11) as described in Figure 3.7.

Figure 3.7. Correlation chain for shared ICT provisions



Note: Values in percentage represent the R^2. Value in decimals represent Cramer's V. The stars next to this R^2 percentage relate to the statistical significance. One star (*) means that the results are significant at the 10% level ($0.05 < p < 0.1$), two stars (**) at the 5% level ($0.01 < p < 0.05$) and three stars (***) at the 1% level ($p < 0.01$).

Several preliminary remarks are necessary before exploring this correlation chain. First, the indications which will be given in this paragraph are more likely to have an influence on the SDGs (IMP2) than on internal process improvements (IMP10). Even if both impacts show a statistically significant positive relation with shared ICT provisions (OUC11), the R^2 linking IMP2 and OUC11 is stronger (0.09) than the one describing the relationship between IMP10 and OUC11 (0.06). Second, the correlation chain presented in Figure 3.7 seems a bit less robust than the ones presented so far. Indeed, this tree presents the weakest correlations linking outcomes to outputs, hinting for an existent yet moderate relationship between the use of shared ICT provisions (OUC11) and management outputs, activities and inputs. As this specific outcome could act both on

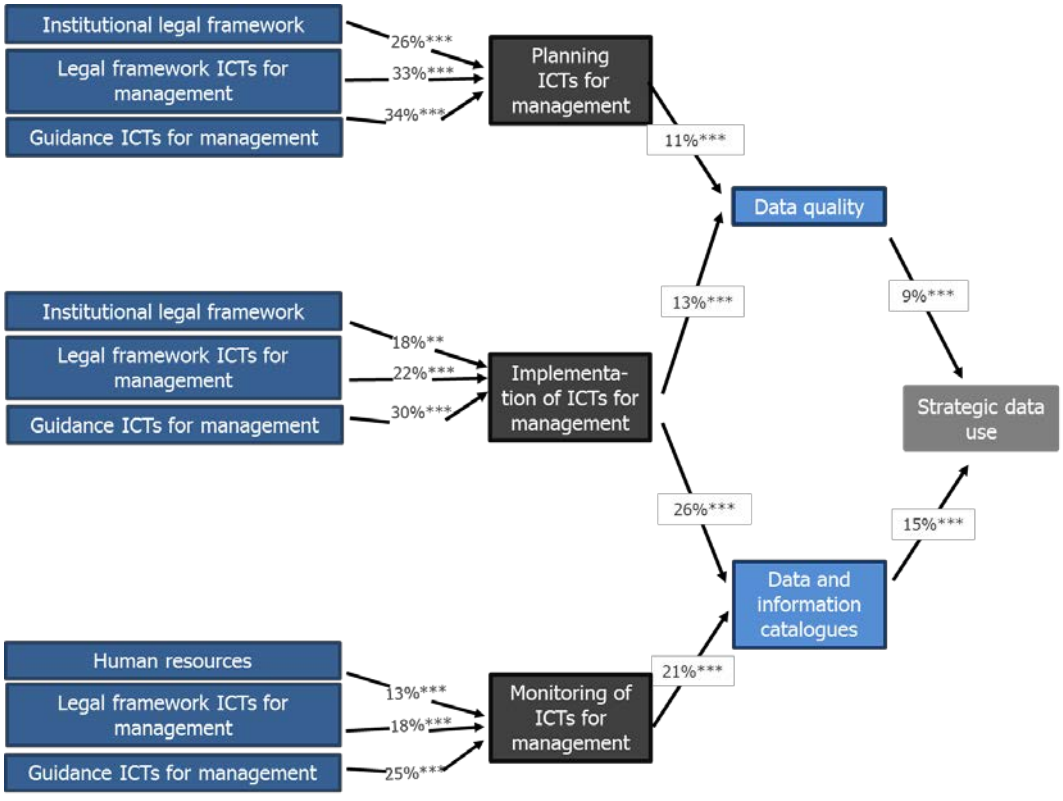
internal process improvements (IMP10) and SDG perception (IMP2), it is, however, worth commenting.

Even if these links seem to be statistically weak, the extent to which institutions use shared ICT provisions (OUC11) could be positively impacted by the level of data quality (OUP10) – which considers amongst others data completeness, disaggregation and accessibility – and the presence of data and information catalogues (OUP11). These results seem coherent with qualitative observations, as the combination of complete, disaggregated and accessible data with the provision of up-to-date information records makes it much easier for entities to engage in technology sharing and data merging. To achieve both higher scores of data quality (OUP10) and data cataloguing (OUP11), focusing on the implementation of ICTs for management seems to be quite efficient (ACT15). For a targeted action on the level of data quality (OUP10), ambitious planning practices regarding management activities (ACT12) could be quite relevant, while the achievement of data catalogues (OUP11) seems to be, logically, more sensitive to the existence of monitoring practices within an institution (ACT16). As observed for previous correlation chains, it seems that increasing the level of all these management activities could be strongly determined by the use of implementation guides (INP11) and legal guidance – both general (INP4) and specific (INP10) – to institutions. The institutions which report the highest legal framework knowledge and use of guides indeed declare significantly higher activity levels, and thus better quality data, better data catalogues and higher capacities for sharing ICT provisions. While secondary, general resources are still important to fuel these ICTs for management activities, adding supplementary human resources (INP2) seems to be particularly relevant within this component.

All in all, focusing on improving government data quality (OUP10) and creating comprehensive data catalogues (OUP11) could allow institutions to share data more easily and increase their use of shared ICT provisions, ultimately improving their internal processes (IMP10) while hypothetically creating a positive image of digital policies as favourable to society as a whole (IMP2).

Another way to potentially act on these impacts through digital management policies would be to focus on strategic data use (OUC13) (Figure 3.8).

Figure 3.8. Correlation chain for strategic data use



Note: Values in percentage represent the R^2. Value in decimals represent Cramer's V. The stars next to this R^2 percentage relate to the statistical significance. One star (*) means that the results are significant at the 10% level ($0.05 < p < 0.1$), two stars (**) at the 5% level ($0.01 < p < 0.05$) and three stars (***) at the 1% level ($p < 0.01$).

First, it is important to note that statistically speaking, higher scores on strategic data use (OUC13) are more likely to produce strong results on internal process improvements (IMP10; $R^2 = 19\%$) than they are to influence SDG perception (IMP2; $R^2 = 6\%$). Second, comparing the correlation chain for strategic data use (OUC13) and the one previously described for shared ICT provisions (OUC11) leads to the conclusion that they are both leveraged by the very same activities and inputs. As such, all the different strategies highlighted in the previous paragraphs to improve the sharing of ICTs (OUC11) could also have a very positive – and even greater considering the strength of the correlation coefficients – effect on the level of strategic data use (OUC13).

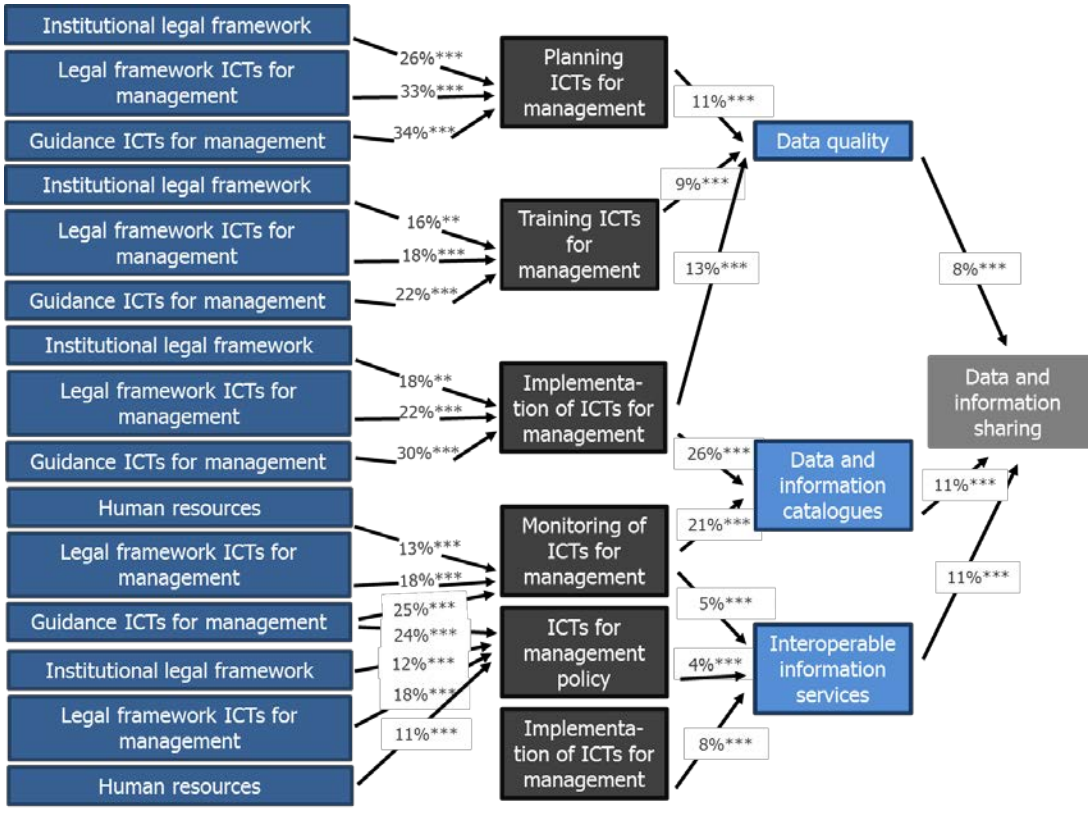
To begin with, increasing data quality (OUP11) and catalogues (OUP10) could allow institutions to increase the use and share of data analytics within their management activities. Like for the number of shared ICTs (OUC13), efficient leverages to reinforce such outputs would lie in the formulation of ambitious planning objectives within institutions (ACT12), in the generalisation of monitoring practises for management data (ACT16) and, most importantly, in the assurance that the online management policies of the Online Government Strategy are thoroughly implemented by administrative entities (ACT15). Enhancing legal framework knowledge (INP4/10) and implementation capacities of stakeholders (INP11) could further prove to be efficient ways to achieve such increased activity levels.

As such, a policy oriented towards the improvement of internal processes (IMP10) could focus on strengthening the level of strategic data use by institutions (OUC13). One of the other advantages of focusing on increasing strategic data use (OUC13) is that this outcome could have a contingent – yet moderate and to be considered carefully – influence on two other impacts: user efficiency (IMP4) and access to services (IMP6). An institution which uses data in a strategic way would indeed be able to generate efficiencies for citizens in the use of government services, for instance by prefilling personal data and redesigning services according to known user preferences.

The statistical model used in this analysis notably points out a very strongly statistically significant correlation (p-value < 0.01) between strategic data use (OUC13) and user efficiency (IMP4), even if the strength of this relationship is weaker than the ones described above ($R^2 = 0.02$). While this result, coupled with the fact that this indicator proved internally flawed (see Annex F) undermines the possibility to assert a strong influence of digital policies on user efficiency, the existence of a statistically significant result should push for further research in this direction. While this impact presents an excellent response rate (79%), its evaluation could benefit from more citizen-driven metrics representing actual user experiences to move from a dominantly institutional to a citizen perspective on user efficiency. In the future, more theoretical thinking is indeed needed to construct an indicator with a stronger internal coherence which could better grasp the effect of digital policies on user efficiency. As stated before, the fact that the statistical model could not firmly confirm the hypothesis that digital policies enhance user efficiency does not mean that the Online Government Strategy had no effect on user efficiency; the model could not disprove this relation as much as it could not prove it exists.

Even if, as mentioned earlier, results concerning the SDGs should be handled with great care, it is worth describing how sharing data in the public sector (OUC12) could have effects beyond mere digital policy outcomes.

Figure 3.9. Correlation chain for data and information sharing in the public sector



Note: Values in percentage represent the R^2. Value in decimals represent Cramer's V. The stars next to this R^2 percentage relate to the statistical significance. One star (*) means that the results are significant at the 10% level ($0.05 < p < 0.1$), two stars (**) at the 5% level ($0.01 < p < 0.05$) and three stars (***) at the 1% level ($p < 0.01$).

This last figure is maybe the most complex of the ones described so far but it largely echoes the first two detailed in this section: among the three different paths highlighted as possibly acting on data sharing within public sector institutions (OUC12), two (OUP10/11) are indeed shared with strategic data use (OUC13) and shared ICT provisions (OUC11). Such shared correlations between management outcomes seem coherent with the close relationships between all the outcomes described in this section, and imply that targeted policies focusing on a small number of inputs could potentially benefit a great number of digital policy outcomes and impacts. For instance, supporting the creation of data of higher quality (OUP10), along with more systematically storing information (OUP11) could facilitate data exchange within institutions (OUC11), as well as it could allow them to share more technologies (OUC12), and to produce and use a great number of strategic data to monitor their management activities (OUC13). As described earlier, efficient leverages to achieve such results could include formulating ambitious planning objectives within institutions (ACT12), generalising monitoring practises for management data (ACT16) and, most importantly, ensuring that online management policies of the Online Government Strategy are thoroughly implemented by administrative entities (ACT15). Enhancing knowledge of the legal framework (INP4/10) and the use of implementation guides (INP11) could also prove to be efficient ways to support such activity levels.

Beyond these synergies with other management outcomes, information sharing in the public sector (OUC12) has a special and exclusive relationship with the existence of interoperable information services (OUP12). As such, it seems quite coherent that increasing the percentage of information services for external institutions made available on the national interoperability platform (OUP12) would allow entities to have better access and more informed use of each other's data (OUC12). Acting on making interoperable services more accessible (OUP12) would here suppose increasing the levels of many activities previously described for other management outputs: generalising monitoring practises for management data (ACT16) and ensuring that online management policies of the Online Government Strategy are properly implemented by administrative entities (ACT15) could notably have a beneficial impact on the volume of information made available to external institutions (OUP12). To a lesser extent, the presence of an institutional plan specifying goals for the use of ICTs for management (ACT13) would allow entities to better schedule and achieve such interoperable services. Looking at the inputs, enhancing knowledge of the legal framework (INP4/10), strengthening the implementation capacities of institutions (INP11) and reinforcing available human resources (INP2) could support these management activities of the Online Government Strategy. Overall, mobilising these levers could benefit the level of data shared within the public sector (OUC12), which could itself create a favourable environment and perception of digital policies and make stakeholders more inclined to perceive this strategy as conducive to broader sustainable goals (IMP2). This last relationship between outcome and impact should, however, be subject to further analysis by the introduction of non-digital control variables to evacuate exogenous and hidden influences altering the causal inference.

Focusing policy efforts for management-related outcomes and impacts

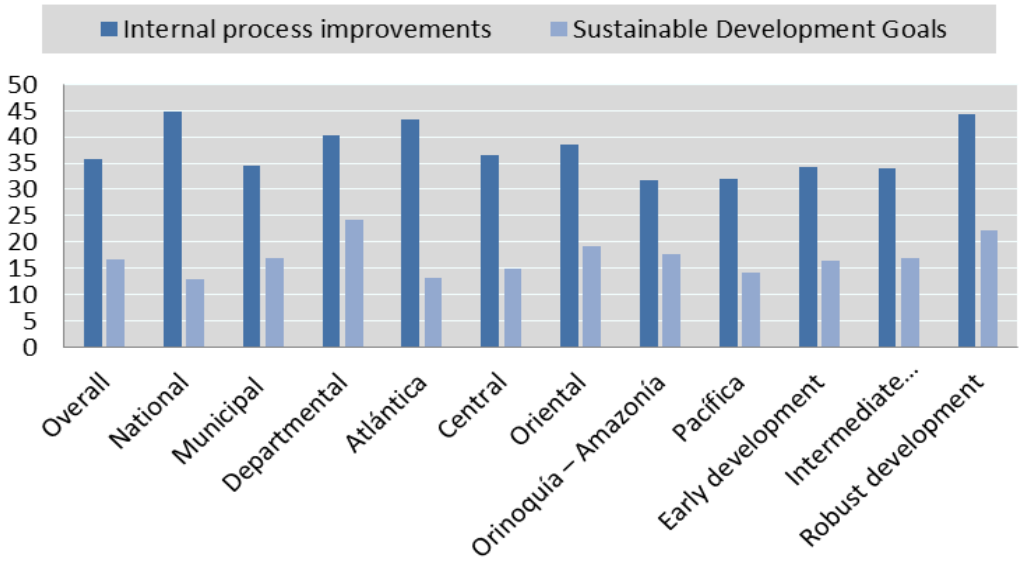
After having exposed different strategies to act on internal processes and Sustainable Development Goals through initiatives related to ICTs for management, it is relevant to precise where these efforts could be the most efficient.

At first glance, internal process improvement rates are the highest in central institutions (44.8), followed by governorates (40.3) and municipalities (34.6). Regions at an early and intermediate development stage also score lower (34.2-33.9) than those with robust economic environments (44.2). Differences between Colombian regions are also notable, with the Atlántica region scoring more than ten points higher (43.4) than the Orinoquía-Amazonia and the Pacific ones (31.8 and 31.9, respectively). Differences also exist between administrative sectors, where culture (68.8) and planning administrations (67.2) contrast with urbanism (16.7) and statistics departments (28.1). Here, it is worth remembering the initial words of caution that the correlations presented above would be more robust for territorial-/local-oriented policies than for reforms aimed at central government entities.

In a nutshell, municipalities at an early and intermediate development stage and in the Pacific and Amazonian regions of the country demonstrate the lowest scores and could constitute a relevant policy target. Scores for the integration of digital reforms into sustainable development plans (IMP2) indicate quite similar conclusions. Indeed, this impact demonstrates its lowest levels for national institutions (12.9) and its highest ones for municipalities (16.9) and departmental entities (24.1). Administrative sectors also show significant differences, with organisations of the security, statistics, finance, planning and education sectors demonstrating the lowest connection between the SDGs and the Online Government Strategy. However, the positive, yet moderate, influence of

the development environment on the scores of this impact are quite common. While such inequalities do exist for this impact, it must nonetheless be remembered that the connection between the Online Government Strategy and the SDGs present the lowest scores among all other similar indicators. As such, were a policy designed to increase this latter impact, it would be more relevant to launch global reforms than targeted measures to reduce the relatively small gaps between institutions.

Figure 3.10. Internal process improvements and Sustainable Development Goals across government levels, regions and levels of development



Regarding ICTs for management outcomes, they were, as opposed to other components' outcomes, all identified as determinants of broader impacts. To begin with, the level of shared ICTs (OUC11) is interestingly the lowest for national institutions (8.8), with municipalities (15.2) and departments scoring higher (22.2). Among central administrative sectors, a particular emphasis could be put on organisations related to education, agriculture, urbanism and housing, planning, and foreign affairs. On the contrary, entities from the judicial sector present relatively high scores for this management outcome. Geographic regions score quite homogeneously, and while economic development seems to have a positive impact on this outcome, its influence is quite moderate. Like for the Sustainable Development Goals, however, shared ICTs are comparatively low among all government tiers, regions and sectors, which calls for more global strategies common to all institutions.

Regarding the level of data sharing within the public sector (OUC12), the highest scores are achieved by governorates (68.6), closely followed by national entities (64.8), with municipalities lagging behind (40.7). Interestingly, all five Colombian regions score quite homogeneously for this outcome, with the development environment more determinant. Strategic data use (OUC13) presents the habitual hierarchy between national (39.8), governorates (33.3) and municipal institutions (18.1). Colombian regions are also characterised by homogenous scores (around 16-18), while the Atlantic region presents significantly superior outcomes (45.7). Like for many outcomes, a split exists between areas in early (18.4) and intermediate (17.7) development stages and more economically robust zones (26.9). Finally, transport, sport and public service administrations present the lowest scores among central institutions.

Achieving impact through information security and privacy

Toward a reworking of measurement strategies for security and privacy indicators

Assessing the impact of the information security and privacy component proves to be challenging for two main reasons. First, it is the component which registers the lowest response rates. To be more accurate, while measures of information security and privacy inputs and activities were quite successful in terms of gathered answers (> 80%), the analysis has not managed to accurately calibrate the results of these efforts. While two out of three information security and privacy outputs present significantly lower response rates (21% for OUP13 and 48% for OUP15), it is for outcomes that there are disqualifying numbers of missing data. For instance, only 14% and 5% of the institutions respectively reported their digital incident level (OUC15) and resolution rate (OUC16). These scores are particularly low for territorial institutions, with respectively 4 and 3 responses (out of 32) for governorates and respectively 137 and 45 for municipalities (out of 1 100) for these two outcomes (see Annex E for more details on data availability). As will be explained in Chapter 4, the policy context for this specific strategy component helps to gain an understanding of the reasons behind the low response rates, as well as ideas on how to increase them. Box 3.5 summarises the main findings regarding the information security and privacy component, which will be discussed in more detail throughout this section.

Box 3.5. Key observations on the impact of the information security and privacy component

Assessing the impact of the information security and privacy component proves to be challenging for two main reasons:

- very low response rates for outcome indicators
- impossibility to causally connect its indicators to expected impacts.

These difficulties in collecting data on security and connecting them to the framework could be linked to:

i. reluctance of institutions to communicate on sensible issues
ii. weak exposure of municipalities to such problematics
iii. inconsistence of certain impacts such as trust in government which could benefit from a citizen-driven measurement approach, rather than an institutional perspective on confidence.

⇨ Calls for a comprehensive reworking of the indicators of this component, along with a new measurement strategy.

Several explanations could be put forward to explain these difficulties in measuring security and privacy outcomes. On the one hand, it could be argued that institutions are reluctant to communicate on such sensible issues, as it could give a negative image of their organisation. This hypothesis is corroborated by the fact that entities do not have any problem making public their inputs and activities in this domain, while failing to report the results of these efforts. However, one can note that the last of the three outcomes of this component, privacy satisfaction (OUC14) – which gathers the number of received privacy-related complaints of online service users – presents a very solid response rate (almost 92% overall). This result certainly weakens the hypothesis advanced earlier. More generally, Colombian institutions have not had any particular problem communicating on service satisfaction, online complaints and petitions, or other subjects which could also produce a negative image of their work. As such, one could ask the following question: why are security issues the only delicate information that institutions would be reluctant to deliver while they broadly communicate on user satisfaction and online complaints?

The second, and more plausible explanation, would be that many institutions do not possess these data, or did not understand the questions which were being asked. The fact that it is only among territorial entities that response rates were significantly lower indeed hints to a generalised issue of reporting these data within this government tier. In other words, territorial institutions are probably much less exposed to security incidents and server hackings than central entities and consequently had difficulties understanding the purpose and the metric of this component. Conversely, they may not see the relevance of this information, and thus neglected to report on these issues.

Another of the particularities creating a contrast between this component and its counterparts is the impossibility to statistically connect its indicators with the expected impacts of the Online Government Strategy. Two of the three above-mentioned outcomes (privacy satisfaction [OUC14] and digital security incident level [OUC15]) indeed present either very weak or no statistically significant relations with the ten targeted impacts of the Online Government Strategy. Regarding the digital security incident level (OUC16), it does demonstrate a notable positive correlation with the trust put in government (IMP1; $R^2 = 0.074$). While not having a very solid statistical significance ($p < 0.1$), this relationship could make sense qualitatively as the more efficient an entity is to solve digital incidents, the more users could gain confidence in its action. This outcome, however, fails to connect with any of the next layers of its component (outputs, activities and inputs), and could not be subjected to the correlation chain analysis conducted in the other subsections.

Overall, the lack of reported correlations on this component is certainly linked to the difficulties in collecting answers for security-related questions. It is nonetheless not the only possible explanation, as the digital security incident level (OUC16), the only one for which a notable correlation was found with an impact (IMP1), possesses the lowest response rate among the three (82/1 280). This hence calls for a more comprehensive reworking of the indicators of this component, but also to new measuring strategies, to thoroughly evaluate the links between the observed outcomes and measured outputs, activities and inputs of the information security and privacy component.

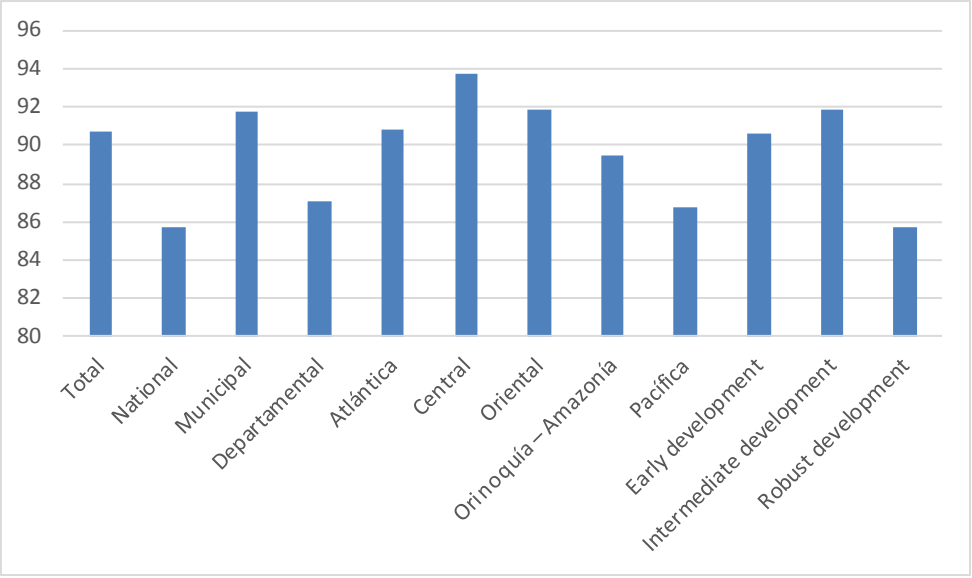
The study of this component also illustrates the incapacity of the model to highlight a relationship between the Online Government Strategy and trust in government (IMP1). This could be explained by several factors. On the one hand, this impact presents a very high response rate (92%) and was not subject to internal flaw as it is not a composed

indicator. On the other hand, one must remember that this impact was measured through institutions', not users', responses. As such, the model cannot have a definitive conclusion on this premise as it did not possess the data to confirm or disprove it. While knowing the opinion of civil servants on the incumbent government could be useful, the initial hypothesis of the Online Government Strategy was that it could reinforce the confidence of users towards the Colombian government. To adequately test this hypothesis, the model would benefit from a citizen-driven government trust metric representing actual user experiences to move from a dominantly institutional to a citizen perspective on the outcomes and impacts of digital government. Because government trust is also a very complex and multidimensional concept, non-digital control variables must be introduced in the study of this precise impact.

Descriptive data for outcomes of the information security and privacy component

The very high response rate of the privacy satisfaction component allows for the provision of some meaningful descriptive data, as summarised in Figure 3.11.

Figure 3.11. Privacy satisfaction across government levels, regions and levels of development



First, one must remark the general high scores of this indicator: with a global mean at 90.7/100, institutions from all three levels of government perform quite well on this indicator. Interestingly, municipalities score higher than national and departmental institutions, while strong territorial inequalities exist. One must also note the fact that institutions evolving within robust economic development areas score lower than the other areas.

Focusing policy efforts to generate better outcomes and impacts

This chapter has highlighted the most striking results which have arisen from the first transitional impact assessment of the Online Government Strategy. The annexes contain more comprehensive results, means and correlations, and should be consulted for more specific issues. This section presents the overall conclusions regarding the impact

assessment results to serve as policy guidelines. As previously emphasised, these results should be interpreted with great care, whether it be in consideration of low response rates, internally flawed composed indicators or, most importantly, the influence of exogenous factors in the absence of control variables.

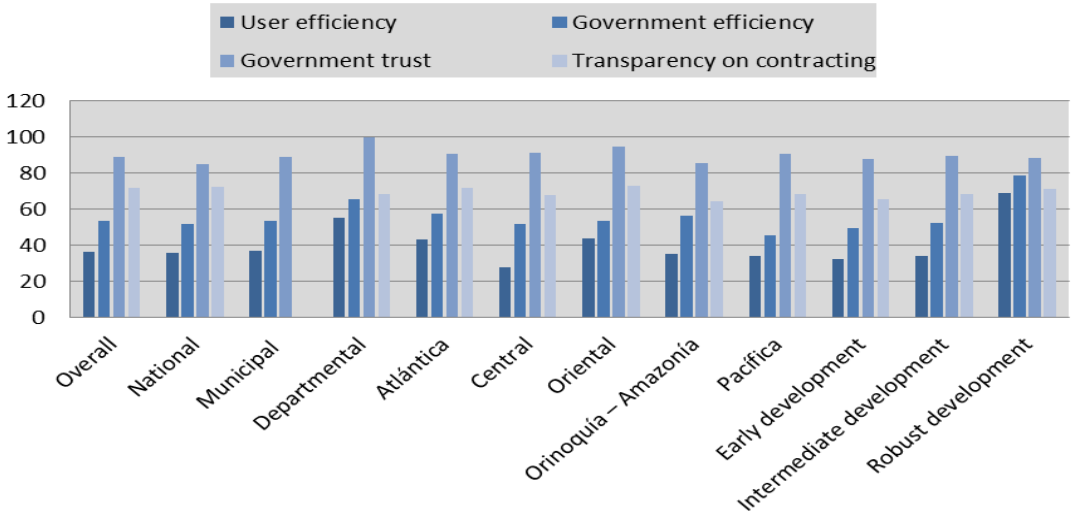
Among the hypothesized impacts, the Online Government Strategy could potentially act positively on citizen participation, internal process improvements, public sector integrity and the Sustainable Development Goals. Efforts should be designed to act on all of these indicators as increasing popular support for digital government reforms among stakeholders cannot be achieved by simply framing them as having a positive impact on administrative routines. Indeed, integrating these reforms into a broader political agenda aimed at achieving a societal project should not be neglected, as it would trigger real popular support for the Online Government Strategy, and the definitive transition from e-government to digital government.

As exemplified in Figure 4.1. at the beginning of this chapter, three of these four impacts present among the lowest scores of their categories (IMP2, IMP7 and IMP10) and the Online Government Strategy and its associated leverages could hence present an efficient tool to specifically reinforce these frail indicators. Achieving stronger scores on these particular impacts could be tried by acting in priority on three components of the strategy according to the targeted results: management for IMP2 and IMP10, open government for IMP10, and services for IMP3 and IMP7.

On the other hand, while the model could not firmly demonstrate the effect of the Online Government Strategy on user and government efficiency (IMP4 and IMP9), government trust (IMP1), or transparency on contracting (IMP8), it could also not disprove these hypothetical relationships. This incapacity necessitates qualitative consideration of each impact. For government trust (IMP1), the main issue was that the dataset only provided an institutional metric. In order to correctly assess the effect of the Online Government Strategy on the confidence in the government, the creation of a citizen-driven indicator will be necessary, along with the inclusion of non-digital control variables to isolate this relationship from exogenous influences. The same remark stands for user efficiency (IMP4), which was only measured through institutions and not actual user experiences. The understanding of this impact would also suppose conducting more theoretical thinking to correct the internal incoherence of this composed indicator (see Annex F).

The difficulties to connect the model to transparency on contracting (IMP8) is itself very likely due to the very low response rate of this indicator (10%). The incapacity to measure this practice at the local level has indeed considerably weakened the robustness of this indicator's correlations and should be dealt with to adequately assess the relationship between transparency and digital government policies. Finally, improving the inclusion of government efficiency (IMP9) in this model would suppose correcting the incoherence of its sub-indicators (see Annex F). It would also necessitate the inclusion of several non-digital control variables to control for exterior influences on this multidimensional indicator. While all these details prevent firm conclusions based on correlations, descriptive results could be extracted from Figures 3.12 and 3.13.

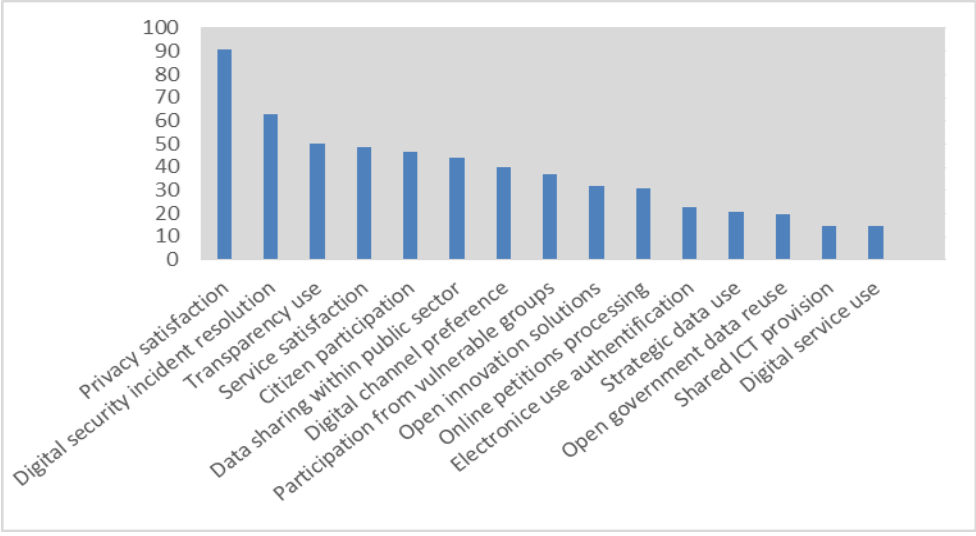
Figure 3.12. User and government efficiency, government trust, and transparency on contracting across government levels, regions and levels of development



At the next analytical layer, the Online Government Strategy could prove efficient in producing strong outcomes in terms of digital service satisfaction (OUC5), digital citizen participation (OUC8), the use of open innovation solutions (OUC10), shared ICT provisions (OUC11), data and information sharing within the public sector (OUC12), and strategic data use (OUC13). As exemplified by Figure 3.13, some of these outcomes demonstrate comparatively low scores (use of open innovation solutions, strategic data use and shared ICTs), and their correlations with Online Government Strategy policies described in this study could provide policy makers with levers to work on these precise outcomes, especially within the ICTs for management component (OUC11 and OUC13).

Figure 3.13. Outcomes of the Online Government Strategy

Standardised overall means.



Note: For visual reasons, this graph does not include digital security incident level (OUC15), measured on a different negative scale than the other ones, and thus unsuitable for comparisons.

Correlation chain analysis has hinted at the fact that even if general resources (financial, human and technical) have a positive impact on achieving better policy outcomes, they could not be the most efficient way of producing strong reform results. For all four components, it seems that the **use of implementation guides** and the **knowledge on the legal framework** (both general and component-specific) for digital policies could also be quite productive inputs for institutions to invest in. Because they could influence many policy outcomes at once, these inputs would be particularly interesting to create positive synergies, by acting on a great number of digital policy outcomes and impacts while using a small number of resources.

While efforts on the above-mentioned inputs could generate higher levels of activities, policy actions could also be coupled with a direct focus on activities. The analysis suggested that ensuring that Online Government Strategy policies are thoroughly implemented (ACT5/10/15) and fixing ambitious levels of ICT planning (ACT2/7/12) could act positively on a vast number of policy outputs and outcomes.

The analysis of **where** impacts and outcomes proved the weakest allowed for the identification of policy targets where there is a large margin for improvement. For almost all impacts and outcomes, municipalities present by far the lowest scores and should be the main focus of policy efforts. More particularly, institutions in the early and intermediate stages of development demonstrate the greatest difficulties in achieving good scores as opposed to institutions evolving in a mature economic environment. If there are some territorial inequalities on specific matters, the analysis has, on the contrary, not put forward a systematic gap between Colombian regions. While the Pacific region is often cited as lagging behind the others. policies should be designed more according to development levels than by targeting a specific region of the country. On the other side of the spectrum, governorates demonstrate notably solid scores, sometimes even higher than national institutions, which also rank quite high. As explained in the introduction, the correlations presented in this analysis were strongly skewed towards municipalities as the largest number of respondents group within the dataset. As such, and unless otherwise stated, the set of levers presented in the last subsections are deemed to be especially productive for municipal institutions.

Chapter 4. Towards a sustainable impact assessment methodology for digital government in Colombia

This chapter evaluates the transitional impact assessment methodology for the Online Government Strategy and its first implementation by considering its statistical quality, the organisational environment and the extent to which it is geared towards digital government. Consequently, it provides recommendations on how to advance towards a sustainable impact assessment methodology for digital government, complemented and supported by a business case approach for ICT projects.

Introduction

As highlighted in Chapter 1 of this report and supported by Key Recommendation 10 of the OECD *Recommendation of the Council on Digital Government Strategies* (OECD, 2014), strengthening institutional capacities for measurement and evaluation of ICT strategies, policies and projects is an essential element for supporting the digital transformation of the public sector. Having the right methodological framework and the necessary skills and resources in public organisations to enable its implementation are both necessary for a successful impact assessment of digital government. This chapter discusses the results of the first impact assessment of the Online Government Strategy from the perspective of the strengths and weaknesses of the transitional methodology and its implementation. Which elements should be kept and built upon for a sustainable impact assessment of digital government in the years to come? What actions should be taken to compensate for the weaknesses in the current methodology?

The assessment of the transitional methodology and its implementation is based on an analysis of the statistical robustness of indicators and validity of results as well as on insights obtained through OECD seminars held with representatives of Colombian public institutions in November 2016 and questions added to the "OECD Questionnaire on the Impact Evaluation of the Online Government Strategy of Colombia" (OECD Questionnaire) for this purpose.

Additionally, based on Key Recommendation 9 of the OECD *Recommendation of the Council for Digital Government Strategies* (OECD, 2014), this chapter puts forward a proposal for the use of a business case component in ICT project management to strengthen institutions' capacities to implement and monitor digital government.

The recommendations put forward in this chapter are mirrored in Annex H, which details a practical guide for future impact assessments of digital government.

The statistical quality of the transitional impact assessment methodology

Incorporating changes while securing the stability of the indicator framework

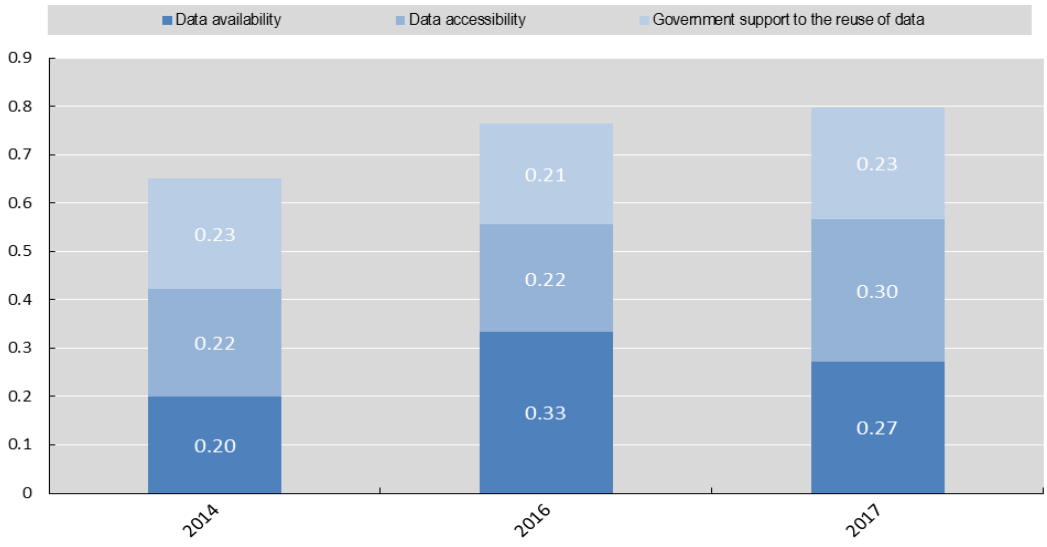
Whereas the monitoring and evaluation of e-government is primarily focused on measuring the attainment of output-related indicators, such as the number of services available on line, the number of automated internal procedures or the number of available open datasets, digital government encompasses a focus on the measurement of direct and indirect public value creation in the form of outcome and impact indicators. The undertaken logic model approach, which traces obtained impacts back to the chain of inputs, activities, outputs and outcomes, is in accordance with the measurement criteria for digital government. As Chapter 3 has shown, valuable insights can be derived from the analysis to support the Colombian government in taking strategic decisions on where to place future efforts in supporting public institutions to implement the transition towards digital government.

However, as explained in more detail in Chapter 3, it is important to keep in mind that the results of the first implementation of the transitional impact assessment methodology should be considered a baseline and descriptive measurement with limited explanatory power. Additionally, its aim was to measure the impact of the Online Government Strategy, which can be characterised as an e-government strategy and that, despite the logic model approach, the parameters of the assessment weren't fully geared towards digital government. To strengthen the transitional methodology in light of these two key

limitations regarding explanatory power and strategic approach, a more detailed analysis of the first assessment in terms of statistical quality and digital government parameters is realised in the subsequent subsections.

One overall recommendation can already be made regarding the implementation of future changes to the indicator framework in light of these two limitations. For future measurements, it is advised to keep the main categories of indicators stable and to potentially vary the sub-indicators, similar to what has been done for the OECD OURdata Index. For the 2014 pilot version of this OECD index, three overall indicator categories were established: data availability, accessibility and reuse. For the matured 2017 edition, the same three overall categories were kept, thereby preserving continuity and comparability, while integrating new policy insights into the index. For instance, for the pillar on open data reuse, new insights on data quality and how to measure this criterion have been taken into account.

Figure 4.1. Colombia's evolution in the OECD Open-Useful-Reusable Government Data Index (OURdata)



Note: Detailed methodology and underlying data available on line in the online annex of *Government at a Glance* 2015 and 2017.
Source: OECD Survey on Open Government Data 2014, 2016 and 2017.

When looking at Colombia's scores since the 2014 pilot edition, it becomes clear that it has advanced, especially on the accessibility pillar. Climbing from a score of 0.65 in 2014 to 0.76 in 2016 and 0.80 in 2017, Colombia now is the highest ranking country in the OECD OURdata Index in the Latin America and Caribbean region and can amply measure itself against OECD countries too. Comparing results at different points in time makes it possible to evaluate both overall progress and changes in the three main assessment categories. In order to couple concrete policy recommendations to such an assessment, it is essential to look into the concrete indicators that were taken into account for the calculation. This would help, for instance, to understand what is behind the decreasing score on the availability component.

The impact assessment methodology for digital government in Colombia could benefit from a similar approach. The analysis presented in Chapter 3 is the result of the

implementation of a transitional methodology, which can be considered as a pilot impact assessment in need of refinement in the coming years, also to be able to take into account future policy changes. In order to ensure comparability between results of this first assessment and those in the years to come, the broad analytical categories, such as digital government budget and available personnel, need to remain stable. Additionally, the explanatory power of the variable correlation model can be strengthened through a number of general measures, as indicated in Box 4.1. How these measures will be shaped depends in large part on the considerations given to the robustness of composite indicators and the assessment of data availability.

Box 4.1. Sustainable strengthening of the explanatory power of the variable correlation model

To ensure the continuity and comparability of the methodology across the years and at the same time the evolution of the impact assessment methodology in accordance with strategic developments and changes in data availability and collection methods:

- Maintain the overall indicator categories, but assess whether the sub-categories are still relevant in light of the robustness of the overall indicator and the strategic change towards digital government.
- Allow for transversal links in the measurement of indicators of different strategy components (e.g. an activity such as training on information security and privacy should be kept in the methodology while opening up possibilities for analysis beyond the information security and privacy component, such as the effect on digital service quality as an output indicator).
- Conduct yearly measurements for all indicators to gradually convert the correlation model into a time-series analytical tool.
- Continue the logic model approach to:
  - measure changes in the level of impact that is accomplished
  - measure change in the chain of events leading up to the impact.
- In the long term, enhance the time sensitivity and time lag consideration of the model by analysing inputs and activities in year x in relation to outputs in year x+1, outcomes in year x+2 and impacts in year x+5.
- Systematically include non-digital control variables correcting for exogenous influence on impact indicators.

Robustness of composite indicators

Thirty-five out of a total of 74 indicators in the methodology are composite indicators, meaning they are calculated based on the scores of 2 or more sub-indicators. A Cronbach's alpha test has been applied to all of these composite indicators to assess the coherence between the sub-indicators making up an indicator (see Annex G for the detailed analysis).

The analysis reveals that 15 composed indicators out of 35 fail to meet the robustness test of Cronbach's alpha being bigger than 0.6. For four indicators (ACT5: Implementation of online procedures and services; OUP1: Digital service availability; OUP5: Online transparency; and OUC1: Digital service use), the statistical study precisely shows which sub-indicator should be removed to meet, or very closely approach, a robust level of internal coherence. Likewise, if the analysis does not precisely identify how they could be reinforced, five other indicators (ACT4: Training ICTs for services; ACT9: Training ICTs for open government; ACT14: Training ICTs for management; ACT 19: Training information for security and privacy; and OUP4: Integrated petitions and claims system) demonstrate robustness scores close to or superior to 0.5. By means of more theory building, they could thus easily be increased by adding new or removing some sub-indicators: added to the four for which the analysis specified an inaccurate sub-indicator, this means that nine composed indicators could be made robust with minor modifications. On the contrary, seven composed indicators (INP1: Financial resources; OUP6: Open government data; OUC12: Data and information sharing within the public sector; OUC13: Strategic data use; OUC16: Digital incident resolution; IMP4: User efficiency; and IMP9: Government efficiency) should be subjected to a more complete theoretical reworking, as they couple very low scores (< 0.3) with either no clear indications on how to improve their robustness, or simply eloquent proof that their sub-indicators have very few in common. One way to make these robustness tests more relevant could also be to add a third component to two sub-indicator variables which do not meet the necessary robustness requirements. With only two components, Cronbach's alpha cannot be of much help, as calling for the removal of one of the sub-indicators would mean dropping the composed variable. On the contrary, it would be able to provide much more precise recommendations for a three-component variable.

These results should also take into account qualitative differences. For instance, while almost all composed input indicators are robust (6 out of 7), output and outcome indicators present the lowest scores (2 out of 6 and 3 out of 7 respectively) and activity and impact variables demonstrate average robustness (6 out of 11 and 2 out of 4). Of course, these figures do not consider the potential improvements indicated earlier, which would firmly increase all these rates. Among inputs, one should notice the strong nature of indicators measuring the legal framework as a key resource for institutions (INP 4/6/8/12), while among activities, variables measuring civil servants' training could uniformly benefit from additional improvements (ACT4/9/13/19). On the other hand, no trend appears peculiar to one of the four components of the Online Government Strategy (ICTs for services, ICTs for open government, ICTs for management, and information security and privacy).

Finally, it is necessary to put these results into a broader perspective. First, it should be recalled that the methodology developed in this review is to be used and improved in the coming years. As such, its current state is not set in stone, and is only the first step in a process of regular and incremental improvements. Each year, collected data will allow for readjustments – such as those provided here – in order to eventually head towards a more

comprehensive and coherent analytical tool. Secondly, it is necessary to determine the very **nature** of the variables to be included in this analysis. Using Cronbach's alpha tests supposes that having variables with highly linked internal components is the final objective of indicator design. But this framework might also benefit from more global composed indicators measuring very diverse, and thus not automatically correlated, facts. As such, evaluating the "coherence" of the parts would be in contradiction with the desired diversity of the whole and would necessitate a more qualitative approach to robustness tests.

Data availability

A second key element to ensure the statistical quality of the impact assessment methodology is to ensure the availability of the data needed to perform the necessary calculations. When it comes to data sourced from questionnaires, as has been done in this transitional methodology, data availability depends on both the overall response rate (number of institutions filling out the questionnaires used for data collection) and on the specific response rate for individual questions (willingness and ability to respond to the question).

The pilot assessment reveals several interesting points on data availability, some of which have been discussed in Chapter 3. As for the specific response rate, as mentioned in Chapter 3 and further detailed in Annex E, several (sub-)indicators were dropped from the assessment due to an extremely high percentage of missing data (more than 75%). For the remaining (sub-)indicators, some still proved to be quite problematic to conduct the full analysis. Table 4.1 shows those sub-indicators with a data availability below 40%. For these indicators, additional measures, as suggested in the remainder of this section, are required to assure a proper evaluation of the policy aspects they represent in future impact assessments. This is especially the case for the two indicators in blue concerning the information security and privacy component, which show low response rates for all levels of government. The fact that it has proven difficult to assess the impacts of the information security and privacy component can, in large part, be explained by the fact that it's the newest component in the strategy and that as such the awareness level of public institutions on this topic is yet to be improved (Box 4.2).

Box 4.2. Supporting digital security incident management

- One way the Colombian government has made efforts to increase the awareness of public institutions on the importance of digital security incidents and reporting to the ColCERT, the government computer security incident response team (CSIRT), which is in an early development stage, is by including specific questions on critical information assets, effective reporting of incidents and remediation of vulnerabilities in the Public Service Department's yearly questionnaire FURAG and the MinTIC's yearly questionnaire Territorial Form and reporting these as indicators in the GEL Index.
- To support public institutions in monitoring and managing digital security incidents, a Cyber Crisis Committee (Comité de crisis de ciberataques) has been created, through which the National Model of Incident Management is being instrumentalised and formalised. Participants of the Cyber Crisis Committee include the national security co-ordinator, the Vice-Minister of Defence, the Vice-Minister of IT and representatives of organisations such as the Joint Cyber Command, the Police Cyber Centre and ColCERT.
- So far, support on matters of digital security has in priority been given to policy sectors at the national level of government. However, based on several interactions with online government leaders in municipalities undertaken since 2016, support is now being given in about a third of the regional departments.
- Furthermore, to address reputational concerns and encourage public institutions to report the incidents they experience, a number of resources have been developed. Through a telephone hotline and incident management email address, institutions can report incidents in a confidential manner. The use of these channels has increased, but institutions remain cautious about reporting incidents.

Source: Information provided by the Colombian government in the context of this report.

Furthermore, dedicated efforts will be necessary to compensate the low data availability on outcomes at the municipal level, mainly regarding services-related outcomes. Some of the problems in data availability at the municipal level are related to dependency on other sources of information than the FURAG or the Territorial Form. For instance, the Transparency Index only approaches a very limited number of municipalities to fill out its questionnaire and DANE only sends the EDI/EDID questionnaire to national institutions and governorates. As such, it will be important for the Colombian government to stay abreast of any developments in these measurement instruments, both regarding the content of the questions asked (to guarantee continuity of the relevant indicators) and the

institutions invited to fill out the questionnaires. Additionally, the Colombian government can consider including the questions from these sources that were used for the impact assessment (see Annex A) in the Territorial Form to assure the data will be available at the municipal level as well.

Table 4.1. Indicators with low response rates

Indicator code	Indicator name	Component	National institutions		Municipal		Departmental	
			N (/147)	%	N (/1 101)	%	N (/32)	%
ACT10	Implementation of ICTs for open government	ICTs for open government	116	78.9	354	32.2	7	21.9
OUC1	Digital service use	ICTs for services	72	49.0	413	37.5	22	68.8
OUC2	Digital channel preference	ICTs for services	102	69.4	0*	0	32	100.0
OUC3	Online petitions processing	ICTs for services	88	59.9	361	32.8	19	59.4
OUC4	Electronic authentication use	ICTs for services	76	51.7	351	31.9	14	43.8
OUC9	Participation from vulnerable groups	ICTs for open government	62	42.2	296	26.9	16	50.0
OUC15	Digital security incident level	Information security and privacy	41	27.9	137	12.4	4	12.5
OUC16	Digital security incident resolution	Information security and privacy	25	17.0	35	3.2	3	9.4
IMP1	Trust in government	General	53	36.1	432	39.2	24	75.0
IMP3	Public sector integrity	General	101	68.7	0*	0	32	100.0
IMP5	Responsiveness to petitions	General	66	44.9	28**	2.5	32	100.0
IMP7	Participation	General	66	44.9	27**	2.5	32	100.0
IMP8	Transparency on contracting	General	100	68.0	0*	0	32	100.0
IMP8	Government efficiency	General	100	68.0	0*	0	32	100.0

Notes: Recurring similarities in certain response rates are explained by the use of common sources (e.g. EDI, Transparency Index). Response rates under 40% appear in blue as they require further consideration.
* These indicators were calculated based on the national and departmental EDI surveys by DANE for which municipalities were not reported.
** These indicators were calculated based on the Transparency Index, for which only a handful of municipalities were reported.

The organisational environment for monitoring and evaluation of digital government

Several approaches can be taken to increase the data availability on indicators, and thereby the external validity of indicator scores, as described below.

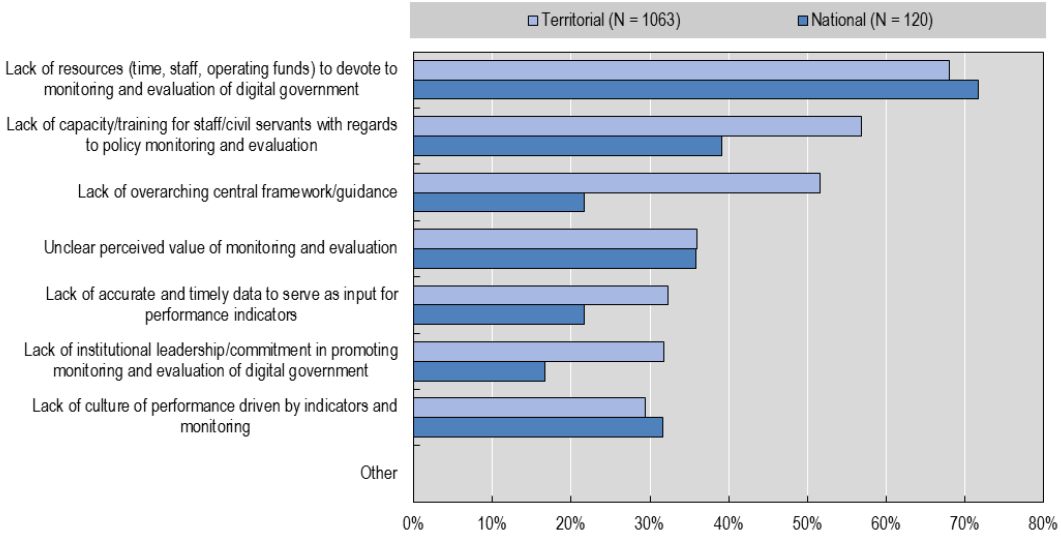
Measurement culture and capacities of public institutions

Public institutions will remain a key source of information for the assessment of the digital government strategy, whether they provide data through questionnaires or in the longer term through other channels, such as open data on the government interoperability platform. Therefore, it is essential to support institutions in developing their capacities in collecting, managing, analysing and sharing relevant data for evaluation purposes as part of broader efforts to foster a data-driven public sector in Colombia.

The OECD questionnaire shows that a majority of public institutions identify a lack of resources as the main barrier for fortifying the monitoring and evaluation of digital government initiatives. This is a major concern, since the overall monitoring and impact assessment of the Online Government Strategy relies on data provision by the individual institutions. The lack of skilled staff appears to be a topic of concern as well, be it mainly at the territorial level of government. It is also suggested that territorial institutions are in need of a stronger framework for evaluation and monitoring activities and guidance from the central government.

Figure 4.2. What are the key challenges faced by your institution to reinforce the monitoring and evaluation of online government/ICT projects?

Number of public institutions as a percentage of the total number of institutions responding to the question



Source: OECD Questionnaire on the Impact Evaluation of the Online Government Strategy of Colombia.

The interactions during the OECD mission with key stakeholders from Colombian public institutions revealed another challenge for monitoring an evaluation system of online government. The compilation of a ranking of institutions, as is currently the case for the GEL Index, made several institutions reluctant to report the data they have, especially in the case of potential low scores.

Consequently, in order to incentivise public institutions to report the data they have, even on areas in which they are lagging behind, the communication strategy on the monitoring and evaluation of digital government should be adapted. Moving from a ranking of institutions to the presentation of impact assessment as a strategic tool for improvement is likely to help emphasise the identification of strategic levers rather than the naming and

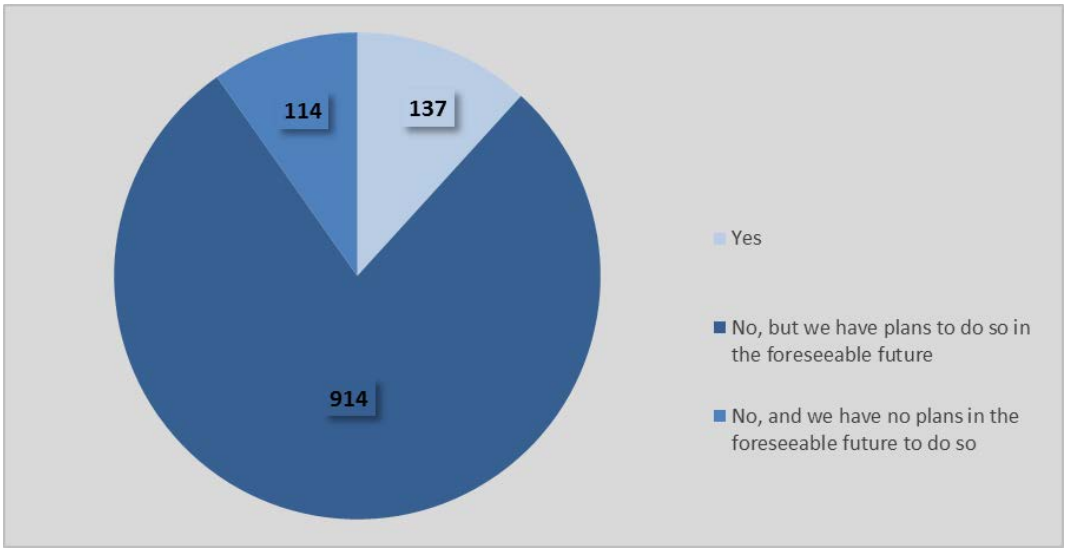
shaming of individual institutions with a low score. This also includes encouraging public institutions to communicate about accomplished outcomes, rather than outputs to support the shift from e-government to digital government.

Exploring alternative data-collection methods

In the longer term, the burden on public institutions in filling out questionnaires to provide data for the assessment might be decreased, e.g. by stimulating the use of open government data (OGD) and of interoperability platforms for the sharing of data, by investing in automated capturing of relevant data, such as automated web statistics on the use of services. The services, platforms and open data themes as identified in the Ministry of Information and Communications Technologies' (MinTIC) Excellence Route could be used as an example.

Figure 4.3. The use of open data as a reporting mechanism on digital government

Do you publish data on your activities related to the Online Government Strategy/ICT projects as open data?



Note: N = 1 165 for this question.
Source: OECD Questionnaire on the Impact Evaluation of the Online Government Strategy of Colombia.

The response to the question shown in Figure 4.3 suggests that there is still a long way to go for open government data to be used as a source for the monitoring and evaluation of digital government in Colombia. In the long term it is worth tapping into this potential of OGD, because it would significantly reduce the burden on institutions of providing performance information through traditional questionnaires. Instead, producing open performance data on digital government activities would become part of everyday routines and processes.

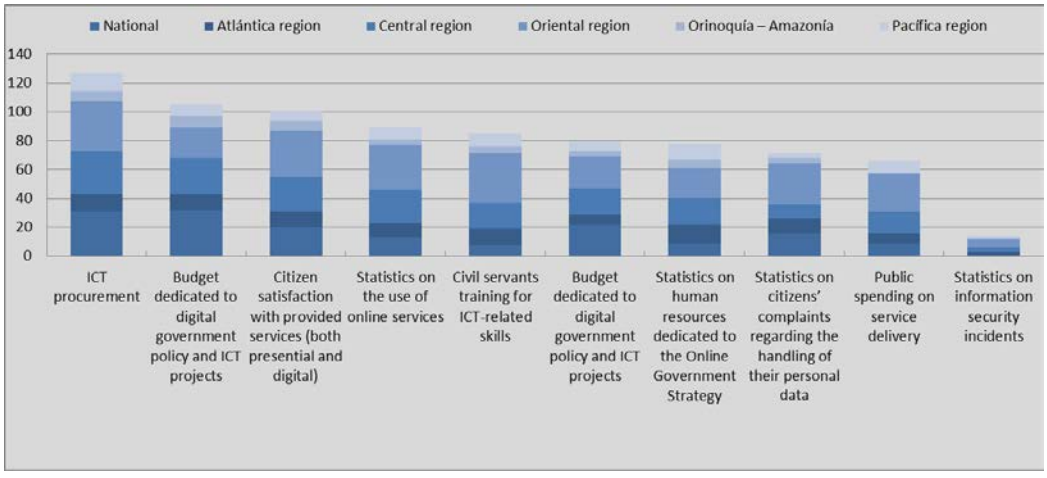
Moreover, MinTIC would have access to digital government performance data in machine-readable formats, thereby significantly reducing the processing time for the calculation of indicators and the assessment of the strategy's impact, and increasing the overall transparency and accountability of results.

The results shown in Figure 4.4 suggest that data on ICT procurement, budget, service satisfaction and the use of digital services may provide a good starting point for

increasing the availability of digital government policy information as open data, building on good examples in the Oriental and Central regions.

Figure 4.4. Different aspects of digital government policies as open data

Yes, my institution publishes open data on the following topics



Note: The graph shows the absolute total number of institutions indicating they publish data on the respective topics as open data (out of 1 175 institutions responding to the question).
Source: OECD Questionnaire on the Impact Evaluation of the Online Government Strategy of Colombia.

Additionally, quantitative impact assessment methods can be complemented by qualitative ones. An example is a case study conducted in Medellin on how trust can be built through better service delivery.[1] Such qualitative assessments can help to identify more relevant metrics for indicators which have proven to be difficult to measure, such as trust in government. Moreover, whereas the impact assessment only reveals a moderate connection between the Online Government Strategy and trust in government, qualitative assessments could lead to a clearer understanding. In the OECD questionnaire, several institutions indicated already collecting qualitative data on a number of online government topics, such as service satisfaction by citizens and businesses.

Measurement topics to be strengthened for a full transition to digital government

While the transitional impact assessment methodology provides a good basis for the monitoring of digital government developments in Colombia, it is a methodology based on an e-government approach. The methodology will have to evolve in line with the strategy under assessment. The *OECD Digital Government Review of Colombia* (OECD, 2018) will provide the government with recommendations on how to realise the transition from the Online Government Strategy to the Digital Government Strategy. These recommendations are likely to lead to some modifications in the theory of change that was presented in Chapter 2. While the overall expected impacts, such as public sector integrity and sustainable development, will not change, some elements in the way to accomplishing these impacts might. Three key elements can be highlighted, which in the long term will require some adjustments in the impact assessment methodology:

1. a **citizen-driven approach**[2] in the design and delivery of digital government policies and service

2. more **strategic use of data** throughout the whole public sector to enable the citizen-driven approach
3. an increased level, and different forms, of **collaboration between stakeholders** of the digital government ecosystem to realise the citizen-driven approach.

A citizen-driven approach implies that governments no longer design and implement digital government policies and services according to what they **think** that citizens need (citizen-centred), but rather capacitate the digital government ecosystem to capture the **actual knowledge** on citizens' needs by engaging them upfront when designing and conceiving services and policies in order to have the real preferences drive decisions. The shift from e-government to digital government is thus accompanied by a shift from citizen-centred to citizen-driven approaches (OECD, 2014).

In order for governments to take on the required facilitating role, new forms of collaboration are needed both between public institutions and other stakeholders, such as the private sector and academia, and among public institutions themselves. As will be further analysed in the *Digital Government Review*, both the governance structure (assigning responsibilities and co-ordination mechanisms) and promoting a data-driven public sector will prove to be crucial to enhancing collaboration between all of the actors involved.

These considerations have implications for the measurement of digital government advances. For instance, digital service quality, a key output indicator, is now measured as a composite of user characterisation and criteria related to accessibility, usability and promotion. Instead of user characterisation, a measure for considering user input in the design of services would be more relevant for digital government. The measurement of collaboration can also be strengthened throughout the whole causal chain for digital government. The current activities indicator on co-ordination could be further specified to find out in which co-ordination mechanisms an institution is involved, and consequently how this would affect outputs and outcomes down the line.

Regarding implementation activities, questions should focus less on assessing whether the individual institutions have implemented certain aspects of the digital government strategy and more on whether they have reached out to other stakeholders to set actions in motion, or look at **how** the strategy was implemented. Additionally, whereas in an e-government context the measurement would have captured data on the amount spent, a digital government perspective would look at **how** the money is spent. Output indicators can also be rethought to incorporate a more citizen-driven approach. For instance, instead of defining the availability of digital services as the percentage of services each institution has managed to offer through digital channels, the emphasis could be put on the realisation of integrated services, where a citizen can enjoy all the services he needs from different institutions through one access point.

When it comes to adequately assessing the driving role of data in fostering collaboration and developing citizen-driven services and open data, it would be necessary to promote the different elements making up the outcome indicators of strategic data use and data sharing in the public sector to full indicators in the model. For instance, a dedicated indicator on the use of data as a basis for participation activities and one on data for evidence-based policy making would create a richer picture of the data-driven landscape in Colombia. Moreover, analysing the statistical relations between these indicators and other indicators in the model, such as the quality of digital services, would enable the

Colombian government to assess the effect of data-driven initiatives on the development of digital government.

A business case component as a critical enabler for solid ICT project management and digital government impact assessment

Towards a new ICT project governance

While governments strive to achieve the digital transformation of the public sector, as many as 87% of large public sector ICT projects are considered failures or partial failures (World Bank, 2016). To address this challenge, the most digitally advanced countries have started to review the overall governance of ICT projects, to improve the decision making and delivery of such projects. These new governance arrangements include standardised ICT project management models and mandatory business cases for projects over a certain budget threshold.

Moreover, these efforts have developed a centralised review system for large ICT projects, demanding their approval by the central digital government body or unit (e.g. in Denmark, see Box 4.3). These units have the power to review ICT projects, mandate external audits or outright order that they be stopped. These units are tasked with the responsibility of making sure these large ICT projects have sound strategies to minimise the risks, ensure effective and efficient implementation, and deliver expected benefits.

Box 4.3. Danish National Council for IT Projects

Located under the Agency for Digitisation, the Danish Council for IT Projects is composed of roughly 50 highly experienced IT project management professionals, half of which come from the private sector. All members of the National Council for IT Projects work *pro bono*.

The National Council is responsible for:

- assessing governmental IT projects
- giving recommendations on minimising risk and requesting external reviews as necessary
- reporting to the government's Economic Committee on ongoing IT projects
- requesting revisions in the current model for IT projects
- ongoing dialogue with IT suppliers and the association of IT suppliers
- revisiting troubled IT projects.

Source: www.digst.dk/Styring/Itprojektraadet; Wang, Y.-J. (2015), "Public sector digitisation: The Danish approach".

As governments seek to tackle ICT project failures, they are also making efforts to strengthen accountability for failed ICT projects. For instance, in Denmark, agencies responsible for the implementation of large ICT projects must report biannually on progress made. For large ICT projects, these reports continue to take place up to two years after the implementation was completed to follow up on the achieved benefits.

These progress reports, including key performance indicators, are public and made available on line. ICT projects that incur mild delays require that the Secretary General of the public agency report directly to the National Council for IT Projects, explaining the reasons for not meeting the original objectives. In cases of important delays, ministers or heads of agencies are called upon to report to the National Council. These measures have substantially favoured compliance.

According to Key Recommendation 9 of the OECD *Recommendation of the Council on Digital Government Strategies* (OECD, 2014), the development and common use of a clear business case methodology across the administration is an essential component of digital government governance, securing strategic decisions on investments in line with the overarching policy objectives of the government. The use of a business case methodology considerably impacts the ICT project lifecycle. Business cases allow project managers to strategically plan ICT investments and to argue and present their decisions to the organ/body supposed to clear, approve and/or audit decisions. Business case approaches support decision making on the feasibility and viability of ICT investments/projects based on calculated and informed risks, making evidence-based decisions. Business cases are built upon an understanding of a problem, of organisational strategic and operational objectives, and a theory of change to which the project contributes.

By establishing the key objectives and the expected benefits of a project, the business case becomes a governance instrument enabling the public sector to follow up on returns and the achieved benefits, and to identify the key drivers of success and/or failure, as well as to eventually identify the need to adopt corrective measures in the course of the implementation of the project. As such, the business case can become an invaluable source of data for the public sector as it progressively improves its ICT project performance in line with the overall objective of achieving the digital transformation.

In this context, the business case component is just one, yet a crucial, piece of ICT project governance, allowing governments to structure and make strategic decisions on their investments and better monitor project performance. Establishing a comprehensive governance framework for ICT projects in Colombia that takes into consideration the specificities of new technologies and their deployment will demand close collaboration between MinTIC, the National Planning Department and the Ministry of Finance.

The use of business cases for planning, implementing and monitoring of ICT projects is generally recommended. However, not to become overly cumbersome, the level of detail should be proportional to the size and scope of the project that the administration intends to implement.

As part of this report, the OECD proposes a detailed business case template, drawing on international best practices and taking into account the specificities of ICT project management in Colombia, which were identified based on workshops held with ICT project leaders during the OECD mission to Colombia in November 2016. This business case template should be consistently adopted as a common policy tool across the whole administration. The models of Denmark, New Zealand, Portugal and the United Kingdom in particular have served as sources of inspiration for the elaboration of the model presented in this section.

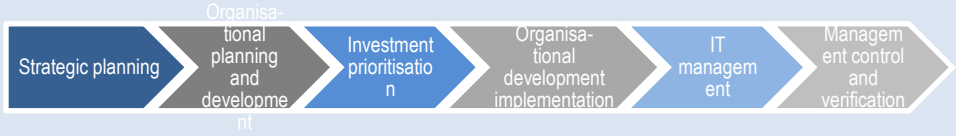
Large ICT projects should develop detailed business cases, proving sound consideration of all identified threats and risks while laying out a structured vision and plan for the project. Such a plan should consider the views, concerns and role of all of the relevant

actors for the project. This is not completely new to the Colombian public sector. Ecopetrol, for example, already demonstrates experiences in working with a business case methodology for its ICT projects (Box 4.4). However, the definition of ICT projects may not always be clear. In Colombia, certain ICT projects may not be registered as such, as they are a supporting element of a different project. Therefore, other ICT budget codes may be needed to identify ICT projects and determine the need to use ICT business cases.

Box 4.4. Ecopetrol: Business cases to deliver value

Ecopetrol, a Colombian state-owned enterprise specialised in oil and energy, has become one of the most successful users of ICT business cases among Colombian public organisations of any kind. The systematic use of a structured business case, and the close collaboration with the organisation's business units and leadership, have allowed Ecopetrol to create a culture of performance and a sense of ownership in ICT project delivery.

ICT business cases are collaboratively developed working with the functional units concerned, ensuring compliance with existing norms and regulations. This business case methodology also projects milestones and quantifiable objectives that can be tracked.



Source: Ocampo, A. (2016), "Arquitectura empresarial: Portafolio TI – Caso de negocios en Ecopetrol".

Data from the OECD questionnaire suggest that the monitoring and evaluation of ICT projects, especially *ex ante*, is not yet a standard activity in ICT project management of Colombian public institutions.

A model for the development of a business case component

Table 4.2. Dimensions of the business case component

Dimensions	Sub-dimensions		Description
1. Project profile	a.	General information	Name, project ID number, general description of the project
	b.	Objectives	Cost reductions, business maintenance, quality of public services, risk reduction, legal compliance
	c.	Budget	Investment budget, maintenance
	d.	Key stakeholders	Identification of key stakeholders concerned and involved in the project
	e.	Impacts	Across sectors and levels of government as well as on external stakeholders. Description of expected impacts over time.
2. Alignment	f.	Strategic alignment	Digital Agenda, Digital Government Action Plan or other public strategies underway
	g.	Normative compliance	Compliance to ICT norms, standards and guidelines in place
3. Cost-benefit analysis	h.	Investment costs	Source of financing, total costs, categories of expenditure (hardware, software, services, communications, etc.)
	i.	Maintenance costs	Source of financing, Year 1, Year 2, Year 5. Hardware maintenance, software maintenance.
	j.	Financial benefits	Increasing revenues, reducing operation costs, reducing personnel costs
	k.	Non-monetary benefits and costs	Benefits and costs for government, the public and society more broadly (impact on delivery, answer to inputs, service availability)
	l.	Net present value	Methodological approach to selecting among different alternatives
4. Service commissioning	m.	ICT commissioning strategy	Scheme used to contract services needed and rationale
	n.	Required services	Required services, good to have and optional characteristics
	o.	Payment approach	Payment method and timelines
	p.	Risk allocation	Expected risk allocation
5. Risk assessment and management	q.	Governance and organisational risks	Involvement of top leadership, changing priorities, relation with other projects/expenses (dependency, independency)
	r.	Technological risks	Interface and interaction with other systems, maturity of the technological solution
	s.	Implementation risks	Meeting the deadlines, financial and human resources, applicability of quality methodologies
	t.	Risk management strategy	Identification and use of mechanisms to either accept or minimise the likelihood of adverse effects; risk monitoring

Project profile

This first dimension of the business case should advance general information on the investment project, including its name, a brief description, targeted objectives, key stakeholders concerned by and involved in the project, expected impacts, and budget of the project.

General information

This sub-dimension of the business case provides general information on the project, including its name and project identification number (if applicable), and a brief and concise description of the project.

Objectives

This component of the business case methodology should lay out the main objectives the authority(/ies) responsible for the project are seeking to achieve through the investment (e.g. cost reduction, service efficiency, service quality, operational maintenance, risk management, legal compliance).

Budget

The project profile should include an estimated budget for the project, including investment and maintenance budgets with multi-year projections for maintenance spending.

Key stakeholders

Large ICT investments should identify as thoroughly as possible the most relevant stakeholders concerned or involved in the project within and outside the organisation responsible for the project implementation. These are stakeholders interested in the project outcomes or that may impact the project development process. Good practices highlight the benefits of engaging with the key stakeholders involved or concerned by the project at an early stage of the business case development process. Early engagement should help project leaders identify other strategic perspectives, costs, benefits and risks associated with the project.

Stakeholders can enrich the project development process through specialist advice, sector perspectives and specific skills at different stages. This sub-dimension should include a brief stakeholder analysis, assessing their ability to influence or their interest in the project (e.g. scale or grid). A more detailed stakeholder management plan may be included as an annex. Providing evidence of the support of key stakeholders for the development of the project strengthens the quality of the business case and the case for the investment.

Impacts

This sub-dimension highlights the expected impacts of the project on the organisation as well as on external stakeholders. This section should also include the timeline for these impacts to take place and a brief description of their expected behaviour or evolution over time (e.g. diminishing or increasing returns, long-term staff reductions on a specific functional area, organisational changes).

Strategic and normative alignment

This dimension of the business case component will ensure that the strategic and normative basis for the development of the project is sound. It will make evident the strategic relevance of the investment, supported by all the necessary proof and references that help place the investment in the public sector's strategic framework. It will also provide a general assessment of the compliance of the project with existing standards and guidelines for ICT projects.

Strategic alignment

The strategic alignment is the first element to provide a justification for the development of a given ICT project. The intention of this sub-section is to provide decision makers with a high degree of certainty on the strategic case and operational need for the development of the project.

This sub-dimension should:

- map the strategic context and describe the role of the project being developed
- make the case for the investment, identifying the key drivers motivating the effort, and lay out a theory of change
- identify all relevant stakeholders and offer them the opportunity to provide input and help shape the structure of the project
- help identify at an early stage projects that should not be developed.

The ultimate goal of this sub-dimension is to confirm that the investment is strategically sound. This sub-section of the business case component should cover the strategic framework, the organisational context and alignment to existing strategies.

Box 4.5. Developing the strategic assessments in New Zealand's Better Business Cases Methodology

New Zealand has developed a robust and structured approach to the development of business cases for large public investments. The strategic assessment for the typical investment project follows the following steps:

1. Initiate the investment proposal and appoint the senior responsible owner to take the leadership role in the development of the strategic assessment.

2. Identify key stakeholders, analyse their interest and influence, and complete a stakeholder management plan. This will inform the choice of attendees for the initial stakeholder workshops required to identify investment drivers.

3. Describe the proposal and draft the strategic context. Use this as the basis for briefing workshop attendees.

4. Arrange facilitated workshops with key stakeholders to identify and agree investment drivers (problems/opportunities).

5. Finalise the workshop outputs and draft the strategic assessment document.

6. Present the final draft strategic assessment (and any supporting documentation required) for review, including a Gateway review panel where required. Incorporate feedback.

7. Finalise the strategic assessment, seek final sign-off from the senior responsible officer and submit for approval to proceed to further business case development.

Source: Treasury of New Zealand (2015) *Better Business Cases: Guide to Developing the Strategic Assessment*.

The strategic framework should provide a sense of what the organisation is seeking to achieve and the operational adjustments it should make to meet its objectives. The main purpose of this component is to briefly outline how the investment fits in the overall business strategies of the organisation and how this specific ICT project helps the organisation(s) achieve strategic and operational objectives and satisfy present or future needs. References in the text are welcome and supporting documents may be included as annexes.

The organisational context provides a brief overview of the scope of the project. It helps determine the organisation(s) and business units involved in the project. It lays out a concise picture of these organisations and business units, what they seek to achieve, their current activities and resources (e.g. staff as full-time equivalent, annual expenditure). It should provide the reader with a sense of the environment in which the organisations

involved operate, including the main factors driving the decision to invest in the project. These factors could be internal and/or external factors, including threats and opportunities present or expected, and of different natures (e.g. political, socio-demographic, economic, technological, environmental).

Finally, the alignment of the investment with national, regional, sector and organisational strategies should be described. It should clearly lay out the strategic and operational objectives to which it will contribute, and how it is consistent with the broader strategic framework of the public sector.

Normative compliance

This sub-dimension will provide evidence of compliance of the project design with outstanding ICT project norms, standards and guidelines.

Cost-benefit analysis

The purpose of this second dimension of the business case is to provide a detailed analysis of the costs and benefits expected from the project implementation. It will help plan for funding requirements and identify the key factors driving value creation and benefit realisation. It should also seek to capture costs and benefits that may not be reflected in monetary transactions.

This dimension should include a clear description of the methodology used, including the key assumptions supporting the calculations as well as all monetary and non-monetary benefits and costs. It should also determine the appraisal period (covering the economic life of the asset or service – it may be at times about a service contract). Methodological information and supporting evidence should enable the business case reviewer to perform the cost-benefit analysis himself and obtain the same results.

All costs and benefits (monetary and non-monetary, direct or indirect) should, whenever possible, be expressed in national currency. Cost-benefit analyses usually exclude goods and services tax (GST) and depreciation charges.

Investment costs

This sub-section aims to identify all relevant investment costs. This section should also identify the source of funding. Additional information may include expenditure categories (e.g. hardware, software, services and communications).

Maintenance costs

This sub-section determines maintenance costs of the project and the resulting asset/service over its lifecycle. It should also clarify the expected source of funding that will finance these costs.

Financial benefits

This sub-section helps identify all monetary benefits expected from the project, such as increasing revenues, operational cost reduction or higher efficiency, staff reduction, etc. The description should include the assumptions and the methodology used to estimate these benefits.

Non-monetary benefits and costs

Non-monetary benefits and costs can also be important drivers on the decision on whether or not to carry out an investment and in which form. These benefits should be identified in the business case and their characteristics and trade-offs made explicit so that senior management and oversight bodies are able to understand the drivers of the project design and the preferred option. This analysis can be quantitative, qualitative or a mix of both.

While accurately assessing these benefits may be hard, it is crucial that the approach, assumptions and stakeholders engaged in the assessment are explicitly described.

Net present value

Ultimately, the cost-benefit analysis aims to determine the economic case in favour of the development of a specific ICT project. Previous assessments should inform a decision on the viability of the project and compare it to alternative options.

These assessments should be risk-adjusted. If competing options have similar estimated net benefits, the project manager should opt for the option that has greater certainty and least risks. The business case should aim at accurately quantifying (in monetary terms) the risks and uncertainty linked to each option to facilitate the analysis. Risk quantification can use different tools such as single-point probability analysis or quantitative risk analysis. For large investments and high-risk projects, quantitative risk analysis should be mandatory.

The net present value methodology should be used to help determine the best-fit alternative among competing options or solutions. In order to maximise value for money, this cost-benefit analysis methodology should clarify the trade-offs and help compare alternative scenarios and shortlisted possibilities.

The analysis should include a brief description of the shortlisted alternatives or scenarios, keeping the *status quo* as a baseline.

The dimension should conclude with a table summarising the findings of the analysis supporting multi-criteria decision analysis (Treasury of New Zealand, 2014), as in Table 4.3.

Table 4.3. New Zealand's cost-benefit analysis template

	Option 1: Do nothing	Option 2: Do minimum	Option 3: Intermediate	Option 4: Aspirational
Appraisal period (years)				
Capital costs				
Whole-of-life costs				
Cost-benefit analysis of monetary costs and benefits				
Present value of monetary benefits				
Present value of costs				
Net present value				
Multi-criteria analysis of non-monetary benefits				
Benefit criteria 1				
Benefit criteria 2				
Benefit criteria 3				
Preferred option				

Source: Treasury of New Zealand (2014), *Better Business Cases: Detailed Business Case Template*.

Service commissioning

This dimension of the business case seeks to have a preliminary plan for the preferred alternative as resulted from the net present value analysis of the shortlisted options. The project manager should make sure he/she considers and sets up the procurement arrangements needed, if any.

ICT commissioning strategy

This sub-dimension should develop a fit-for-purpose technology acquisition process and plan, weighing the different alternatives available and choosing the most adapted to the project based on a SWOT analysis. The approach for commissioning the needed ICT goods and services should be adapted to the nature, size, complexity, budget, value and risk of the service or product being procured.

Required services

This sub-dimension should clearly lay out which services and characteristics are required from the service or product being procured. It should also describe good to have services, as well as optional gadgets or characteristics.

Payment approach

It should provide a first overview, updated once the work plan has been finalised, of the payment methods and timelines for this project.

Contractual issues and risk allocation

This sub-dimension seeks to identify in advance the risks of contracting the service or acquiring the product, considering if the service already exists, will be partially developed or completely developed to respond to the organisation's needs. Based on this initial mapping exercise, it should highlight how these risks and issues will be distributed and managed in the contractual relation with the provider.

Risk assessment and management

A robust business case should identify in advance notable risks to help mitigate their likeliness and develop a risk management strategy. A thorough assessment of the risks of the project requires the involvement and input of all relevant stakeholders.

The risk assessment should include, but not necessarily be limited to, the most common risks associated with ICT projects, including governance and organisational risks, implementation and technological risks.

Quantitative risk analysis is always recommended. However, the level of effort put in the risk assessment should be proportional to the scope and ambitions of the project. High-risk and large-scale ICT projects (above government-determined thresholds) should include a quantitative risk analysis. In these cases, the risk assessment section should a methodological note, describing the approach followed to quantify the risks, including basic assumptions and the model used. It should include a sense of the limitations of the model. A more thorough description of the results of the quantitative risk analysis should be enclosed in the annexes.

Governance and organisational risks

Public investment projects, especially if their development and implementation extends over a long period of time, face the risk of changing leadership and priorities. Consulting with the leadership of the responsible agency and other relevant stakeholders, including MinTIC, is necessary to adequately identify the potential governance and organisational risks of the project, their likelihood and potential impact.

Technological risks

The business case developer should work with ICT project managers to actively identify technological risks and threats, including potential problems in the interaction with other systems, usability, maturity of the technological solution, technological change and alternatives.

Implementation risks

The implementation of large and complex ICT projects comes with a wide variety of risks. These include factors that may prevent the development of solutions within time or budget, or unplanned human resources needs. Working with other ICT project management specialists with relevant experience, the business case developer should identify the main risks of the project, and determine risk mitigation and management strategies and procedures.

Risk management strategy

All ICT investments should develop a fit-for-purpose risk management strategy to effectively address the hazards and threats associated with similar types of investments, delivering value for money in the public sector's digitalisation efforts.

After identifying the major risks associated with the project, this sub-dimension should help the project manager identify and put in place mechanisms to minimise the likelihood of having the ICT project be derailed by the materialisation of adverse effects.

A risk management strategy for large ICT projects should also include a risk monitoring system, decision-making processes informed by risk analysis and the creation of an issues

log. Finally, it should include a risk register, summarising the risk assessments performed in this section (Table 4.4).

Table 4.4. New Zealand's risk register template

Risk	Consequence (high/medium/low)	Likelihood (high/medium/low)	Comments and risk management strategies

Source: Treasury of New Zealand (2014), *Better Business Cases: Detailed Business Case Template*.

Monitoring mechanism and indicators for ICT project management

To complement the business case component of ICT project management, mechanisms for monitoring and evaluation should be determined early on when starting an ICT project. Key performance indicators are needed to follow up on the implementation of ICT initiatives. A structured mechanism for monitoring progress made in the implementation of projects can help identify issues at an early stage and make adjustments as required to prevent project failure.

Moreover, large-scale projects should provide proof of impact and, whenever possible, the government of Colombia should help make visible their specific contribution to wider public sector strategies.

Structured project management requires indicators that inform managers and oversight authorities on the progress and success of the implementation. Key performance indicators provide an overview of past and present performance and may provide insight on potential future problems.

Their main objective is to inform the management team on issues that require adjustments to deliver the project as described in the business case. They should be few in number, but cover the most relevant aspects of the project (budget, timeline, quality assessment of deliverables, etc.).

Most important, they should be SMART:

- **S**pecific: clearly and effectively targeting performance
- **M**easurable: key performance indicators must be able to be expressed quantitatively, helping track progress
- **A**ttainable: key performance indicators targets should be reasonable if they are to provide a fair picture of project implementation performance
- **R**ealistic: Directly pertinent to project tasks and objectives
- **T**ime-bound: Ensuring the ability for the key performance indicators to be measured in a given time frame.

Large ICT investments should carefully monitor outputs, outcomes and impacts. Determining in advance key indicators helps ensure value for money and return on investments. These indicators should be developed at the planning stage and aligned with the overall impact assessment methodology for digital government. They should provide evidence of the project's contribution to wider public sector goals and strategies.

Based on the budget and strategic value of the project, the project manager should also plan for an evaluation and/or impact assessment of the project to better account for the public value created by the initiative.

Notes

[1] http://siteresources.worldbank.org/EXTGOVANTICORR/Resources/3035863-1289428746337/Guerrero_Rebuilding_Trust.pdf.

[2] Citizen-driven doesn't solely apply to citizens, but also to other beneficiaries of government services and policies, such as businesses and other organisations.

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Annex A. Detailed indicator framework

Table A.1. Input indicators

Code	Indicator name	Data source	Source indicator/question	Response options	Score calculation
INP 1	**Financial resources**	**OECD**	8. Please indicate:	a. The budget of the institution in 2016 b. The budget for the Online Government Strategy in 2016 c. The budget of the Online Government Strategy in 2016, financed with own resources d. The budget of the Online Government Strategy in 2016, financed with external resources	**(INP 1a+INP 1b+INP 1c)/3**
INP 1a	Institutional budget dedicated to the GEL Strategy	OECD	8		Quintile-based groups for b: $x \geq 8.7x10^7$: 100; $2.1\ x10^7 \leq x < 8.7\ x10^7$: 75; $1\ x10^7 \leq x < 2.1\ x10^7$: 50; $0 < x < 1x10^7$: 25; $x = 0$: 0
INP 1b	Internally funded GEL budget as a percentage of overall institutional budget	OECD	8		c/a*100
INP 1c	Externally funded GEL budget as a percentage of overall institutional budget	OECD	8		d/a*100
INP 2	**Human resources**	**OECD**	10. Please provide the following information about your institution's staff in 2016:	a. Number of internal employees of the institution b. Number of internal employees dedicated to the implementation of the Online Government Strategy c. Number of contractors of the institution d. Total number of contractors dedicated to the implementation of the Online Government Strategy	**(INP 2a+INP 2b+INP 2c)/3**

Table A.1. Input Indicators *(continued)*

INP 2a	Personnel dedicated to the implementation of the GEL Strategy	OECD	10		Quintile-based groups for b+d: x ≥ 4: 100; 2 ≤ x < 4: 67; 0 < x < 2: 35; x = 0: 0
INP 2b	Internal human resources dedicated to the GEL Strategy as a percentage of the total number of internal human resources	OECD	10		b/a*100
INP 2c	External human resources dedicated to the GEL Strategy as a percentage of the total number of external human resources	OECD	10		d/c*100
INP 3	**Technical resources**				
	The use of technological tools offered by the Ministry of Information and Communication Technologies (MinTIC)	OECD	13. Does your organisation use the following tools offered by the Ministry of Information and Communications Technologies, related to the Online Government Strategy?	a. Sí Virtual Portal b. Open Data Portal c. Common Language Portal d. Territorial platforms (only applies to entities of the territorial order) e. Territorial Portal (of municipalities and governorates) (only applies to entities of the territorial order)	For national institutions: 1 option = 33; 2 = 66; 3 = 100 For territorial institutions: 1 option = 20; 2 = 40; 3 = 60; 4 = 80; 5 = 100
INP 4	**Institutional legal framework for the GEL Strategy**				
INP 4a	Awareness of the institutional legal framework	OECD	11. Does your institution have knowledge of the following policy documents and norms related to the Online Government Strategy?	b. Law 1341 of 2009 – Mechanism and conditions to guarantee the massification of online government c. Decree 1078 of 2015 – Sectoral Single Decree – General Guidelines of the Online Government Strategy	(b+c)/2*100
INP 4b	Application of the institutional legal framework	OECD	12. Which of the following policy and regulatory documents does your institution apply in the implementation of the Online Government Strategy?	b. Law 1341 of 2009 – Mechanism and conditions to guarantee the massification of online government c. Decree 1078 of 2015 – Sectoral Single Decree – General Guidelines of the Online Government Strategy	(b+c)/3*100
INP 5	**Strategic support**				

Table A.1. Input Indicators *(continued)*

	Priority within the overall institutional strategy to implement the GEL Strategy	OECD	7. To what extent is the implementation of the GEL Strategy a strategic priority for your institution?	a. Not a priority b. Low priority c. High priority d. Essential	a = 0; b = 30; c = 70; d = 100
INP 6	**Legal framework for ICTs for services**				**(INP 6a+INP 6b)/2**
INP 6a	Awareness of the legal framework for ICTs for services	OECD	11. Does your institution have knowledge of the following policy documents and norms related to the Online Government Strategy?	a. Decree Law 2150 of 1995 – Anti-procedural Statute j. Law 527 of 1999 – Law of Electronic Commerce l. Decree 333 of 2014 – Accreditation system for certification bodies m. Law 962 of 2005 – Rationalisation of procedures and administrative procedures n. Decree 019 of 2012 – Suppress or amend unnecessary regulations and procedures in the public administration o. NTC 5854 of 2012 – Accessibility to web pages p. Decree 2364 of 2012 – Electronic signature	(a+j+l+m+n+o+p)/7*100
INP 6b	Application of the legal framework for ICTs for services	OECD	12. Which of the following policy and regulatory documents does your institution apply in the implementation of the Online Government Strategy?	a. Decree Law 2150 of 1995 – Anti-procedural Statute j. Law 527 of 1999 – Law of Electronic Commerce l. Decree 333 of 2014 – Accreditation system for certification bodies m. Law 962 of 2005 – Rationalisation of procedures and administrative procedures n. Decree 019 of 2012 – Suppress or amend unnecessary regulations and procedures existing in the public administration o. NTC 5854 of 2012 – Accessibility to web pages p. Decree 2364 of 2012 – Electronic signature	(a+j+l+m+n+o+p)/7*100
INP 7	**Guidance for ICTs for services**				

Table A.1. Input Indicators *(continued)*

	The use of MinTIC implementation guides for ICTs for services	OECD	9. Please indicate the implementation guides used by your institution in the development of the GEL Strategy.	a. Guide for the characterisation of citizens, users or interest groups: http://bit.ly/1fpNntX b. Colombian Technical Standard NTC 5854 (website accessibility): http://ntc5854.accesibilidadweb.co c. Online Usability Guidelines and Methodologies: http://bit.ly/2mTrnhW d. Guidelines for the Design and Implementation of Measurements of Perception and Citizen Expectations of the National Planning Department PNSC e. Annex Multi-channel User Guide: http://bit.ly/2mwRqIu f. Common Language Exchange Guide: http://bit.ly/2mNjmJD g. Guide for the Rationalisation of Procedures of the Public service Department (DAFP): http://bit.ly/2n3qUKs	(a+b+c+d+e+f+g)/7*100
INP 8	**Legal framework for ICTs for open government**				**(INP 8a+INP 8b)/2**
INP 8a	Awareness of the legal framework for ICTs for open government	OECD	11. Does your institution have knowledge of the following policy documents and norms related to the Online Government Strategy?	d. Law 57 of 1985 – Publicity of official documents e. Law 594 of 2000 – General Law of Archives f. Law 1712 of 2014 – Law on Transparency and the Right of Access to Public Information g. Single Regulatory Decree 1081 of 2015 – Unique Regulatory Decree of the Presidency of the Republic Sector h. Decree 103 of 2015 – Regulation on the management of public information i. Resolution 3564 of 2015 – Regulations associated with the Law on Transparency and Access to Public Information	(d+e+f+g+h+i)/6*100

Table A.1. Input Indicators *(continued)*

INP 8b	Application of the legal framework for ICTs for open government	OECD	12. Which of the following policy and regulatory documents does your institution apply in the implementation of the Online Government Strategy?	d. Law 57 of 1985 – Publicity of official documents and documents e. Law 594 of 2000 – General Law of Archives f. Law 1712 of 2014 – Law on Transparency and the Right of Access to National Public Information g. Single Regulatory Decree 1081 of 2015 – Unique Regulatory Decree of the Sector Presidency of the Republic h. Decree 103 of 2015 – Regulation on the management of public information i. Resolution 3564 of 2015 – Regulations associated with the Law on Transparency and Access to Public Information	(d+e+f+g+h+i)/6*100
INP 9	**Guidance for ICTs for open government**				
	The use of MinTIC implementation guides for ICTs for open government	OECD	9. Please indicate the implementation guides used by your institution in the development of the GEL Strategy.	h. Guidelines for Electronic Accountability – MinTIC: http://bit.ly/2ne2PRW i. Single Accountability Manual: http://bit.ly/1SYqHk1 j. Guide for opening data in Colombia: http://bit.ly/2jWKe87 k. Open Innovation Guide: http://bit.ly/1NQva1Z l. Annex for exercises of electronic participation: http://bit.ly/2m60usv	(h+i+j+k+l)/5*100
INP 10	**Legal framework for ICTs for management**				**(INP 10a+INP 10b)/2**
INP 10a	Awareness of the legal framework for ICTs for management	OECD	11. Does your institution have knowledge of the following policy documents and norms related to the Online Government Strategy?	q. Law 790 of 2002 – Public Administration Reform Program r. Decree 235 of 2010 – Exchange of information between entities for the fulfilment of public functions s. Decree 415 of 2016 – Guidelines for institutional strengthening in the field of information and communications technologies v. Agreement 003 of 2015 of the General National Archive which gives general guidelines on the management of electronic documents	(q+r+s+v)/4*100

Table A.1. Input Indicators *(continued)*

INP 10b	Application of the legal framework for ICTs for management	OECD	12. Which of the following policy and regulatory documents does your institution apply in the implementation of the Online Government Strategy?	q. Law 790 of 2002 – Public Administration Reform Program r. Decree 235 of 2010 – Exchange of information between entities for the fulfilment of public functions s. Decree 415 of 2016 – Guidelines for institutional strengthening in the field of information and communications technologies v. Agreement 003 of 2015 of the General National Archive which gives general guidelines on the management of electronic documents	(q+r+s+v)/4*100
INP 11	**Guidance for ICTs for management**				
	The use of MinTIC implementation guides for ICTs for management	OECD	9. Please indicate the implementation guides used by your institution in the development of the GEL Strategy.	m. IT Strategy Domain Guides: http://bit.ly/2nekRDr n. General Guide to the Adoption of the Reference Framework for Enterprise Architecture: http://bit.ly/2mTAzCW o. IT Governance Domain Guides: http://bit.ly/2nrNltU p. Guide to Understanding the Framework Price Agreements (AMP): http://bit.ly/2n3tCjm q. Information Domain Guides: http://bit.ly/2n3qK5M r. Information Systems Domain Guides: http://bit.ly/2nekusn s. Technology Services Domain Guide: http://bit.ly/2nwiCsr t. Use and ownership domain guide: http://bit.ly/2n3prUv	(m+n+o+p+q+r+s+t)/8*100
INP 12	**Legal framework for information security and privacy**				**(INP 12a+INP 12b)/2**
INP 12a	Awareness of the legal framework for information security and privacy	OECD	11. Does your institution have knowledge of the following policy documents and norms related to the Online Government Strategy?	t. Law 1266 of 2008 – General provisions of habeas data and regulates the handling of information u. Statutory Law 1581 of 2012 – Protection of personal data w. CONPES 3854 of 2016 – National Digital Security Policy	(t+u+w)/3*100

Table A.1. Input Indicators *(continued)*

INP 12b	Application of the legal framework for information security and privacy	OECD	12. Which of the following policy and regulatory documents does your institution apply in the implementation of the Online Government Strategy?	t. Law 1266 of 2008 – General provisions of habeas data and regulates the handling of information u. Statutory Law 1581 of 2012 – Protection of personal data w. CONPES 3854 of 2016 – National Digital Security Policy	(t+u+w)/3*100
INP 13	**Guidance for information security and privacy**				
	The use of MinTIC implementation guides for information security and privacy	OECD	9. Please indicate the implementation guides used by your institution in the development of the GEL Strategy.	u. Guide to the design and implementation of an information security strategy: http://bit.ly/2myzE8g v. Security and privacy model guidelines: http://bit.ly/1DyLXTF	(u+v)/2*100

Note: In the cases where sub-indicators were calculated on the basis of several response elements from one question, the question and response options have been mentioned next to the main indicator. Response option (k) of OECD questions 11 and 12 is not mentioned in the table, since it is a duplication of response option (a) and has therefore not been taken into account in the calculation of indicators.

Table A.2. Activity indicators

Code	Indicator name	Data source	Source indicator/question	Response options	Score calculation
ACT1	**Co-ordination**				
	Level of institutional co-ordination for the implementation of the Online Government Strategy	OECD	17. How do you co-ordinate the implementation of the Online Government Strategy in your institution?	a. There is a body (committee) or area that co-ordinates the institutional implementation of the four components of the Online Government Strategy jointly b. There are several bodies (committees) or areas that co-ordinate different specific components of the Online Government Strategy c. The IT director, CIO and/or GEL leader co-ordinates with other areas the different projects that incorporate ICT in the institution d. The IT director, CIO, GEL leader and/or ICT project manager(s) co-ordinate(s) with each other without major institutional direction e. There is little co-ordination between different ICT projects f. There is no co-ordination between different ICT projects	a = 100; b = 80; c = 60; d = 40; e = 20; f = 0
ACT2	**Planning for ICTs for services**				
	ICTs for services activities planned as a percentage of the total range of possible ICTs for services activities	OECD	14. Select the topics of the Online Government Strategy on which the institution planned to carry out actions during the year 2016.	a. Procedures and services on line b. Integrated PQRD systems c. User-centric services	(a+b+c)/3*100
ACT3	**ICTs for services policy**				
	Presence of (an) institutional plan(s)/policy(ies) or strategy(ies) specifying goals/targets for digital government services	OECD	18. Does the institution have (a) plan/ policy/strategy (s) specifying goals/objectives for any of the following topics?	a. ICT for services Yes/No	Yes = 1; No = 0
ACT4	**Training for ICTs for services**				**(ACT 4a+ACT 4b)/2**
ACT 4a	Frequency of training sessions on making services and procedures available on line	OECD	16. How many awareness and/or training sessions did your organisation's public servants attend on the following topics of the Online Government Strategy?	a. ICT for services	$x \geq 2 = 100$; $0 < x < 2 = 50$; $x = 0 = 0$

Table A.2. Activity Indicators *(continued)*

ACT 4b	Activities to increase awareness about digital services and spread corresponding ICT user skills among employees	OECD	15. In the year 2016, on which topics of the Online Government Strategy were your institution's public servants trained?	a. Procedures and services on line b. Mobile procedures and services c. Integrated PQRD system d. Characterisation of users of the institution's services e. Accessibility of online procedures and services f. Usability of online procedures and services	(a+b+c+d+e+f)/6*100
ACT5	**Implementation of online procedures and services**				**(ACT 5a+ACT 5b+ACT 5c)/3**
ACT 5a	User-centred services	OECD	19. Select the activities performed by the institution in 2016 related to the implementation of procedures and other administrative procedures on line.	a. Characterisation of users b. Incorporation of accessibility criteria in procedures and other online administrative procedures c. Incorporation of usability criteria into procedures and other online administrative procedures d. Promotion of the use of formalities and other administrative procedures on line	(a+b+c+d)/4*100
ACT 5b	Developing a digital system for complaints, claims and petitions	OECD	20. Indicate whether in 2016 the institution carried out activities aimed at:	a. Managing petitions, complaints, suggestions (PQRD) through the institution's website b. Managing PQRD through mobile devices c. Managing PQRD through an integrated system	(a+b+c)/3*100

ACT 5c	Rationalising procedures and services	OECD	21. In 2016 did the institution have procedures or other administrative procedures (OPA) that could be rationalised?	a. Yes
				b. No, the institution has no formalities or OPA
				c. No, the institution has rationalised all its procedures and OPA
				
				e. The number of procedures that the institution rationalised in 2016
				g. The number of other administrative procedures that the institution rationalised in 2016
					a = score based on question 22
					b = 0;
					c = 100;
					
					e or g = 0 = 0
					e or g > 0 = 50

ACT6	**Monitoring of online procedures and services**				

Table A.2. Activity Indicators *(continued)*

	Evaluation of satisfaction with online procedures and services	OECD	19. Select the activities performed by the institution in 2016 related to the implementation of procedures and other administrative procedures on line.	e. Evaluation of the satisfaction of users of formalities and other administrative procedures on line	e = 100 ; e not selected = 0
ACT7	**Planning for ICTs for open government**				
	ICTs for open government activities planned as a percentage of the total range of possible ICTs for open government activities	OECD	14. Select the topics of the Online Government Strategy on which the institution planned to carry out actions during the year 2016.	d. Transparency and access to public information supported by ICT (publication of information and open data) e. Accountability supported by ICT f. Collaborative exercises supported by ICT (open innovation) g. Citizen participation by electronic means	(d+e+f+g)/4*100
ACT8	**ICTs for open government policy**				
	Presence of (an) institutional plan(s)/policy(ies) or strategy(ies) specifying goals/targets for the use of ICTs for open government	OECD	19. Select the activities performed by the institution in 2016 related to the implementation of procedures and other administrative procedures on line.	b. ICT for open government Yes/No	Yes = 100; No = 0
ACT9	**Training for ICTs for open government**				**(ACT 9a+ACT 9b)/2**
ACT 9a	Frequency of training sessions on ICTs for open government	OECD	16. How many awareness and/or training sessions did your organisation's public servants attend on the following topics of the Online Government Strategy?	b. ICTs for open government	x ≥2 = 100; x = 1; 50; x = 0 = 0.
ACT 9b	Activities to increase awareness about the use of ICTs for open government and spread corresponding ICT user skills among employees	OECD	15. In the year 2016, on which topics of the Online Government Strategy were your institution's public servants trained?	g. Promotion of online procedures and services h. Open data basics i. Publication of quality open data according to national and/or international standards j. Use of open data to involve non-institutional actors (e.g. citizens, private sector, non-governmental organisations) k. Potential value of reuse of open data (e.g. to improve service delivery, improve public participation) l. Reuse of open data published by other public entities or by the private sector for innovation in the public sector (e.g. more specific provision of services, policy formulation)	(g+h+i+j+k+l)/6*100

Table A.2. Activity Indicators *(continued)*

ACT10	Implementation for ICTs for open government				(ACT 10a+ACT 10b+ACT 10c)/3
ACT 10a	Activities for digital transparency	OECD	24. Indicate which of the following transparency and access to information activities were carried out by the institution during 2016:	a. Published information on the institution's website b. Updated the information published on its website c. Enabled mechanisms for users to subscribe to information services	(a+b+c)/3*100
ACT 10b	Consultation of societal stakeholders to inform institutional open data plans	OECD	23. During the course of 2016 how many times did your organisation organise inquiries with the following stakeholders to exchange information related to your institution's open data plans (suggestions for prioritisation, publication or data release dates)?	a. Private sector organisations (companies) b. Citizens c. Journalists d. Academics e. Civil society organisations (NGOs, non-profit organisations) f. Public servants	Scale based on a+b+c+d+e+f: 0 = 0; 1 or 2: 33; 3 or 4 = 67; x > 4 = 100
ACT 10c	Activities for digital accountability	OECD	25. Indicate which of the following accountability activities were performed by the institution during 2016:	a. Published its management reports for 2016 on the institution's website b. Used electronic channels to convene its stakeholders to face-to-face accountability events c. Permanently enabled electronic channels to know the opinions, suggestions and other contributions of users, citizens and interest groups d. Published the contributions of users, citizens and interest groups on the management of the institution and the decisions taken against them on its website	(a+b+c+d)/4*100
ACT 10d	Activities for digital collaboration	OECD	26. Indicate which of the following collaborative activities the institution conducted during 2016:	a. Identified appropriate problems or challenges to solve b. Enabled the technological tools and inputs needed for the collaboration of users, citizens and interest groups c. Managed the collaborative actions to obtain the solution(s) or improvement(s) to the problems or challenges identified d. Published the results of the collaboration process	(a+b+c+d)/4*100

Table A.2. Activity Indicators *(continued)*

ACT 10e	Activities for digital participation	OECD	27. Indicate the activities carried out by the institution during 2016 related to citizen participation.	a. Elaborated and disseminated the participation plan by electronic means b. Enabled and disseminated institutional electronic channels, including social networks, according to the participation plan c. Developed continuous improvement actions to increase the participation and use of electronic channels, according to the feedback obtained from users, citizens and interest groups	(a+b+c)/3*100
ACT11	**Monitoring of open government data reuse**				
	Percentage of public institutions that monitor the reuse of open government data	GEL index	L1.5 Did the Institution monitor the use of published datasets?	a. Yes b. No	a = 100; b = 0
ACT 12	**Planning for ICTs for management**				
	ICTs for management activities planned as a percentage of the total range of possible ICTs for management activities	OECD	14. Select the topics of the Online Government Strategy on which the institution planned to carry out actions during the year 2016.	h. Generation of an IT strategy i. IT governance j. Information (management of information for decision making) k. Management of information systems l. Technological services (management of the technological infrastructure that supports systems, information services and the operation of the institution) m. ICT use and ownership n. Institutional capacities (automation of processes and procedures and application of good IT practices)	(h+i+j+k+l+m+n)/7*100
ACT 13	**ICTs for management policy**				**(ACT 13a+ACT 13b)/2**
ACT 13a	Presence of (an) institutional plan(s)/policy(ies) or strategy(ies) specifying goals/targets for the use of ICTs for management	GEL index	L7.1 What is the status of the IT strategic plan (PETI)?	a. Formulated and updated according to the reference framework of State Enterprise Architecture b. Formulated, but not updated according to the reference framework of State Enterprise Architecture c. Does not have it or is being developed	a = 100; b = 70; c = 0

Table A.2. Activity Indicators *(continued)*

ACT 13a	Scope of the strategic plan for ICTs for management?	GEL index	L7.2 The IT strategic plan (PETI) included:	a. Portfolio or route map of projects b. Budget projection c. Strategic understanding d. Analysis of the current situation and PETI Communications Plan f. All domains of the reference framework g. None of the above	(a+b+c+d+e)/5*100; f = 100; g = 0
ACT 14*	**Training for ICTs for management**				**(ACT 14a+ACT 14b)/2**
ACT 14a	Frequency of training sessions on the use of ICTs for management within the public sector	OECD	16. How many awareness and/or training sessions did your organisation's public servants attend on the following topics of the Online Government Strategy?	c. ICTs for management	x = 0:0; x=1:50; x > 1 : 100
ACT 14b	Activities to increase awareness about the use of ICTs for management and spread corresponding ICT user skills among its employees	OECD	15. In the year 2016, on which topics of the Online Government Strategy were your organisation's public servants trained?	m. IT architecture in the institution to be aligned with the organisational and sectoral strategies n. Adequate management of programmes and projects associated with IT. Includes the management of IT projects and the monitoring and evaluation of IT projects. o. Analysis of data and decision making from the information components that are processed in the institution. p. Standardised, interoperable and usable information systems. q. Operation, monitoring and supervision of technological services. r. Combination and exchange of data produced by other public entities to produce shared content, services and policies between administrations. s. Co-ordination and collaboration with external actors (i.e. skills to improve public-private technical co-operation and partnerships).	(m+n+o+p+q+r+s)/7*100
ACT 15	**Implementation for ICTs for management**				**(ACT 15a to ACT 15g)/7**

Table A.2. Activity Indicators *(continued)*

ACT 15a	The scope of use of the interoperability framework	OECD	28. Does your institution use the interoperability framework of the Ministry of Information and Communication Technologies (including standards and policies) to support collaboration between agencies and entities?	a. Yes, the interoperability framework is used between entities within my institution b. Yes, the interoperability framework is used between my institution and a select number of entities at the same level of government (national, regional or municipal) c. Yes, the interoperability framework is used between all entities at the same level of government as my institution (national, regional or municipal) d. Yes, the interoperability framework is used between my institution and a select number of entities across different levels of government (national, regional or municipal) e. Yes, the interoperability framework is used for the whole public sector f. The interoperability framework is not used	e = 100; d = 80; c = 60; b = 40; a = 20; f = 0
ACT 15b	IT governance	GEL index	GEL index L8		(L8.1 +L8.2+L8.3+L8.4)/4
			L8.1. Point out the aspects incorporated into the institution's IT governance scheme	a. IT policies b. IT processes c. IT indicators d. IT decision instances e. Roles and responsibilities of IT f. Organisational structure of the IT area g. Does not have an IT governance scheme	If a = 100/5; If b = 100/5; If c = 100/5; If d = 100/5; If e = 100/5 If f = 0
			L8.2. With respect to the optimisation of IT purchases, the institution:	a. Used framework price agreements for IT goods and services b. Used demand aggregation contracts for IT goods and services c. Applied methodologies or business cases and criteria for the selection and/or evaluation of IT solutions d. None of the above	
			L8.3. Does the institution use a methodology for the management of IT projects?	a. Yes b. No	If a =100 If b = 0
			L8.4. Was there transfer of knowledge of suppliers and/or IT contractors towards their institution?	a. Yes b. No	If a =100 If b = 0

Table A.2. Activity Indicators *(continued)*

ACT 15c	Information management	GEL index	L9.1 In relation to the management and planning of the information components, the institution:	a. Defined a scheme for the governance of the components of information b. Defined a methodology for the design of the information components c. Defined a scheme for the analysis and use of the information components d. None of the above	If a or b or c= 30; If (a and b) or (a and c) or (b and c)=70; If d= 0
ACT 15d	Percentage of ICT projects for which a use and appropriation strategy has been realised	GEL index	RC3.5 Report:	i. Number of IT projects for which a use and appropriation strategy has been made j. The number of IT projects executed during the term	(i/j)*100
ACT 15e	Service architecture	GEL index	L11.1 The institution has an architecture of technological services (technological infrastructure):	a. Documented and updated b. Does not have an architecture of technological services	If a = 100 If b = 0
ACT 15f	Methodology for acquisition of technological services	GEL index	L11.2 Does the institution apply methodologies to evaluate alternative solutions and/or technological trends for the acquisition of IT services and/or solutions?	a. Always b. Sometimes c. Never	If a=100 If b = 50 If c = 0
ACT 15g	Information systems life cycle	GEL index	L10.4 With regard to the life cycle management of information systems, the institution has:	a. Defined and applied methodologies for the design, development, implementation and deployment of information systems b. Implemented activities for the management of change control over information systems c. Performed preventive and corrective maintenance on information systems d. Established independent testing and production environments to ensure the correct functionality of information systems e. None of the above	(a+b+c+d)/4)+100 If e = 0
ACT 16	**Monitoring of ICTs for management**				(ACT 16a+ACT 16b+ACT 16c)/3

Table A.2. Activity Indicators *(continued)*

ACT 16a	Monitoring and evaluation of the strategic plan for ICTs	GEL index	L7.3 In relation to the monitoring and evaluation of the Strategic IT Plan (PETI), the institution has:	a. Defined indicators b. Defined and measured indicators c. Defined and measured indicators and generated improvement actions based on the results of the measurement d. None of the above	a = 30; b = 60; c =100; d = 0
ACT 16b	Insurance, control, inspection and improvement mechanisms for the quality of information components	GEL index	L9.4 Regarding the quality of the information components, the institution has:	a. Defined a programme and/or quality strategy of the institutional information components b. Implemented and monitored the programme and/or quality strategy of the information components c. Implemented data quality controls in information systems d. Defined indicators and metrics to measure the quality of information components e. Performed diagnostic exercises and data quality profiling f. Defined and applied methodologies to measure the quality of information components g. None of the above	(a+b+c+d+e+f)/6)*100; g=0;
ACT 16c	Monitoring of technological services	GEL index	L11.4 With regard to the mechanisms for monitoring the continuity and availability of technological services, the institution has:	a. Defined service-level agreements for technological services provided by third parties b. Defined and monitored service-level agreements for technological services provided by third parties c. Implemented management tools for the monitoring and generation of early alarms on the continuity and availability of services d. Realised a projection of the capacity of technological services e. None of the above	a = 25; b = 50; c = 25; b and c =100, d = 30; e = 0
ACT 17	**Planning for information security and privacy**				

Table A.2. Activity Indicators *(continued)*

	Information security and privacy activities planned as a percentage of the total range of possible information security and privacy activities	OECD	14. Select the topics of the Online Government Strategy on which the institution planned to carry out actions during the year 2016.	o. Security and privacy diagnostics p. Generation of security plan and information privacy q. Security risk management and information privacy r. Evaluation of information security and privacy performance	(o+p+q+r)/4*100
ACT 18	**Information security and privacy policy**				
	Presence of (an) institutional plan(s)/policy(ies) or strategy(ies) specifying goals/targets for information security and privacy	GEL index	L14.2 An information security and privacy policy has been established for the institution.	a. Yes b. No	Yes = 100; No = 0
ACT 19*	**Training for information security and privacy**				**(ACT 19a+ACT 19b)/2**
ACT 19a	Frequency of training sessions on information security and privacy	OECD	16. How many awareness and/or training sessions did your organisation's public servants attend on the following topics of the Online Government Strategy?	d. Information security and privacy	x = 0:0; x=1:50; x > 1 : 100
ACT 19b	Activities to increase awareness about information security and privacy and spread corresponding ICT user skills among its employees	OECD	15. In the year 2016, on which topics of the Online Government Strategy were your institution's public servants trained?	t. Personal data protection laws and other relevant regulations u. Stages and activities of the information security and privacy model v. Privacy policy (e.g. consent mechanisms, data retention limits) w. Prevention of internal information security risks (e.g. unauthorised access, destruction, modification of data) x. Prevention of external information security risks (e.g. cyber-attacks) and response to internal and external digital security incidents z. Ethical use of data	(t+u+v+w+x+y+z)/7*100
ACT 20	**Implementation of the information security and privacy model (MSPI)**				**(ACT 20b+ACT 20c+ACT 20d+ACT 20e+ACT 20f+ACT 20g)/6**

Table A.2. Activity Indicators *(continued)*

ACT 20b	Weaknesses in the implementation of the MSPI	GEL index	L15.1 Select the strengths that the institution has shown in terms of the implementation of the information security management system (ISMS)	a. Allocation budget for the implementation of the ISMS b. Assignment of highly trained human resources c. Identification of appropriate controls d. Definition of the implementation of the activities or phases of the ISMS and commitment by the management and co-ordinators in the active support to the MSPI, showing its importance for the institution f. Other, which one? g. None of the above	If g = 0 If 1 option selected, except g (a or b or c or d or e) = 80 If 2 options selected, except g (e.g. a and b, etc.) = 60 If 3 options selected, except g (e.g. a, b and c, etc.) = 40 If 4 options selected, except g (e.g. a, b, c and d, etc.) = 20 If 5 options selected, except g (a, b, c, d and e) = 0
ACT 20c	Implementation of the risk treatment plan	GEL index	L15.2 Indicate which of the following actions the institution has developed and in what state it is:	a. The operational control plan, which indicates the methodology to implement the safety measures defined in the risk management plan: under construction b. The operational control plan, which indicates the methodology to implement the safety measures defined in the risk management plan: approved c. Reports related to the implementation of information security and privacy controls: under construction d. Reports related to the implementation of security and privacy controls: approved e.Definition of management and compliance indicators to identify whether the implementation of the MSPI is efficient, effective and effective: under construction f. Definition of management and compliance indicators to identify whether the implementation of the MSPI is efficient, effective and effective: approved g. None of the above	If b, d and f = 100 If b, c and e = 75 If 3 different response options than previous ones = 50 If 2 answer options any Combination = 25 If 1 answer option = 12.5 If g = 0

Table A.2. Activity Indicators *(continued)*

ACT 20d	Information security and privacy diagnosis	GEL index	L14.1 Which of the following actions has the institution already carried out?	a. A diagnostic document has been generated, which clearly identifies the current status of the institution in the implementation of information security and privacy b. The institution has determined the current state of the technology infrastructure to develop the transition plan from IPv4 to IPv6 c. None of the above	If a and b= 100; If a or b= 50; If c = 0
ACT 20e	Establishing procedures, roles and responsibilities within the MSPI	GEL index	L14.3 The institution has an administrative act through which the functions of the institutional committee for administrative development are created or modified or a similar committee where the topics of security and privacy of the information are included	a. Yes b. No	If a = 100; If b = 0
ACT 20f	Information assets inventory	GEL index	L14.4 (FURAG 469, 470)		(469+470)/2
			469 The institution has an information asset management methodology that takes into account aspects such as: legal compliance, dates of updating, owners and criticality of the assets.	a. Under construction b. In review c. In approval d. Revised, approved and disclosed by the institutional administrative development committee or the committee that has taken up such a role e. Does not exist	If 469 a = 25; If 469 b = 50; If 469 c = 75; If 469 d = 100; If 469 e = 0
			470 The institution has an inventory of information assets according to the methodology proposed.	a. Yes b. Under construction c. No	If 470a = 100; If 470b = 50; If 470c = 0
ACT 20g	Management of information security and privacy risks	GEL index	L14.5 (FURAG 471, 472, 473)		(471+472+473)/3

Table A.2. Activity Indicators *(continued)*

		471. The institution has:	a. An advanced version of the document of the methodology for the management of the security risks and privacy of the information b. A formalised methodology for the management of information security and privacy risks c. Progressed the risk management plan d. The established risk treatment plan and the declaration of applicability under development f. A statement of definite applicability g. None of the above	If 471 3 options selected (b, d, f) = 100 If 471 3 options selected (b, c, e) = 75 If 471 3 options selected different from the ones below = 50 If 471 2 options selected with any combination = 25 If 471 1 option selected = 12.5 If 471 g = 0
		472. The institution carries out the identification, analysis and evaluation of the security and privacy risks of the information according to the methodology proposed.	a. Yes b. Under construction c. No	If 472 a = 100; If 472 b = 50; If P472 c = 0
		473. The document of the diagnostic plan and transition strategy from IPv4 to IPv6 is:	a. Under construction b. In review c. In approval d. Revised, approved and disclosed by the institutional development committee or the one taking up such a role e. Do not exist	If 473 a = 25; If 473 b = 50; If 473 c = 75; If 473 d = 100
ACT 21	**Monitoring of information security and privacy**			
ACT 21a	Monitoring and evaluation of information security and privacy performance	L16.1 (479, 480, 481, 482)		(479+480+481+482)/4
		479. The commitments established to implement the risk management plan are periodically reviewed.	a. Yes b. No	479: a = 100; b = 0
		480. Which of the following activities does the institution perform:	a. Monitoring the measurement of effectiveness of controls b. To determine the effectiveness in the management of security incidents of the institution's information c. None of the above	480: c= 100; If 480 a or b = 50; If 480d= 0

Table A.2. Activity Indicators *(continued)*

		481. The institution has the following plans:	a. Plan for monitoring, evaluation and analysis of results of the MSPI, taking into account management and compliance indicators b. Audit plans for reviewing and verifying the management of the security and privacy of the institution's information c. None of the above	481: c= 100; 481 a or b = 50; If 481d = 0
		Does the institutional development administrative committee or its equivalent, follow up and control the implementation of the MSPI?	a. Yes b. No	482: a = 100; If 482 b = 0
ACT 21b	Continuous improvement	L16.2 (485, 486, 487)		(P485+P486+P487)/3
		485. The institution determines the possible corrective actions based on the findings or weaknesses identified in the evaluation of the security and privacy of information measures of the institution.	a. Yes b. No	485: a = 100; If 485 b = 0
		486. The institution implements corrective actions and plans to improve its security and privacy of information.	a. Yes b. No	486: a = 100: If 486 b = 0
		487. The institution determines if the corrective actions applied are adequate to manage the findings and weaknesses identified in the security and privacy of its information.	a. Yes b. No	487: a = 100; If 847 b = 0

Note: The question pertaining to ACT5c originally included two options (d and f) related to planned activities for the rationalisation of services and procedures. Due to the low response rate on these options, they were not taken into account in the final calculation of the sub-indicator and have therefore been left out of the table. It was not possible to make a transversal coding for the four indicators related to the frequency of training sessions (ACT4a, ACT9a, ACT14a, ACT19a) since they all presented different distributions.

Table A.3. Output indicators

Code	Indicator name	Data source	Source indicator/question	Response options	Score calculation
OUP 1	**Digital service availability**				
OUP 1a	Percentage of certifications and records available on line	GEL index	L6.1 In relation to the certifications and certificates of the institution, indicate:	a. How many are there? b. How many can be performed by electronic means?	(Number of online certifications and records/total certifications and records)*100
OUP 1b	Percentage of services and procedures available on line	GEL index	L6.2 (FURAG 496, 497 and 498)		(Number of online procedures and services/total procedures and services registered in SUIT)*100
			496. Of the total number of procedures/other administrative procedures that the institution has, how many are registered in the Single Procedures Information System (SUIT)?	a. Formalities b. Other administrative procedures	
			497. Of the total number of procedures registered in the institution's SUIT, how many can be carried out:	a. In person b. Totally on line c. Partially on line	
			498. Of the total number of other administrative procedures registered in the institution's SUIT, how many can be carried out:	a. In person b. Totally on line c. Partially on line	
OUP 1c	Percentage of services and procedures available through mobile devices	OECD FURAG/TF	37. In 2016 did the institution have formalities or other administrative procedures registered in SUIT?	a. Yes b. No	If 37b = 0; If a, proceed to 39 and compute:
			39. Regarding the use of procedures or other administrative procedures (OPA) please indicate the total number of:	i. Procedures and other administrative procedures of the institution registered in SUIT that can be made entirely through a mobile device j. Procedures and other administrative procedures of the institution registered in SUIT that can be partially done through a mobile device	(39i + 39j) /(FURAG 391a + 391b)
			FURAG 391. How many procedures/other administrative procedures does the institution have?	a. Procedures b. Other administrative procedures	
OUP 2	**Electronic authentication availability**				

Table A.3. Output Indicators *(continued)*

	Percentage of procedures and services for which digital authentication is available	OECD FURAG/TF	37. In 2016 did the institution have formalities or other administrative procedures registered in SUIT?	a. Yes b. No	If 37b = 0; If a, proceed to 38 and compute:
			38. Please indicate:	a. The total number of procedures and other administrative procedures registered in the institution's SUIT for which an electronic authentication mechanism is available	(38a/(FURAG 391a+391b)*100
			FURAG 391. How many procedures/other administrative procedures does the institution have?	a. Procedures b. Other administrative procedures	
OUP 3	**Digital service quality**				**(OUP 3a+OUP 3b+OUP 3c+OUP 3d)/4**
OUP 3a	Percentage of online services for which user characterisation has taken place	GEL index	L4.1 (FURAG 497, 498, 499, 500) 497. Of the total number of procedures registered in the institution's SUIT, how many can be carried out:	a. In person b. Totally on line c. Partially on line	(Number of online services with user characterisation/total online services)*100
			498. Of the total number of other administrative procedures registered in the institution's SUIT, how many can be carried out:	a. In person b. Totally on line c. Partially on line	
			499. Of the total number of online procedures, how many count on characterisation of the users?	a. Totally on line b. Partially on line	
			500. Of the total of other online administrative procedures, how many count on characterisation of the users?	a. Totally on line b. Partially on line	

Table A.3. Output Indicators *(continued)*

OUP 3b	Percentage of online services adhering to accessibility criteria	GEL index	GEL index L4.2 (FURAG 497, 498, 501, 502) 497. Of the total number of procedures registered in the institution's SUIT, how many can be carried out: 498. Of the total number of other administrative procedures registered in the institution's SUIT, how many can be carried out: 501. Of the total number of procedures partially and totally on line, how many met accessibility criteria? 502. Of the total number of other administrative procedures partially and totally on line, how many met accessibility criteria?	a. In person b. Totally on line c. Partially on line a. In person b. Totally on line c. Partially on line a. Totally on line b. Partially on line a. Totally on line b. Partially on line	(Number online services with accessibility criteria/total online services)*100
OUP 3c	Percentage of online services adhering to usability criteria	GEL index	L4.3 (FURAG 497, 498, 503, 504) 497. Of the total number of procedures registered in the institution's SUIT, how many can be carried out: 498. Of the total number of other administrative procedures registered in the institution's SUIT, how many can be carried out: P503. Of the total number of procedures partially and totally on line, how many met usability criteria? 504. Of the total number of other administrative procedures partially and completely on line, how many met usability criteria?	a. In person b. Totally on line c. Partially on line a. In person b. Totally on line c. Partially on line a. Totally on line b. Partially on line a. Totally on line b. Partially on line	(Number of online services with usability criteria/total online services)*100

Table A.3. Output Indicators *(continued)*

OUP 3d	Percentage of promoted online services and procedures	GEL index	L4.4 (FURAG 497, 498, 505, 506) 497. Of the total number of procedures registered in the institution's SUIT, how many can be carried out: 498. Of the total number of other administrative procedures registered in the institution's SUIT, how many can be carried out: 505. Of the total number of procedures partially and completely on line, how many were promoted to increase their use? 506. Of the total number of other administrative procedures partially and totally on line, how many were promoted to increase their use?	a. In person b. Totally on line c. Partially on line a. In person b. Totally on line c. Partially on line a. Totally on line b. Partially on line a. Totally on line b. Partially on line	(Number of promoted online services/total online services)*100
OUP 4	**Integrated petition and claim system**				**(OUP 4a+OUP 4b+OUP 4c)/3**
OUP 4a	Possibility to fill out petitions, complaints and claims on line	GEL index	L5.1 Do you have a form on your web page for receiving requests, complaints and claims?	a. Yes b. No	Yes = 100; No = 0
OUP 4b	Possibility to fill out petitions, complaints and claims through a mobile device	GEL index	L5.2 Did the institution offer the possibility to make petitions, complaints and claims through mobile devices?	a. Yes b. No	Yes = 100; No = 0
OUP 4c	Integrated system of petitions, complaints and claims	GEL index	L5.3 Indicate the criteria incorporated in the information system for the orderly registration and management of petitions, complaints and claims of the institution	Centralisation of all petitions, complaints, claims and denunciations, entered by various means or channels	Selected = 100; No = 0
OUP 5	**Online transparency**				**(OUP 5a+OUP 5b+OUP 5c)/3**
OUP 5a	Percentage of mandatory information according to transparency regulation that is published on line	GEL index	L1.1 In the section "transparency and access to public information" of its official website, the institution published:	a. Number of transparency themes published on line b. Mandatory number of transparency themes to be published on line	(a/b)*100

Table A.3. Output Indicators *(continued)*

OUP 5b	Accessibility and usability level of institutional website	GEL index	L1.2 (FURAG 338, P39) 338. Indicate which of the following accessibility criteria the website meets:	a. Non-text content b. Information and relations c. Significant suggestion d. Sensory characteristics and use of colour f. Keyboard g. No traps for keyboard focus h. Adjustable time i. Pause, stop, hide j. Avoid blocks k. Page titling l. Focus order m. Purpose of the links (in context) n. Page language or when receiving focus p. Receiving tickets q. Identification of errors r. Tags or instructions s. Prosecution t. Name, function, value u. None of the above	(Number of observed accessibility criteria/total accessibility criteria) *50 + Number of observed usability criteria/total usability criteria)*50
			339. Indicate which of the following usability criteria the website meets:	a. Clean and tidy design b. Crumb route c. Interfaces in motion d. Clean URLs e. Consistent global navigation f. Appropriate use of whitespace g. Context browsing h. Link to home page i. Independence of browser j. Well-formulated links k. Pop-up windows l. Back button m. Titles and headers n. Broken links o. Justification of the text p. Wide body width	

Table A.3. Output Indicators *(continued)*

				q. Underlined text r. Horizontal travel s. Style sheets for different formats t. Number of visits? u. Required fields v. Association of labels and fields w. Examples in form fields x. List y. None of the above	
OUP 5c	Percentage of accountability exercises realised on line	GEL index	L1.3 Indicate:	a. How many accountability exercises did the institution perform? b. How many of the accounts rendered by the institution used electronic means?	(b/a)*100
OUP 6	**Open government data**				**(OUP 6a+OUP 6b+OUP 6c+OUP 6d+OUP 6e)/5**
OUP 6a	Availability – percentage of strategic datasets published as open data	GEL index	RC1.1 Indicate:	a. How many of the strategic datasets identified in the information inventory were published? b. How many strategic open datasets were identified	(Number of published strategic open datasets/total of identified strategic open datasets)*100
OUP 6b	Accessibility – proportion of structured open government data	GEL index	40. With regard to the subject of open data, please indicate the number of:	a. Open datasets published by your institution on the open data platform of the Ministry of Information and Communication Technologies and/or other platforms b. Open datasets published by your institution that are provided as structured data (e.g. data are provided in Excel and not a pdf document)	b/a*100

Table A.3. Output Indicators *(continued)*

OUP 6c	Accessibility – proportion of open government data in multiple formats	GEL index	40. With regard to the subject of open data, please indicate the number of:	a. Open datasets published by your institution on the open data platform of the Ministry of Information and Communication Technologies and/or other platforms c. Open datasets published by your institution that are provided in multiple formats (i.e. more than one format, e.g. CSV, JSON, txt, xml)	c/a*100
OUP 6d	Accessibility – proportion of open government data in machine-readable formats	GEL index	40. With regard to the subject of open data, please indicate the number of:	a. Open datasets published by your institution on the open data platform of the Ministry of Information and Communication Technologies and/or other platforms d. Open datasets published by your institution that are provided in automatically readable formats (e.g. XML, CSV):	d/a*100
OUP 6e	Open government data usability	GEL index	L1.4 Indicate:	a. How many of the strategic datasets identified in the information inventory were published? c. How many of the published open datasets are up-to-date and widespread?	(c/a)*100
OUP 7	**Digital participation availability**				

Table A.3. Output Indicators *(continued)*

	Percentage of participation activities that were offered through ICTs	GEL index	L3 Of the activities formulated in the citizen participation strategy, indicate which were done by electronic means:	a. Accountability b. Development of regulations c. Formulation of planning d. Formulation and implementation of policies, programmes and projects f. Exercises of open innovation to find the solution to problems related to its functions g. Promotion of social control and citizen monitoring I. Other, which ones?	Number of participation activities using ICT/number of activities specified in the citizen participation strategy*100
OUP 8	**Open innovation exercises**				
	Realisation of open innovation exercises through which citizens are consulted to solve problems	GEL index	L2 The institution has advanced actions, initiatives or exercises of collaboration with third parties using electronic means to solve a problem of the institution	a. Yes b. No	a = 100; b = 0
OUP 9	**Automated procedures and processes**				
	Percentage of internal processes and procedures that have been automated	OECD	41. Please indicate the total number of:	a. Internal processes and procedures of the institution b. Processes and internal procedures of the institution automated and/or supported in information systems	b/a*100
OUP 10	**Data quality**				**(OUP 10a to OUP 10k)/11**
OUP 10a	Completeness	OECD	52. Indicate whether in 2016 the institution's databases:	a. Were more complete than in 2015, in terms of available data b. Remained the same in terms of available data c. Were less complete than in 2015 in terms of available data	a = 100; b = 0; c = -100
OUP 10b	Frequency	OECD	53. Indicate whether the frequency of updates (expected dates for updates) of the institution's data between 2015 and 2016:	a. Improved b. Remained stable c. Worsened	a = 100; b = 0; c= -100
OUP 10c	Metadata	OECD	54. Indicate whether the metadata description of the institution's data between 2015 and 2016:	a. Improved b. Remained stable c. Worsened	a = 100; b = 0; c= -100

Table A.3. Output Indicators *(continued)*

OUP 10d	Sources	OECD	55. Indicate whether the information about the institution's data sources (e.g. report who produces and publishes the data):	a. Improved b. Remained stable c. Worsened	a = 100; b = 0; c= -100
OUP 10e	Raw data	OECD	56. State whether the institution's raw data provision between 2015 and 2016:	a. Improved b. Remained stable c. Worsened	a = 100; b = 0; c= -100
OUP 10f	Desegregation	OECD	57. Indicate whether the institution's disaggregated data provision (e.g. by gender, socio-economic group, etc.) between 2015 and 2016:	a. Improved b. Remained stable c. Worsened	a = 100; b = 0; c= -100
OUP 10g	Precision	OECD	58. Indicate whether the accuracy of the institution's data between 2015 and 2016:	a. Improved b. Remained stable c. Worsened	a = 100; b = 0; c= -100
OUP 10h	Accessibility	OECD	59. Indicate whether the accessibility and readability of the institution's data (e.g. open, readable and machine-readable formats) between 2015 and 2016:	a. Improved b. Remained stable c. Worsened	a = 100; b = 0; c= -100
OUP 10i	Consistency	OECD	60. Indicate whether between 2015 and 2016 the consistency of the data generated by different sources of information in the institution:	a. Improved b. Remained stable c. Worsened	a = 100; b = 0; c= -100
OUP 10j	Validity	OECD	61. Indicate whether the validity of the institution's data between 2015 and 2016:	a. Improved b. Remained stable c. Worsened	a = 100; b = 0; c= -100
OUP 10k	Unicity	OECD	62. Indicate whether the institution's data uniqueness between 2015 and 2016:	a. Improved b. Remained stable c. Worsened	a = 100; b = 0; c= -100
OUP 11	**Data and information catalogues**				
	The range of data and information catalogues available	GEL index	L9.2 From the catalogue of information components, the institution has documented in line with the Enterprise Architecture Framework:	a. Data catalogue or data directory (open and georeferenced)? b. information catalogue c. information services catalogue d. information flows e.None of the above	((a+b+c+d)/4)*100; If e = 0
OUP 12	**Interoperable information services**				

Table A.3. Output Indicators *(continued)*

	Percentage of information services for external institutions made available on the national interoperability platform	GEL index	RC3.2 Indicate:	c. The number of information services provided on the interoperability platform of the Colombian state d. The total number of information services to related external entities and identified in the catalogue of information services of the institution	c/d*100
OUP 14	**Critical information assets**				
	Identification of critical information assets	GEL index	R4.1 Does the institution have a critical infrastructure identification process, apply it and communicate the results to the stakeholders?	a. Yes b. No	a = 100; b = 0
OUP 15	**Incident information exchange**				
	Exchange of incident information with the sector head or COLCERT	GEL index	R4.3 The institution exchanges safety incident information with the head sector institution or if necessary with ColCERT.	a. Yes b. No	a = 100; b = 0

Note: Scores can be negative for OUP10 because the question included the option "worsened over the last year", which was awarded a negative score. OUP 13 is not included in this table, since this indicator was removed from the variable correlation model due to an insufficient response level,

Table A.4. Outcome indicators

Code	Indicator name	Data source	Source indicator/question	Response options	Score calculation
OUC 1	**Digital service use**				**(OUC 1a+OUC 1b+OUC 1c+OUC 1d)/4**
OUC 1a	Percentage of service transactions that were completely realised on line	OECD	37. In 2016 did the institution have formalities or other administrative procedures registered in SUIT? 39. Regarding the use of procedures or other administrative procedures (OPA) please indicate the total number of:	a. Yes b. No c. Transactions made for procedures and other administrative procedures that the institution has registered in SUIT (total for all channels used: face-to-face, telephone or Internet) e. Transactions made entirely through the Internet (e-mail, instant messaging, chat, forums, web portals, mobile applications, social media) for paperwork and other administrative procedures that the institution registered in SUIT	If 37b = 0; If a, proceed to 39 and compute: e/c*100
OUC 1b	Percentage of service transactions that were partially realised on line	OECD	37. In 2016 did the institution have formalities or other administrative procedures registered in SUIT? 39. Regarding the use of procedures or other administrative procedures (OPA) please indicate the total number of:	a. Yes b. No c. Transactions made for procedures and other administrative procedures that the institution has registered in SUIT (total for all channels used: face-to-face, telephone or Internet) f. Transactions made partially via the Internet (e-mail, instant messaging, chat, forums, web portals, mobile applications, social media) for paperwork and other administrative procedures that the institution has registered in SUIT	If 37b = 0; If a, proceed to 39 and compute: f/c*100
OUC 1c	Percentage of service transactions that were completely realised through a mobile device	OECD	37. In 2016 did the institution have formalities or other administrative procedures registered in SUIT? 39. Regarding the use of procedures or other administrative procedures (OPA) please indicate the total number of:	a. Yes b. No c. Transactions made for procedures and other administrative procedures that the institution has registered in SUIT (total for all channels used: face-to-face, telephone or Internet) i. Transactions made entirely through a mobile device for paperwork and other administrative procedures that the institution has registered in SUIT	If 37b = 0; If a, proceed to 39 and compute: i/c*100

Table A.4. Outcome Indicators *(continued)*

OUC 1d	Percentage of service transactions that were partially realised through a mobile device	OECD	37. In 2016 did the institution have formalities or other administrative procedures registered in SUIT? 39. Regarding the use of procedures or other administrative procedures (OPA) please indicate the total number of:	a. Yes b. No c. Transactions made for procedures and other administrative procedures that the institution has registered in SUIT (total for all channels used: face-to-face, telephone or Internet) j. Transactions made partially through a mobile device for paperwork and other administrative procedures that the institution has enrolled in SUIT	If 37b = 0; If a, proceed to 39 and compute: j/c*100
OUC 2	**Digital service preference**				
	Percentage of public servants that estimate that the Internet and e-mail are preferred channels for citizens to realise government services	EDI	EDI/EDID G03C Of the following communication channels, what do you consider to be preferred by citizens to perform procedures or request services in your institution? (only give one answer)	G03C_2 The institutional website (Internet) G03C_5 E-mail	Percentage of public servants who indicated the institutional website as the preferred service channel for citizens + percentage of public servants who indicated e-mail as the preferred service channel for citizens
OUC 3	**Online petition processing**				
	Percentage of petitions, claims and complaints that were processed on line	FURAG/TF	246 Indicate:	a. How many general requests did the institution receive during the period evaluated? f. How many of the requests received by the institution during the period evaluated were answered by electronic means? g. How many complaints did the institution receive during the evaluation period? j. How many of the complaints received by the institution during the period evaluated were answered by electronic means? k. How many claims did the institution receive during the period evaluated? n. How many of the claims that the institution received during the evaluated period were answered by electronic means?	((246f/246a + 246j/246g + 246n/246k)/3*100)
OUC 4	**Electronic authentication use**				

Table A.4. Outcome Indicators *(continued)*

	Percentage of service transactions that were realised using electronic authentication	OECD	37. In 2016 did the institution have formalities or other administrative procedures registered in SUIT? 38. Please indicate: 39. Regarding the use of procedures or other administrative procedures (OPA) please indicate the total number of:	a. Yes b. No b. The total number of transactions carried out using electronic authentication for the procedures and other administrative procedures that the institution has registered in SUIT c. Transactions made for procedures and other administrative procedures that the institution has registered in SUIT (total for all channels used: face-to-face, telephone or Internet)	38b/39c*100
OUC 5	**Service satisfaction**				
	Level of user satisfaction regarding online government procedures and services on a scale of 0-100 reported by public institutions	GEL index	RC 2.1 On a scale of 0-100, indicate the level of satisfaction of users against all formalities and/or other administrative procedures provided by the institution through electronic means	Scale	0-100
OUC 6	**Use of public information**				
	Number of page views of the "transparency and access to information" section on the institutional website	OECD	47. Please indicate the number of:	Visits to the "transparency and access to public information" section of the official website during 2016	Quintiles: 0<x<53.8 = 0; 53.9<x<433.8 = 25; 433.9<x<2628 = 50; 2629<x<20696 = 75; x>20697 = 100
OUC 7	**Open government data reuse**				**(OUC 7a+OUC 7b))/2**
OUC 7a	Number of applications generated based on the reuse of open government data	FURAG/TF	216d Please indicate:	The number of applications generated based on the reuse of open government data	Based on quintiles: x = 0:0; 1≤x = 100
OUC 7b	Number of publications using open government data	FURAG/TF	216e Please indicate:	The number of publications using open government data	Based on quintiles x = 0:0; 1≤x≤3: 50; x>3:100
OUC 8	**Digital participation**				

Table A.4. Outcome Indicators *(continued)*

	Percentage of public consultation or decision-making exercises that have been realised through digital means	GEL index	RC1.4 (FURAG P495, P496) 495. Indicate: 496. Indicate:	How many exercises, initiatives or actions for citizen participation has the institution made with citizens, users or groups of interest for consultation or decision making? How many exercises, initiatives or actions for citizen participation has the institution carried out with citizens, users or interest groups using electronic means for consultation or decision making?	Number of ICT-enabled consultation exercises/total of consultation exercises*100
OUC 9	**Participation of vulnerable groups**				
	Percentage of public consultation or decision-making exercises with vulnerable groups that have been realised through digital means	OECD	43. Does your organisation serve a vulnerable population (indigenous populations, peasants, Afro-Colombians, mothers who are heads of families, displaced persons, the elderly, conflict victims, minors, LGBTI community, population in poverty and indigence, disability)? 44. Please indicate the number of exercises, initiatives or participation actions for consultation or decision making in 2016 by the institution with citizens, users or interest groups that are part of vulnerable and marginalised groups, in which electronic means were used.	a. Yes b. No	If 43b = 0; If a, proceed to 44 and compute: Number of ICT-enabled consultation exercises with vulnerable users/total of consultation exercises*100
OUC 10	**Open innovation solutions**				
	Number of implemented solutions from digitally enabled collaboration exercises	GEL index	RC 1.3 Indicate:	How many solutions from the actions, initiatives or exercises of collaboration with third parties using electronic means were implemented?	Index score
OUC 11	**Shared ICT provisions**				**(OUC 11a+OUC 11b+OUC 11c)/3**

Table A.4. Outcome Indicators *(continued)*

OUC 11a	Use of shared ICT infrastructure	OECD	29. Does your institution use shared ICT infrastructure (e.g. shared data centres, shared website hosting)? 30. If yes, please indicate if you share this infrastructure:	a. Yes b. No a. With dependencies that are within the institution b. With all the entities that are part of the same level of government as the institution c. With all the entities that make up the public sector d. With entities other than government entities (banks, companies, among others)	If 29b = 0; If a, proceed to 30 and compute: 30 (a+b+c+d)/4*100
OUC 11b	Use of shared ICT business processes	OECD	31. Does your institution use shared management processes (e.g. common logistics management, common payment system)? 32. If the previous answer was affirmative, please indicate if you share these management processes:	a. Yes b. No a. With entities that are within the institution b. With all the entities that are part of the same level of government as the institution c. With all the entities that make up the public sector d. With entities other than government entities (banks, companies, among others)	If 31b = 0; If a, proceed to 32 and compute; 32 (a+b+c+d)/4*100
OUC 11c	Use of shared ICT services	OECD	33. Does your institution use shared services (e.g. joint software development, electronic collaboration systems)? 34. If yes, please indicate if you share these services:	a. Yes b. No a. With entities that are within the institution b. With all the entities that are part of the same level of government as the institution c. With all the entities that make up the public sector d. With entities other than government entities (banks, companies, among others)	34 (a+b+c+d)/4*100
OUC 12	**Data and information sharing within the public sector**				**(OUC 12a+OUC 12b)/2**

Table A.4. Outcome Indicators *(continued)*

OUC 12a	Level of data exchange with other public sector institutions	OECD	64. Please indicate through which methods your institution regularly exchanges data with other public entities.	a. My institution does not regularly exchange data with other public institutions b. My institution exchanges data through individual requests to other public institutions c. My institution exchanges data through government-to-government agreements d. My institution exchanges data through the government's open data portal e. My institution exchanges data through the state interoperability platform	(a = 0; b = 25; c = 50; d= 50; e = 50)
OUC 12b	Use of information services	FURAG/TF	334 The institution provided and/or consumed information services through:	a. Standardised services under the guidelines of the Interoperability Framework b. Other information-exchange services c. Does not supply or consume information services of other public entities	a = 100; b = 100; c = 0
OUC 13	**Strategic data use**				**(OUC 13a+OUC 13b)/2**
OUC 13a	The use of data analytics	OECD	35. Does your institution perform data analytics activities, e.g. applying data mining, profiling, automated learning to support decision making and policy making?	a. Yes b. No	a = 100; b = 0

Table A.4. Outcome Indicators *(continued)*

OUC 13b	The extent to which data which were shared by other institutions and/or generated through data analytics within the own institution is used for strategic purposes	OECD	65. For what purpose has your organisation carried out projects in which data were reused?	a. Developing strategic foresight capabilities from economic and social trends, for policy formulation (e.g. through predictive analysis) b. Developing evidence-based policies based solely on the analysis of data already present within the institution itself c. Developing evidence-based policies based on the analysis of data shared with other institutions in conjunction with information that exists within the institution itself d. Increasing the participation of social actors (data, analysis or visualizations that support the processes of deliberation with citizens or companies) e. Incorporating data produced by citizens into the public policy cycle f. Developing procedures/services centred on the citizen (adaptation of services to the citizen based on their needs, preferences and usage patterns) g. Increasing public sector productivity and efficiency (management based on financial data, time, human or material resources) h. Developing monitoring capabilities for institutional learning and performance enhancement (using data that allows continuous monitoring of the policy and introduction of policy adjustments) i. Other, please specify	(a+b+c+d+e+f+g+h+i)/ 9*100
OUC 14	**Privacy satisfaction**				
	The number of privacy-related complaints received from online service users	OECD	45. Has your organisation received complaints from users of services and other online administrative procedures related to the privacy of their personal data? 46. Please indicate how many your institution received during 2016:	a. Yes b. No	(x=0:100; x >=1 : 0)
OUC 15	**Digital security incident level**				

Table A.4. Outcome Indicators *(continued)*

	Total number of information security incidents over the course of last year	OECD	66. Has your institution received digital incidents, cyber threats or cyberattacks during the year 2016? 67. Enter the total number of:	a. Yes b. No a. Security incidents (cyberattacks, piracy, manipulation of data, among others) that the institution experienced in 2016 b. Security incidents that had a lower impact (slight impact on one of the components of any information system or workstation) c. Security incidents that had a low impact (moderate impact on one of the components of any information system or workstation) d. Security incidents that had an average impact (high impact on one of the components of any information system or workstation) and security incidents that had a high impact (moderate impact on one or more components of more than one information system) f. Security incidents that had a higher impact (high impact on one or more components of more than one information system)	If 66b = 0; If a, proceed to 67 and compute: (b*0.2 + c*0.4 + d*0.6 + e*0.8 + f*1)/a) x 100
OUC 16	**Digital security incident resolution**				**(OUC 16a+OUC 16b+)/2**
OUC 16a	Average time to resolve a security vulnerability once reported by COLCERT	GEL index	RC 4.2 How long does the institution take to correct a vulnerability once reported by ColCERT?	a. Minutes b. Hours c. Days d. Weeks e. The institution has not had a report from ColCERT	If a= 75; if b = 50; if c = 25; if d = 0; If e = 100
OUC 16b	The weighted average time to resolve digital security incidents	OECD	68. How many of these digital security incidents were resolved in the following time periods?	a. Within an hour: b. Within a day's work: c. Within a week: d. Within a month: e. Within a year: f. Unresolved:	(a/total number)*100+(b/total number)*80+(c/total number)*60+(d/total number)*40+(e/total number)*20

Source: EDI and EDID data are available in Excel format under the heading "Anexos por entidades" at: https://www.dane.gov.co/index.php/estadisticas-por-tema/gobierno/encuesta-sobre-ambiente-y-desempeno-institucional-nacional-edi/edi-2016-anexos (national institutions) and https://www.dane.gov.co/index.php/estadisticas-por-tema/gobierno/encuesta-sobre-ambiente-y-desempeno-institucional-departamental-edid/edid-2016-anexos (governorates).

Table A.5. Impact Indicators

Code	Indicator name	Data source	Source indicator/question	Response options	Score calculation
IMP 1	**Trust in government**				
	The effect of the use of digital technologies in services delivery, accountability, participation and transparency exercises on the public's trust in government	OECD	98. Did your organisation measure in 2016 the effect of the use of electronic channels in accountability, citizen consultation, formulation/follow-up of plans and projects and/or implementation of procedures/services, in the trust of citizens/companies in your institution?	a. Yes b. No	98: no = NA 99: a = 100; b = -100; c = 0
			99. If the previous answer is affirmative, indicate whether the use of electronic channels in rendering of accounts, public consultations, formulation/follow-up to plans and projects and/or carrying out procedures generated:	a. Increased confidence of citizens/companies in the institution b. Decreased confidence of citizens/companies in the institution c. Did not generate changes in the confidence of citizens/companies in the institution	
			100. Include any additional information that you consider pertinent to the previous question.		
IMP 2	**Sustainable Development Goals**				

Table A.5. Impact Indicators *(continued)*

	Contribution of the GEL Strategy to the accomplishment of the Sustainable Development Goals	OECD	101. Select whether the implementation of the Online Government Strategy in your institution contributed in 2016 to: 102. Justify briefly your answer to the previous question:	a. Put an end to poverty b. End hunger, achieve food security and improve nutrition, and promote sustainable agriculture c. Ensure a healthy life and promote well-being for all ages d. Ensure inclusive, equitable and quality education and promote lifelong learning opportunities for all e. Achieve gender equality and empower all women and girls f. Ensure water availability and sustainable management and sanitation for all g. Ensure access to affordable, secure, sustainable and modern energy for all h. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all i. Build resilient infrastructures, promote inclusive and sustainable industrialisation and foster innovation j. Reduce inequality in and between countries k. Ensure that cities and human settlements are inclusive, secure, resilient and sustainable l. Ensure sustainable consumption and production patterns m. Take urgent action to combat climate change and its effects n. Conserve and sustainably use oceans, seas and marine resources for sustainable development o. Sustainably manage forests, combat desertification, halt and reverse land degradation and the loss of biodiversity p. Promote fair, peaceful and inclusive societies q. Revitalise the Global Partnership for Sustainable Development r. It did not contribute to achieving any of the previous sustainable development objectives	m = 0; (number of cases selected up to q/17)*100
IMP 3	**Public sector integrity**				**(IMP 3a+IMP 3b+IMP 3c+IMP 3d)/4**
IMP 3a	Perceived effectiveness of the publication of the anti-corruption and citizen attention plan for the prevention of irregular practices	EDI/EDID	During the past 12 months, how effective has each of the following strategies been to prevent the occurrence of irregular practices in your institution? E03J – "Publication of the Anti-Corruption and Citizen Service Plan"	Very effective Somewhat effective Slightly effective Not at all effective Don't know	Percentage of public servants who responded "very effective" + percentage of public servants who responded "somewhat effective"

Table A.5. Impact Indicators *(continued)*

IMP 3b	Perceived effectiveness of the citizen accountability processes for the prevention of irregular practices	EDI/EDID	During the past 12 months, how effective has each of the following strategies been to prevent the occurrence of irregular practices in your institution? E03E – "Citizen accountability process"	Very effective Somewhat effective Slightly effective Not at all effective Don't know	Percentage of public servants who responded "very effective" + percentage of public servants who responded "somewhat effective"
IMP 3c	Perceived effectiveness of the strengthening of the citizen petitions and complaints system for the prevention of irregular practices	EDI/EDID	During the past 12 months, how effective has each of the following strategies been to prevent the occurrence of irregular practices in your institution? E03G – "Strengthening the Strategy for responding to Petitions, Complaints and Claims"	Very effective Somewhat effective Slightly effective Not at all effective Don't know	Percentage of public servants who responded "very effective" + percentage of public servants who responded "somewhat effective"
IMP 3d	Perceived effectiveness of the rationalisation of services for the prevention of irregular practices	EDI/EDID	During the past 12 months, how effective has each of the following strategies been to prevent the occurrence of irregular practices in your institution? E03C – "Rationalisation of procedures"	Very effective Somewhat effective Slightly effective Not at all effective Don't know	Percentage of public servants who responded "very effective" + percentage of public servants who responded "somewhat effective"
IMP 4	**User efficiency**				**(IMP 4a+IMP 4b)/2**
IMP 4a	Saving time for citizens and businesses of using digital services compared to traditional channels	OECD	48. In 2016 did the institution have formalities or other administrative procedures (OPAs) that could be carried out either in person or on line? 50. The online provision of the procedure/OPA mentioned in the previous question generated in 2016:	a. Yes b. No g. Less time to access the procedure/service by the user h. More time to access the procedure/service by the user	g = 100; h = -100; none = 0

Table A.5. Impact Indicators *(continued)*

IMP 4b	Saving money for citizens and businesses of using digital services compared to traditional channels	OECD	48. In 2016 did the institution have formalities or other administrative procedures (OPAs) that could be carried out either in person or on line? 50. The online provision of the procedure/OPA mentioned in the previous question generated in 2016:	a. Yes b. No e. Saved money to access the procedure/service by the user f. Cost more (money) to access the procedure/service by the user	e = 100; f = -100; none = 0
IMP 5	**Responsiveness to petitions**				
	Responsiveness to citizen petitions	Transparency Index	ITM 12.3/ITD10.3/ITN sub-indicator 3.1.3. Responding to requests for information from citizens	Scale	0-100
IMP 6	**Access to services**				
	Effect of digital availability on access to a selected service	OECD	48. In 2016 did the institution have formalities or other administrative procedures (TPOs) that could be carried out either in person or on line? 50. The online provision of the procedure/OPA mentioned in the previous question generated in 2016:	a. Yes b. No i. Increased user access to the process/service	i = 100; i not selected = 0
IMP 7	**Participation**				
	Citizen participation	Transparency Index	ITM 14.2/ITD 12.2/ITN 3.3.2: Promotion of spaces for dialogue and consultation with citizens	Scale	0-100
IMP 8	**Transparency on contracting**				**(IMP 8a+IMP 8b+IMP 8c+)/3**
IMP 8a	Public awareness about contracting of goods and services	EDI	During the last 12 months, the contracting of goods and services ...: D02A – was public knowledge.	Totally agree Agree Disagree Strongly disagree Don't know	Percentage of public servants who responded "totally agree" + percentage of public servants who responded "agree"

Table A.5. Impact Indicators *(continued)*

IMP 8b	Contracting information is available through several media	EDI	During the last 12 months, in the institution, information on hiring ...: D05A – was published in various media.	Totally agree Agree Disagree Strongly disagree Don't know	Percentage of public servants who responded "totally agree" + percentage of public servants who responded "agree"
IMP 8c	Transparency in contracting of personnel	EDI	During the last 12 months, in the institution, contracting contractor personnel ...: C09B – was public knowledge.	Totally agree Agree Disagree Strongly disagree Don't know	Percentage of public servants who responded "totally agree" + percentage of public servants who responded "agree"
IMP 9	**Government efficiency**				**(IMP 9a+IMP 9b+IMP 9c)/3**
IMP 9a	Presence of ICT capacities generating efficiency in internal and/or external service provision	GEL index	RC3.6: Has the institution developed IT management capabilities that generate greater efficiency in providing the service to the user (internal or external)?	a. Yes b. No	Yes = 100 No = 0
IMP 9b	Money savings thanks to digital service provision	OECD	48. In 2016 did the institution have formalities or other administrative procedures (OPAs) that could be carried out either in person or on line? 50. The online provision of the procedure/OPA mentioned in the previous question generated in 2016:	a. Saved money for the provision of the procedure/service for the institution b. Cost more (money) for the provision of the procedure/service for the institution	**a = 100; b = -100; none = 0**
IMP 9c	Time savings thanks to digital service provision	OECD	48. In 2016 did the institution have formalities or other administrative procedures (OPAs) that could be carried out either in person or on line? 50. The online provision of the procedure/OPA mentioned in the previous question generated in 2016:	c. Saved time in the provision of the procedure/service by the institution d. Took more time in the provision of the procedure/service by the institution	c = 100; d = -100; none = 0

Table A.5. Impact Indicators *(continued)*

IMP 10	Internal process improvements				
	Percentage of internal processes that have been improved through the use of ICTs	OECD	63. Please indicate which of the following internal processes were improved in 2016 thanks to ICT:	a. Human resources management b. Budget cycle c. Financial management d. Asset management e. Travel expenses and commissions f. Recruitment g. Project management h. Participation of actors in decision-making processes i. Claim and suggestion management j. Internal and external communication k. Form processing l. Evidence-based policy formulation m. Provision of services n. Detection/prevention of erroneous behaviour o. Evaluation of initiatives p. Other, please specify:	(a+b+c+d+e+f+g+h+i+j+k+l+m+n+o+p)/16*100

Source: Indicator scores of the Transparency Index are available in Excel format at: http://indicedetransparencia.org.co/2015-2016/ITN/EntidadesNacionales (national institutions), http://indicedetransparencia.org.co/ITD/Gobernaciones (governorates) and http://indicedetransparencia.org.co/ITM/Alcaldias (municipalities). EDI and EDID data are available in Excel format under the heading "Anexos por entidades" at: https://www.dane.gov.co/index.php/estadisticas-por-tema/gobierno/encuesta-sobre-ambiente-y-desempeno-institucional-nacional-edi/edi-2016-anexos (national institutions) and https://www.dane.gov.co/index.php/estadisticas-por-tema/gobierno/encuesta-sobre-ambiente-y-desempeno-institucional-departamental-edid/edid-2016-anexos (governorates).

Annex B. Categorisation for aggregated indicator scores

Institutions at the national level of government (1 score)

Sector scores (24 scores) *– categorisation provided by the Ministry of Information and Communication Technologies (MinTIC*

a) Agriculture and rural development
b) City and territory housing
c) Commerce, industry and tourism
d) Culture
e) Defence
f) Education
g) Employment
h) Environment and sustainable development
i) Foreign affairs
j) Health and social protection
k) Information and communications technologies
l) Interior
m) Justice and law
n) Mines and energy
o) Planning
p) Presidency
q) Public administration
r) Science, technology and innovation
s) Social inclusion and reconciliation
t) Sports, recreation, physical activity and leisure
u) Statistics
v) Strategic intelligence and counter-intelligence
w) Transport

Institutions at the territorial level of government (1 score)

Governorates (1 score) and municipalities (1 score) – categorisation provided by MinTIC

Regions (5 scores) – categorisation created by the OECD in co-operation with MinTIC

a) *Atlántica*: Atlántico, Bolívar, Cesar, Córdoba, La Guajira, Magdalena, San Andrés and Sucre (eight departments)
b) *Oriental*: Boyacá, Cundinamarca, Meta, Norte de Santander, Santander and Bogotá (six departments)

c) *Central*: Antioquia, Caldas, Caquetá, Huila, Quindío, Risaralda and Tolima (seven departments).
d) *Pacífica*: Cauca, Chocó, Nariño and Valle del Cauca (four departments)
e) *Orinoquía-Amazonía*: Arauca, Casanare, Vichada, Guainía, Guaviare, Vaupés, Amazonas and Putumayo (eight departments).

Development environment ***(3 scores)*** *– existing categorisation by the National Planning Department*

a) robust
b) intermediate
c) early

Annex C. Eliminated indicators

A first statistical analysis of the collected data has led to the elimination of one indicator and of nine sub-indicators from the model. Several sub-indicators were removed as they were detrimental to other sub-indicators with excellent response rates, hence affecting the whole quality of the indicator. As far as sub-indicators are concerned, full indicators are calculated based on the remaining sub-indicators in the model.

Table C.1. First elimination of (sub-)indicators from the assessment model

Code	Indicator name	Source	Missing data	Consideration
OUP 13	Online incident reporting	OECD	1 000+	Compromise the validity of the results
ACT 20a	Adoption of the Information Security and Privacy Framework (MSPI)	SINERGIA	Not available	Impossible to calculate the specified indicator
OUC 7c	Percentage of downloaded datasets on the central open data portal	MinTIC statistics	Not available	Impossible to calculate the specified indicator
OUC 8b	Percentage of people involved in the definition of current and future policies, plans, programmes, projects and initiatives of public entities through electronic means	SINERGIA	Not available	Impossible to calculate the specified indicator
IMP 4c	Digital/face-to-face service time ratio for user	OECD	1 050+	Compromise the validity of the results through contamination of other sub-indicators
IMP 4d	Digital/face-to-face service costs ratio for user	OECD	1 200+	Compromise the validity of the results through contamination of other sub-indicators
IMP 4e	Digital/face-to-face service process ratio for user	OECD	1 050+	Compromise the validity of the results through contamination of other sub-indicators
IMP 9d	Digital/face-to-face service time ratio for institution	OECD	1 050+	Compromise the validity of the results through contamination of other sub-indicators
IMP 9e	Digital/face-to-face service costs ratio for institution	OECD	1 150+	Compromise the validity of the results through contamination of other sub-indicators
IMP 9f	Digital/face-to-face service process ratio for institution	OECD	1 050+	Compromise the validity of the results through contamination of other sub-indicators

Annex D. Response rates and coded nature of variables

Table D.1. Response rates and coded nature of variables

Indicator code	Indicator name	National institutions		Municipalities		Governorates		Variable nature
		N (/147)	%	N (/1101)	%	N (/32)	%	
INP1	Financial resources	112	76.2	618	56.1	29	90.6	Continuous
INP2	Human resources	105	71.4	863	78.4	28	87.5	Continuous
INP3	Technical resources	120	81.6	1 051	95.5	31	96.9	Continuous
INP4	Institutional legal framework	120	81.6	993	90.2	31	96.9	Ordinal
INP5	Strategic support	119	81.0	1 078	97.9	32	100.0	Ordinal
INP6	Legal framework: Services	120	81.6	993	90.2	31	96.9	Continuous
INP7	Guidance: Services	120	81.6	1 054	95.7	32	100.0	Continuous
INP8	Legal framework: Open government	120	81.6	1 039	94.4	31	96.9	Continuous
INP9	Guidance: Open government	120	81.6	954	86.6	32	100.0	Continuous
INP10	Legal framework: Management	120	81.6	993	90.2	31	96.9	Continuous
INP11	Guidance: Management	120	81.6	1 047	95.1	32	100.0	Continuous
INP12	Legal framework: Security	120	81.6	993	90.2	31	96.9	Continuous
INP13	Guidance: Security	120	81.6	954	86.6	32	100.0	Ordinal
ACT1	Co-ordination	120	81.6	1 038	94.3	32	100.0	Continuous
ACT2	Planning: Services	120	81.6	1 077	97.8	32	100.0	Ordinal
ACT3	Services policy	120	81.6	943	85.6	30	93.8	Dichotomous
ACT4	Training: Services	120	81.6	821	74.6	27	84.4	Continuous
ACT5	Implementation: Services	120	81.6	561	51.0	17	53.1	Continuous
ACT6	Monitoring: Services	120	81.6	967	87.8	31	96.9	Dichotomous
ACT7	Planning: Open government	120	81.6	1 077	97.8	32	100.0	Ordinal
ACT8	Open government policy	120	81.6	943	85.6	30	93.8	Dichotomous
ACT9	Training: Open government	120	81.6	740	67.2	30	93.8	Continuous
ACT10	Implementation: Open government	116	78.9	354	32.2	7	21.9	Continuous
ACT11	Monitoring: Open government data reuse	138	93.9	1 089	98.9	32	100.0	Dichotomous
ACT12	Planning: Management	120	81.6	1 056	95.9	32	100.0	Continuous

Table D.1. Response rates and coded nature of variables *(continued)*

Indicator code	Indicator name	National institutions		Municipalities		Governorates		Variable nature
		N (/147)	%	N (/1101)	%	N (/32)	%	
ACT13	Management policy	138	93.9	1 089	98.9	32	100.0	Continuous
ACT14	Training: Management	120	81.6	660	59.9	27	84.4	Continuous
ACT15	Implementation: Management	139	94.6	1 089	98.9	32	100.0	Continuous
ACT16	Monitoring: Management	138	93.9	1 089	98.9	32	100.0	Continuous
ACT17	Planning: Security	120	81.6	1 056	95.9	32	100.0	Ordinal
ACT18	Security policy	147	100.0	1 089	98.9	32	100.0	Continuous
ACT19	Training: Security	120	81.6	671	60.9	26	81.3	Continuous
		N (/147)	%	N (/1101)	%	N (/32)	%	
ACT20	Implementation: MSPI	138	93.9	1 089	98.9	32	100.0	Continuous
ACT21	Monitoring: Security	147	100.0	1 077	97.8	32	100.0	Continuous
OUP1	Digital service availability	106	72.1	450	40.9	16	50.0	Continuous
OUP2	Digital authentication availability	106	72.1	662	60.1	30	93.8	Continuous
OUP3	Digital service quality	130	88.4	1 089	98.9	32	100	Continuous
OUP4	Integrated petition system	138	93.9	1 089	98.9	32	100	Ordinal
OUP5	Online transparency	138	93.9	1 089	98.9	32	100	Continuous
OUP6	Open government data	95	64.6	484	43.9	28	87.5	Continuous
OUP7	Digital participation availability	138	93.9	1 089	98.9	32	100	Continuous
OUP8	Open innovation exercises	138	93.9	1 089	98.9	32	100.0	Dichotomous
OUP9	Automated procedures	109	74.1	614	55.8	21	65.6	Continuous
OUP10	Data quality	120	81.6	1 015	92.2	31	96.9	Continuous
OUP11	Data catalogues	138	93.9	1 089	98.9	32	100.0	Ordinal
OUP12	Interoperable information services	138	93.9	1 089	98.9	32	100.0	Continuous
OUP13	Digital incident reporting	44	29.9	220	20.0	11	34.4	X
OUP14	Critical information assets	138	93.9	1 089	98.9	32	100.0	Dichotomous
OUP15	Incident information exchange	131	89.1	463	42.1	20	62.5	Dichotomous
OUC1	Digital service use	72	49.0	413	37.5	22	68.8	Continuous

Table D.1. Response rates and coded nature of variables *(continued)*

Indicator code	Indicator name	National institutions		Municipalities		Governorates		Variable nature
		N (/147)	%	N (/1101)	%	N (/32)	%	
OUC2	Digital channel preference	102	69.4	0*	0	32	100.0	Continuous
OUC3	Online petition processing	88	59.9	361	32.8	19	59.4	Continuous
OUC4	Digital authentication use	76	51.7	351	31.9	14	43.8	Continuous
OUC5	Service satisfaction	130	88.4	1 089	98.9	32	100.0	Continuous
OUC6	Use of public information	106	72.1	645	58.6	22	68.8	Ordinal
OUC7	Open government data reuse	89	60.5	713	64.8	27	84.4	Ordinal
OUC8	Digital participation	138	93.9	1 089	98.9	32	100.0	Ordinal
OUC9	Participation of vulnerable groups	62	42.2	296	26.9	16	50.0	Continuous
OUC10	Open innovation solutions	138	93.9	1 089	98.9	32	100.0	Dichotomous
OUC11	Shared ICT provisions	120	81.6	1 022	92.8	30	93.8	Continuous
OUC12	Data sharing in the public sector	119	81.0	1 013	92.0	31	96.9	Continuous
OUC13	Strategic data use	120	81.6	953	86.6	29	90.6	Continuous
OUC14	Privacy satisfaction	119	81.0	1 022	92.8	31	96.9	Dichotomous
OUC15	Digital incident level	41	27.9	137	12.4	4	12.5	Continuous
OUC16	Digital incident resolution	25	17.0	35	3.2	3	9.4	Continuous
IMP1	Trust in government	53	36.1	432	39.2	24	75.0	Ordinal
IMP2	Sustainable Development Goals	120	81.6	1 012	91.9	31	96.9	Continuous
IMP3	Public sector integrity	101	68.7	0*	0	32	100.0	Continuous
IMP4	User efficiency	120	81.6	859	78.0	29	90.6	Ordinal
IMP5	Responsiveness to petitions	66	44.9	28**	2.5	32	100.0	Continuous
IMP6	Access to services	120	81.6	859	78.0	29	90.6	Dichotomous
IMP7	Participation	66	44.9	27**	2.5	32	100.0	Continuous

Table D.1. Response rates and coded nature of variables *(continued)*

Indicator codes	Component	National institutions		Municipalities		Governorates		Variable nature
		N (/147)	%	N (/1101)	%	N (/32)	%	
IMP8	Transparency on contracting	100	68.0	0*	0	32	100.0	Continuous
IMP9	Government efficiency	120	81.6	858	77.9	29	90.6	Ordinal
IMP10	Internal process improvements	120	81.6	1 025	93.1	31	96.9	Continuous

Notes: Recurring similarities in certain response rates are explained by the use of common sources (GEL index, FURAG, Transparency Index, etc.). Response rates under 40% have been coloured in blue as they require further consideration.
* These indicators were calculated based on the national and departmental EDI surveys for which municipalities were not reported.
** These indicators were calculated based on the Transparency Index, for which only a handful of municipalities were reported.
Variable nature refers to how different variables were classified within the statistical analysis.

Annex E. Mean indicator scores

Table E.1. Means for input indicators

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		INP1	INP2	INP3	INP4	INP5	INP6	INP7	INP8	INP9	INP10	INP11	INP12	INP13
		Financial resources	Human resources	Technical resources	Institutional legal framework	Strategic support	Legal framework: services	Guidance: Services	Legal framework: Open government	Guidance: Open government	Legal framework: management	Guidance: Management	Legal framework: Security	Guidance: Security
Regions	Overall	18.7	18.3	60.0	57.1	69.7	51.0	43.8	57.7	39.1	40.9	25.5	48.8	35.5
	National institutions	29.6	30.4	73.3	79.4	75.6	72.2	62.5	83.8	55.2	72.9	61.7	86.0	88.3
	Municipalities	16.0	16.5	58.4	53.9	67.9	48.1	40.7	54.1	35.3	36.8	20.1	43.9	29.0
	Governorates	33.5	27.3	61.3	72.6	70.6	62.4	63.4	75.8	55.0	49.6	44.1	63.4	60.9
	Atlántica	31.8	30.7	76.9	56.7	65.6	48.1	39.6	55.2	33.1	34.7	19.6	44.3	28.7
	Central	17.5	16.9	58.4	56.4	67.3	52.2	44.5	58.9	41.6	39.1	23.9	48.2	33.7
	Oriental	19.2	17.2	59.1	56.8	70.1	49.5	42.0	55.6	35.7	40.3	20.9	46.3	29.2
	Orinoquía-Amazonía	15.5	16.7	59.9	49.6	68.0	44.6	41.0	52.1	39.3	32.6	19.9	38.1	34.4
	Pacífica	18.4	17.9	629	44.8	66.9	41.8	37.1	46.3	29.2	30.8	17.4	36.3	25.3
Development environment	Early	14.5	16.5	53	49.7	68.4	45.8	35.3	51.4	30.3	34.1	16.4	40.0	24.8
	Intermediate	16.8	15.9	60	54.2	67.5	47.9	42.3	54.0	36.6	36.0	20.7	43.3	29.1

Table E.1. Means for input indicators *(continued)*

	Robust	24.1	27.0	64.6	76.1	74.5	64.9	58.8	74.3	54.6	55.4	39.8	68.6	56.3
Sectors	Agriculture and rural development	30.1	30.6	66.7	49.6	80.0	65.5	46.0	72.2	44.4	56.3	45.8	83.3	83.3
	City and territory housing	22.3	31.6	55.5	91.7	70.0	80.9	61.9	88.9	53.3	75	91.7	94.4	66.7
	Commerce, industry and tourism	32.8	26.7	76.7	75.0	71.0	58.6	74.3	80.0	62.0	58.8	57.5	73.3	90.0
	Culture	25.1	23.4	91.7	81.3	60.0	83.9	85.7	95.8	75.0	81.3	93.8	100	100
	Defence	31.4	34.5	64.1	79.9	68.5	62.1	44.2	79.5	36.2	58.7	39.3	74.4	76.9
	Education	30.2	33.6	66.7	83.3	68.9	61.9	62.3	74.1	60.0	66.7	62.5	74.1	100
	Employment	23.4	26.4	66.7	80.0	88.0	74.3	69.0	86.7	56.7	77.5	58.3	86.7	100
	Environment and sustainable development	34.9	35.4	91.7	100	90.0	92.9	100	100	85.0	90.6	93.8	100	100
	Foreign affairs	17.1	36.0	83.3	75	100.0	100	92.9	91.7	50.0	81.3	81.3	100	100
	Health and social protection	26.8	30.2	100	82.1	72.9	82.6	67.1	90.5	64.0	87.5	56.3	88.1	92.9
	Information and communications technologies	32.7	30.8	73.3	95	80.0	81.4	82.9	88.3	88.0	80.0	85.0	100	100
	Interior	27.1	33.4	60	65	82.2	68.6	69.0	81.7	56.7	67.5	72.9	83.3	90.0
	Justice and law	38.2	18.9	58.3	75	92.5	64.3	54.3	66.7	56.0	75.0	52.5	100	100
	Mining and energy	34.5	28.1	76.2	64.3	68.6	72.4	79.6	92.9	60.0	83.9	92.9	97.6	85.7
	Planning	36.7	35.2	83.3	100	70.0	89.3	100	95.8	100	93.8	96.8	95.8	100
	Presidency	34.2	23.7	91.7	87.5	77.5	76.8	60.0	87.5	48.0	81.3	50.0	100	100
	Public administration	33.8	37.4	100	50.0	70.0	71.4	35.7	75.0	50.0	100	50.0	100	100
	Science, technology and innovation	33.4	34.8	66.7	100	70.0	100	85.7	91.7	100	100	100	100	100
	Social inclusion and reconciliation	33.8	33.9	88.9	83.3	90.0	80.9	50	86.1	40.0	91.7	53.1	100	83.3

Table E.1. Means for input indicators *(continued)*

Sports, recreation, physical activity and leisure	33.5	23.0	100	50.0	70.0	85.7	100	100	100	100	100	100	100
Statistics	33.4	22.2	66.7	100	85.0	78.6	57.1	91.7	0.0	93.8	93.8	75	50
Strategic intelligence and counter-intelligence	33.3	34.5	X	100	100	85.7	71.4	100	20.0	87.5	100	100	100
Transport	26.7	25.6	58.3	81.3	70.0	75.0	31.4	81.3	44.0	62.5	52.5	79.2	75.0
Finance and public credit	22.6	34.1	71.1	75.0	76.7	66.7	55.6	79.4	51.6	64.2	52.6	77.8	76.7

Note: All scores have been calculated on a scale from 0-100.

Table E.2. Means for activity indicators

		ACT1	ACT2	ACT3	ACT4	ACT5	ACT6	ACT7	ACT8	ACT9	ACT10	ACT11	ACT12	ATC13
		Co-ordination	Planning: Services	Services policy	Training: Services	Implementation: Services	Monitoring: Services	Planning: Open government	Open government policy	Training: Open government	Implementation: Open government	Monitoring: Open government data reuse	Planning: Management	Management policy
Overall	Overall	52.9	66.8	55.3	44.8	45.3	24.9	57.6	76.8	43.4	60.8	43.2	41.1	20.3
	National institutions	75.7	82.8	78.3	57.6	59.8	54.2	78.1	86.7	53.3	63.7	55.8	81.3	71.3
	Municipalities	49.6	64.8	51.3	42.6	41.6	21.1	55.0	75.3	41.1	59.8	41.0	36.2	12.7
	Governorates	75.6	74.0	86.7	56.5	65.8	29.0	70.3	83.3	60.0	69.2	65.6	51.8	43.8
Regions	Atlántica	48.1	67.8	56.1	47.6	44.0	26.2	52.8	71.1	45.6	62.4	41.7	36.3	18.8
	Central	54.8	68.3	53.2	45.8	46.1	24.6	60.9	78.0	42.1	61.0	44.0	41.0	13.6
	Oriental	51.9	66.5	49.9	41.3	41.4	18.1	55.7	79.0	41.3	60.0	45.0	35.3	12.4
	Orinoquía-Amazonía	53.2	63.3	46.0	40.3	40.7	20.0	51.7	78.0	40.6	51.6	47.5	33.9	12.1
	Pacífica	40.7	59.9	55.1	38.1	37.1	18.8	50.3	67.3	38.4	57.7	28.5	34.3	10.8
Development environment	Early	46.6	59.7	52.5	40.9	39.6	20.4	50.2	70.5	39.1	57.8	36.4	31.7	12.3
	Intermediate	49.5	65.2	48.9	41.9	41.6	19.1	55.6	77.9	41.0	59.8	41.7	36.2	12?4
	Robust	71.8	84.8	75.0	57.0	59.3	44.8	73.9	79.4	56.8	67.7	66.2	59.0	32.6
Sectors	Agriculture and rural development	83.3	88.9	66.7	66.7	57.9	50.0	75.0	83.3	62.5	62.2	33.3	83.3	61.3
	City and territory housing	66.7	88.9	100	27.8	39.8	66.7	66.7	66.7	47.2	61.6	33.3	66.7	86.7
	Commerce, industry and tourism	74.0	80.0	70.0	55.0	62.8	60.0	70.0	90.0	57.5	67.4	71.4	72.9	77.8
	Culture	60.0	100	75.0	68.8	53.5	0.0	93.4	100	77.1	61.2	25.0	78.6	77.9
	Defence	72.3	79.5	92.3	55.8	54.1	61.5	67.3	76.9	48.1	55.6	75	72.5	61.3

Table E.2. Means for activity indicators *(continued)*

Education	77.8	92.6	77.8	63.0	63.6	44.4	83.3	88.9	36.1	57.9	X	76.2	71.8
Employment	72.0	60.0	80.0	45.0	75.0	60.0	70.0	100	48.3	57.5	66.7	85.7	86.7
Environment and sustainable development	90.0	100	100	72.9	72.2	75.0	87.5	100	66.7	77.5	50.0	92.9	82.1
Finance and public credit	73.3	75.6	53.3	67.2	55.7	53.3	83.3	86.7	51.1	64.2	22.8	85.7	78.9
Foreign affairs	80.0	83.3	100	62.5	68.1	100	62.5	100	41.7	66.7	50.0	100	100
Health and social protection	74.3	90.5	57.1	45.2	54.0	71.4	71.4	85.7	48.1	61.4	50.0	77.6	41.7
Information and communications technologies	84.0	86.7	80.0	68.3	57.8	40.0	90.0	100	70.0	71.6	80.0	91.4	90.3
Interior	76.0	80.0	100	61.7	62.2	80.0	80.0	60.0	58.3	54.6	16.7	77.1	59.2
Justice and law	80.0	75.0	75.0	66.7	52.1	25.0	87.5	100	56.3	81.6	40.0	67.9	74.3
Mines and energy	82.9	85.7	85.7	59.5	67.1	28.6	85.7	100	64.3	74.0	85.7	77.6	552
Planning	75.0	100	100	70.8	84.7	100	93.8	100	72.9	70.4	100	100	81.7
Presidency	90.0	58.3	100	70.8	74.3	75.0	87.5	75.0	68.8	71.6	100	82.1	75
Public administration	60.0	100	100	41.7	58.3	100	100	100	66.7	93.2	100	100	91.7
Science, technology and innovation	60.0	100	100	50.0	63.9	X	100	100	58.3	74.9	100	100	100
Social inclusion and reconciliation	73.3	88.9	100	16.7	51.9	33.3	91.7	66.7	44.4	57.2	75	100	97.9
Sports, recreation, physical activity and leisure	100	100	100	75.0	63.9	100	75.0	100	41.7	58.3	X	100	83.3
Statistics	60.0	50.0	50.0	33.3	56.9	0.0	37.5	50.0	12.5	50.8	0	92.9	59.2

Table E.2. Means for activity indicators *(continued)*

Strategic intelligence and counter-intelligence	60.0	33.3	X	33.3	22.2	X	75.0	X	50.0	23.3	X	100	66.7
Transport	70.0	91.7	75.0	33.3	47.9	50.0	56.3	100	22.9	55.8	60.0	71.4	64.3

Note: All scores have been calculated on a scale from 0-100. ACT3 and ACT8 were measured on a 0-1 basis, but were converted to a 0-100 scale in this table for coherence with other indicators.

Table E.2. Means for activity indicators (continued)

		ACT14	ACT15	ACT16	ACT17	ACT18	ACT19	ACT20	ACT21
		Training: Management	Implementation: Management	Monitoring: Management	Planning: Security	Security policy	Training: Security	Implementation: MSPI	Monitoring: Security
Overall	Overall	35.0	31.2	17.3	33.4	41.1	39.3	25.0	33.1
	National institutions	47.1	60.6	56.2	71.3	87.2	60.9	61.8	69.2
	Municipalities	32.3	26.9	11.6	28.8	34.8	35.1	19.7	28.0
Regions	Governorates	46.3	47.4	31.2	43.0	43.2	47.8	36.4	40.2
	Atlántica	36.8	28.5	13.9	32.6	35.6	34.8	20.9	29.2
	Central	33.5	29.2	14.7	30.4	32.7	36.1	18.7	27.9
	Oriental	31.6	27.0	9.7	29.0	37.5	36.8	21.2	28.5
	Orinoquía-Amazonía	30.6	26.2	9.5	25.0	41.3	30.4	22.4	23.6
	Pacífica	30.6	25.4	12.8	25.4	30.7	33.9	18.6	29.2
Development environment	Early	32.5	24.7	11.4	26.2	27.9	33.9	18.5	27.1
	Intermediate	31.5	26.7	10.9	28.1	35.6	34.3	19.0	28.1
	Robust	44.9	46.0	25.9	47.9	56.7	50.7	35.3	34.4
Sectors	Agriculture and rural development	57.7	65.8	61.4	87.5	85.2	86.9	67.5	70.8
	City and territory housing	35.7	57.4	44.1	66.7	72.2	34.5	64.3	55.6
	Commerce, industry and tourism	52.5	62.3	59.1	60.0	91.7	52.5	65.0	75.4
	Culture	45.5	60.6	45.4	75.0	54.2	68.8	43.0	65.6
	Defence	55.3	54.6	54.4	69.2	82.5	57.1	52.4	70.8
	Education	41.3	46.8	46.5	72.2	57.9	60.3	64.2	51.5
	Employment	49.3	71.2	74.6	45.0	81.9	65.7	78.4	72.9
	Environment and sustainable development	50.9	51.1	42.9	81.3	93.8	50.9	59.3	70.8

Table E.2. Means for activity indicators *(continued)*

Finance and public credit	41.4	62.7	54.7	75.0	86.4	60.2	59.5	70.6
Foreign affairs	16.1	83.4	87.8	75.0	100	64.3	77.9	100
Health and social protection	39.8	61.2	50.6	53.6	97.5	38.8	63.3	58.8
Information and communications technologies	53.6	52.4	54.7	65.0	76.7	77.9	50.1	80.0
Interior	56.4	57.3	44.5	65.0	83.3	70.7	41.5	59.7
Justice and law	51.8	57.9	54.8	81.3	98.3	72.3	72.3	65.8
Mines and energy	53.1	67.0	64.0	64.3	83.3	72.4	65.9	69.6
Planning	50.9	82.1	95.8	87.5	100	86.6	92.0	96.9
Presidency	61.6	64.2	53.6	87.5	100	72.3	69.9	80.0
Public administration	60.7	61.1	67.2	100	95.8	53.6	58.3	68.8
Science, technology and innovation	71.4	85.7	76.7	50.0	100	39.3	70.8	41.7
Social inclusion and reconciliation	53.6	60.5	68.2	91.7	81.3	60.1	65.6	62.5
Sports, recreation, physical activity and leisure	32.1	48.6	25.0	100	100	46.4	69.2	100
Statistics	19.6	70.4	44.2	62.5	87.5	39.3	60.3	75.0
Strategic intelligence and counter-intelligence	39.3	55.4	26.7	100	100	67.9	87.5	100
Transport	24.1	57.8	54.9	75.0	95.0	27.7	56.4	62.5

Note: All scores have been calculated on a scale from 0-100.

Table E.3. Means for output indicators

		OUP1	OUP2	OUP3	OUP4	OUP5	OUP6	OUP7	OUP8	OUP9	OUP10	OUP11	OUP12	OUP13	OUP14	OUP15
		Digital service availability	Electronic authentication availability	Digital service quality	Integrated petition system	Online transparency	Open government data	Digital participation availability	Open innovation exercises	Automated procedures	Data quality	Data catalogues	Interoperable information services	Online incident reporting	Critical information assets	Incident information exchange
Overall	Overall	41.1	33.0	41.4	75.2	69.9	57.3	74.5	36.1	37.2	47.9	14.9	13.6	X	22.8	22.8
	National institutions	45.2	37.3	64.6	81.9	76.7	66.4	58.1	54.3	43.1	58.1	31.6	18.0	X	56.5	43.5
	Municipalities	39.7	32.6	37.9	73.8	68.9	55.0	75.8	33.1	36.0	46.4	12.3	12.9	X	17.9	16.6
Regions	Governorates	46.2	26.0	67.6	91.7	84.8	67.1	100	62.5	40.6	58.7	27.8	14.1	X	34.4	30.0
	Atlántica	40.2	29.3	40.1	72.2	65.3	52.9	71.4	35.7	43.1	53.7	14.3	13.4	X	18.1	14.3
	Central	41.2	31.2	42.9	76.6	72.6	57.6	78.9	37.7	40.5	49.5	13.9	12.7	X	21.5	22.4
	Oriental	41.8	36.6	39.9	75.3	70.3	58.2	82.9	31.7	34.3	43.1	10.3	14.4	X	16.1	16.3
	Orinoquía-Amazonía	34.9	25.1	35.2	74.9	72.3	60.1	62.3	34.4	25.6	41.1	16.4	6.8	X	9.8	22.2
	Pacífica	33.7	28.6	29.2	70.4	63.7	47.0	69.3	31.3	29.3	44.6	13.0	11.9	X	21.8	12.3
Development environment	Early	37.6	32.3	32.2	69.9	64.1	46.5	68.1	33.5	29.1	47.6	12.3	13.1	X	16.6	19.1
	Intermediate	40.0	32.0	38.0	75.1	69.5	57.3	78.4	30.8	36.5	45.0	12.2	12.8	X	17.1	16.7
	Robust	45.1	29.3	61.4	85.9	83.7	70.3	91.6	66.2	54.5	58.4	19.3	13.9	X	39.4	17.1
Sectors	Agriculture and rural development	36.3	61.5	58.3	70.4	68.7	62.5	38.1	50.0	44.8	65.2	40.0	11.1	X	55.6	33.3
	City and territory housing	41.2	18.5	16.7	88.9	70.3	53.3	66.7	66.7	35.7	15.2	0.0	0.0	X	33.3	50.0
	Commerce, industry and tourism	58.7	57.0	81.7	90.0	83.3	65.4	73.6	71.4	49.8	72.7	43.0	10.0	X	80.0	30.0
	Culture	10.5	42.4	37.5	58.3	82.1	80.0	57.1	50.0	51.8	77.3	32.5	55.0	X	50.0	0.0
	Defence	46.5	32.6	63.1	82.5	78.3	77.9	45.0	50.0	51.6	41.3	25.7	27.0	X	71.4	66.7
	Education	42.5	23.6	73.1	72.7	74.6	51.5	55.8	54.5	35.9	64.6	17.3	9.1	X	27.3	30.0
	Employment	63.9	61.9	52.8	66.7	68.2	48.0	40.5	33.3	31.5	70.9	38.3	24.0	X	83.3	16.7

Table E.3. Means for output indicators *(continued)*

Environment and sustainable development	35.5	63.6	84.2	75.0	78.7	70.5	85.7	50.0	27.9	75.0	17.5	25.0	X	75.0	50.0
Finance and public credit	41.4	28.1	53.5	87.1	69.4	60.8	53.2	44.4	59.5	46.7	29.5	13.0	X	52.6	16.7
Foreign affairs	35.2	60.0	95.2	100	75.2	82.5	78.6	0.0	67.8	81.8	65.0	62.5	X	50.0	50.0
Health and social protection	38.4	25.6	65.1	83.3	82.4	73.0	57.1	70.0	36.2	48.1	33.0	10.0	X	50.0	50.0
Information and communications technologies	49.4	19.0	88.3	100	89.6	56.4	79.5	40.0	26.2	52.7	12.0	20.0	X	60.0	60.0
Interior	43.8	58.3	60.7	72.2	64.5	37.8	45.2	16.7	43.1	41.8	28.3	0.0	X	33.3	40.0
Justice and law	53.1	14.8	83.3	66.7	85.4	50.0	48.6	60.0	18.9	84.1	46.0	3.3	X	20.0	50.0
Mines and energy	40.4	48.7	51.6	95.2	80.4	77.1	77.6	42.9	53.2	61.0	32.9	6.5	X	71.4	83.3
Planning	59.5	61.9	100	100	86.6	79.2	82.1	75.0	32.1	77.3	75.0	27.0	X	75.0	100
Presidency	75.0	32.3	89.1	100	74.1	78.6	68.6	80.0	34.9	40.9	26.0	42.9	X	60.0	100
Public administration	86.1	100.0	69.4	83.3	85.9	83.3	71.4	100	X	100	30.0	70.0	X	50.0	50.0
Science, technology and innovation	66.7	44.4	100	100	93.8	80.0	100	100	10.7	81.8	100	X	X	X	X
Social inclusion and reconciliation	27.5	0.00	32.8	83.3	73.7	69.2	42.9	75	32.3	75.8	32.5	25.0	X	75.0	25.0
Sports, recreation, physical activity and leisure	66.7	X	X	100	83.5	60.0	85.7	X	2.0	100	X	X	X	X	X
Statistics	37.2	1.9	79.7	66.7	70.1	X	42.9	100	79.2	50.0	30.0	12.5	X	50.0	50.0
Strategic intelligence and counter-intelligence	X	X	X	66.7	X	X	X	X	X	45.5	X	X	X	100	100
Transport	36.8	25.0	62.3	66.7	74.6	78.3	68.6	80.0	32.2	40.9	40.0	20.0	X	40.0	20.0

Note: All scores have been calculated on a scale from 0-100.

Table E.4. Means for outcome indicators

		OUC1	OUC2	OUC3	OUC4	OUC5	OUC6	OUC7	OUC8	OUC9	OUC10	OUC11	OUC12	OUC13	OUC14	OUC15	OUC16
		Digital service use	Digital channel preference	Online petition processing	Electronic authentication use	Service satisfaction	Use of public information	Open government data reuse	Digital participation	Participation of vulnerable groups	Open innovation solutions	Shared ICT provisions	Data sharing public sector	Strategic data use	Privacy satisfaction	Digital incident level	Digital incident resolution
Overall	Overall	14.6	40.0	30.7	22.9	48.9	50.1	19.7	46.6	36.9	31.8	14.8	44.0	20.8	90.7	-31.3	62.7
	National institutions	20.0	46.6	49.8	21.0	59.2	58.0	26.4	55.8	24.0	47.1	8.8	64.8	39.8	85.7	-34.1	55.5
	Municipalities	13.7	0	25.8	23.7	46.8	48.1	18.5	44.9	38.9	29.3	15.2	40.7	18.1	91.4	-30.5	68.1
	Governorates	14.3	18.9	35.9	13.1	76.0	70.5	28.7	65.6	46.4	50.0	22.2	68.6	33.3	87.1	-27.4	59.7
Regions	Atlántica	24.3	49.6	57.7	12.8	55.7	60.6	26.8	56.0	26.3	52.4	11.3	69.8	45.7	90.8	-32.9	56.1
	Central	17.4	17.0	26.2	32.8	46.2	51.0	18.1	45.0	35.7	30.2	15.4	42.7	18.9	93.7	-26.5	57.9
	Oriental	43.5	21.2	28.8	22.1	51.8	55.0	21.1	52.1	41.0	33.1	15.9	40.7	22.1	91.9	-30.5	80.7
	Orinoquía-Amazonía	14.2	22.9	27.1	22.2	50.7	46.7	18.6	45.7	47.4	28.6	14.7	42.1	16.1	89.5	-33.7	68.7
	Pacífica	12.0	15.4	15.0	23.6	45.1	52.1	22.4	42.6	21.3	32.8	16.4	43.6	16.4	86.8	-25.7	58.1
Development environment	Early	13.8	11.7	26.2	19.0	43.1	46.2	19.8	39.5	33.5	26.8	14.8	41.5	18.4	90.6	-27.0	57.0
	Intermediate	12.8	20.2	26.2	24.1	45.9	47.9	18.1	47.8	39.3	28.4	15.0	40.5	17.7	91.9	-32.7	70.2
	Robust	16.2	21.9	28.6	22.2	76.9	63.1	23.5	52.1	54.9	59.2	20.5	51.1	26.9	85.7	-25.9	73.0
Sectors	Agriculture and rural development	16.8	45.4	37.9	0.7	66.7	68.8	0.0	50.0	0.0	33.3	4.2	69.0	50.9	83.3	-32.8	60.2
	City and territory housing	14.3	38.1	49.0	2.3	23.1	50.0	X	66.7	27.0	33.3	5.6	35.7	24.1	66.7	-50.0	46.3
	Commerce, industry and tourism	24.0	54.0	72.7	55.4	85.7	61.1	33.3	64.3	0.0	57.1	5.8	57.9	53.3	100	-40.0	76.3
	Culture	16.2	54.4	99.5	33.4	92.0	68.8	0.0	75.0	33.3	50.0	12.5	69.6	29.2	75	-20.0	65.0
	Defence	26.7	38.4	58.1	11.8	67.4	65.9	23.2	25.0	10.0	40.0	14.1	65.4	35.0	84.6	-20.0	55.0
	Education	10.4	52.3	55.9	7.1	45.5	50.0	14.3	68.2	19.0	45.5	4.6	52.4	39.5	77.8	-10.0	50.6
	Employment	12.8	39.3	68.2	51.3	66.7	70.0	31.3	50.0	50.0	16.7	10.0	75.7	67.8	60.0	-14.0	73.8
	Environment and sustainable development	15.9	66.7	33.4	0.2	40.8	25.0	0.0	75.0	5.6	50.0	8.3	87.5	58.7	100	-22.9	X

Table E.4. Means for outcome indicators *(continued)*

Finance and public credit	23.7	45.6	45.7	31.2	64.6	57.7	21.9	58.3	0.0	44.4	9.4	58.7	41.5	100	-50.3	52.1
Foreign affairs	25.0	47.3	83.8	10.6	100	62.5	62.5	50.0	100	0.0	0.0	50.0	72.2	50.0	-80.0	X
Health and social protection	15.1	28.4	27.6	16.9	47.6	35.7	36.1	50.0	33.7	70.0	10.7	60.2	35.7	85.7	-20.0	X
Information and Communications Technologies	16.6	61.2	40.4	10.5	100	56.3	45.0	100	21.5	40.0	11.7	71.4	43.3	100	-30.0	36.3
Interior	31.9	48.7	52.3	X	42.5	58.3	0.0	50.0	16.7	0.0	11.7	62.9	17.8	80.0	X	X
Justice and law	20.1	43.5	24.9	30.7	23.3	56.3	75.0	40.0	X	40.0	31.3	76.8	34.7	100	-65.5	59.1
Mines and energy	30.0	57.9	26.2	13.3	56.5	67.9	37.5	35.7	55.0	42.9	6.0	79.6	18.3	71.4	-10.0	X
Planning	45.8	50.4	53.7	44.4	58.7	43.8	37.5	100	38.9	75.0	2.1	83.9	47.2	75.0	-43.3	41.1
Presidency	11.7	57.1	31.7	11.4	68.5	75.0	25.0	80.0	60.0	60.0	8.3	60.7	23.6	75.0	-20.0	50.0
Public administration	X	62.1	80.2	X	50.0	X	37.5	100	66.7	100	X	85.7	11.1	100	X	X
Science, technology and innovation	X	68.5	53.2	0.2	72.0	50.0	X	100	4.3	100	X	71.4	61.1	100	X	X
Social inclusion and reconciliation	12.4	16.4	18.1	X	50.0	66.7	33.3	0.0	23.2	75.0	8.3	90.5	77.8	50.0	-20.0	12.5
Sports, recreation, physical activity and leisure	X	74.3	32.8	X	49.0	50.0	75.0	100	X	X	16.7	57.1	5.6	100	X	X
Statistics	13.6	47.4	4.4	21.9	50.0	50.0	X	50.0	X	100	8.3	46.4	61.1	100	-30.0	65.0
Strategic intelligence and counter-intelligence	X	X	X	X	X	100	X	X	X	X	X	57.1	X	100	X	X
Transport	9.6	46.5	75.8	33.7	20.0	58.3	25.0	80.0	39.9	80.0	0.0	48.2	12.5	100	-80.0	70.0

Note: All scores have been calculated on a scale from 0-100.

Table E.5. Means for impact indicators

		IMP1	IMP2	IMP3	IMP4	IMP5	IMP6	IMP7	IMP8	IMP9	IMP10
		Trust in government	Sustainable Development Goals	Public sector integrity	User efficiency	Responsiveness to petitions	Access to services	Participation	Transparency on contracting	Government efficiency	Internal process improvements
Overall	Overall	88.8	16.6	57.7	36.1	47.3	54.2	45.6	71.6	53.4	35.8
	National institutions	84.9	12.9	60.0	35.4	61.5	35.8	26.4	72.6	51.9	44.8
	Municipalities	88.7	16.9	0.0	36.6	38.6	56.1	65.7	0.0	53.2	34.6
Regions	Governorates	100	24.1	53.8	55.2	25.6	72.4	68.3	68.3	65.5	40.3
	Atlántica	90.9	13.1	57.4	43.1	69.0	38.9	30.9	71.9	57.4	43.4
	Central	91.3	14.9	54.3	27.6	28.0	53.2	56.8	67.9	51.9	36.6
	Oriental	94.6	19.3	59.8	43.9	30.8	62.5	83.3	73.1	53.2	38.5
	Orinoquía-Amazonía	85.8	17.6	56.3	35.3	35.6	55.4	80.9	64.5	56.2	31.8
	Pacífica	90.9	14.2	47.9	34.1	32.5	56.8	54.5	68.5	45.5	31.9
Development environment	Early	87.9	16.5	46.0	32.1	25.7	52.1	42.1	65.2	49.3	34.2
	Intermediate	89.5	16.9	55.2	33.9	35.3	57.0	70.3	68.5	52.4	33.9
	Robust	88.6	22.3	56.9	69.0	25.0	73.0	71.9	71.0	78.8	44.2
Sectors	Agriculture and rural development	50.0	18.6	60.2	41.7	80.0	33.3	35.7	65.1	55.6	41.7
	City and territory housing	X	5.9	59.6	33.3	60.0	33.3	35.8	69.2	55.6	16.7
	Commerce, industry and tourism	75.0	13.5	56.8	20.0	65.0	20.0	28.6	73.4	40.0	43.8
	Culture	66.7	7.3	59.4	62.5	80.0	75.0	42.9	76.5	66.7	68.8
	Defence	83.3	5.4	64.0	38.5	56.0	23.1	7.1	75.6	51.3	49.5
	Education	83.3	6.5	54.9	33.3	40.0	44.4	57.1	70.7	48.1	47.2
	Employment	100	25.9	60.5	60.0	70.0	60.0	35.7	70.5	73.3	46.3
	Environment and sustainable development	100	20.6	53.4	25.0	100	25.0	35.8	65.7	33.3	48.4

Table E.5. Means for impact indicators *(continued)*

Finance and public debt	85.7	9.0	60.7	33.3	60.0	40.0	33.4	73.2	48.9	42.5
Foreign affairs	X	14.7	58.2	100	100	100	42.9	70.7	83.3	31.3
Health and social protection	100	10.9	62.0	21.4	93.3	28.6	47.6	73.5	47.6	45.5
Information and communications technologies	100	12.9	67.8	20.0	40.0	20.0	35.7	83.9	40.0	32.5
Interior	X	9.4	44.3	40.0	80.0	60.0	0.0	70.4	53.3	30.0
Justice and law	66.7	8.8	58.2	25.0	33.3	0.0	9.5	73.6	41.7	59.4
Mines and energy	100	22.7	63.1	28.6	36.0	28.6	25.7	79.5	52.4	53.6
Planning	100	5.9	59.7	50.0	80.0	50.0	23.8	75.0	66.7	67.2
Presidency	100	36.8	63.8	25.0	60.0	25.0	35.7	78.9	41.7	43.8
Public administration	X	X	56.1	X	60.0	X	57.1	67.0	3.33	43.8
Science, technology and innovation	100	52.9	45.3	100	60.0	100	28.6	70.8	100	37.5
Social inclusion and reconciliation	100	15.7	49.3	33.3	26.7	33.3	14.3	67.9	55.6	37.5
Sports, recreation, physical activity and leisure	X	29.4	55.5	X	100	X	71.4	64.3	33.3	56.3
Statistics	X	2.9	46.5	50.0	90.0	100	0.0	63.1	83.3	28.1
Strategic intelligence and counter-intelligence	X	5.9	X	X	X	X	X	X	33.3	56.3
Transport	100	13.2	51.9	50.0	52.0	25.0	28.6	63.8	66.7	31.3

Note: All scores have been calculated on a scale from 0-100.

Annex F. Robustness of composed indicators

Table F.1. Cronbach's Alpha test for composed indicators

Code	Indicators	Sub-indicators	Cronbach's Alpha scores	Sub-indicator Cronbach's Alpha scores	Recommendations
INP 1	**Financial resources**		**0.00**		**Non-robust**
		INP 1a		0.00	Remove
		INP 1b		0.03	Remove
		INP 1c		0.00	Remove
INP 2	**Human resources**		**0.66**		**Robust**
		INP 2a		0.89	Potentially removable
		INP 2b		0.21	Keep
		INP 2c		0.28	Keep
INP 4	**Institutional legal framework**		**0.79**		**Robust**
		INP 4a		X	
		INP 4b		X	
INP 6	**Legal framework: Services**		**0.87**		**Robust**
		INP 6a		X	
		INP 6b		X	
INP 8	**Legal framework: Open government**		**0.80**		**Robust**
		INP 8a		X	
		INP 8b		X	
INP 10	**Legal framework: Management**		**0.85**		**Robust**
		INP 10a		X	
		INP 10b		X	

Notes: Cronbach's Alpha evaluates the coherence of a composed indicator by measuring how interconnected its different sub-indicators are with each other. It is commonly accepted that a composed indicator characterised by a Cronbach's Alpha superior to 0.6 constitutes a workable basis. Sub-indicator Cronbach's Alpha scores indicate the hypothetical indicator Alpha were this sub-indicator to be removed. When an indicator is only composed of two sub-indicators, these sub-scores are not computed as the removal of one of the sub-indicators would mean dropping the entire index. Based on the individual influence of each sub-indicator on the general score, recommendations are formulated to reinforce the indicators' robustness.

Table F.1. Cronbach's Alpha test for composed indicators *(continued)*

Code	Indicators	Sub-indicators	Cronbach's Alpha scores	Sub-indicator Cronbach's Alpha scores	Recommendations
INP 12	**Legal framework: Security**		**0.84**		**Robust**
		INP 12a		X	
		INP 12b		X	
ACT 4	**Training: Services**		**0.51**		**Weak**
		ACT 4 a		X	
		ACT 4b		X	
ACT 5	**Implementation: Services**		**0.47**		**Weak**
		ACT 5a		0.19	Keep
		ACT 5b		0.27	Keep
		ACT 5c		0.64	Remove
ACT 9	**Training: Open government**		**0.55**		**Weak**
		ACT 9a		X	
		ACT 9b		X	
ACT 10	**Implementation: Open government**		**0.68**		**Robust**
		ACT 10a		0.66	Keep
		ACT 10b		0.73	Potentially removable
		ACT 10c		0.59	Keep
		ACT 10d		0.57	Keep
		ACT 10e		0.58	Keep
ACT 13	**Management policy**		**0.94**		**Robust**
		ACT 13a		X	
		ACT 13b		X	
ACT 14	**Training: Management**		**0.46**		**Weak**
		ACT 14a		X	
		ACT 14b		X	

Table F.1. Cronbach's Alpha test for composed indicators *(continued)*

Code	Indicators	Sub-indicators	Cronbach's Alpha scores	Sub-indicator Cronbach's Alpha scores	Recommendations
ACT 15	**Implementation: Management**		**0.79**		**Robust**
		ACT 15a		0.80	Keep
		ACT 15b		0.73	Keep
		ACT 15c		0.77	Keep
		ACT 15d		0.80	Keep
		ACT 15e		0.76	Keep
		ACT 15f		0.75	Keep
		ACT 15g		0.74	Keep
ACT 16	**Monitoring: Management**		**0.73**		**Robust**
		ACT 16a		0.61	Keep
		ACT16b		0.68	Keep
		ACT 16c		0.61	Keep
ACT 19	**Training: Security**			**0.52**	**Weak**
		ACT 19a		X	
		ACT 19b		X	
ACT 20	**Implementation: MSPI**		**0.85**		**Robust**
		ACT20a		X	Removed
		ACT20b		0.81	Keep
		ACT20c		0.83	Keep
		ACT20d		0.82	Keep
		ACT20e		0.85	Keep
		ACT20f		0.81	Keep
		ACT20g		0.81	Keep
ACT21	**Monitoring: Security**		**0.77**		**Robust**
		ACT21a		X	
		ACT 21b		X	

Table F.1. Cronbach's Alpha test for composed indicators *(continued)*

Code	Indicators	Sub-indicators	Cronbach's Alpha scores	Sub-indicator Cronbach's Alpha scores	Recommendations
OUP1	**Digital service availability**		**0.00**		**Non-robust**
		OUP 1a		0.00	Keep
		OUP 1b		0.00	Keep
		OUP 1c		0.53	Remove
OUP 3	**Digital service quality**		**0.91**		**Robust**
		OUP 3a		0.92	Keep
		OUP 3b		0.86	Keep
		OUP 3c		0.86	Keep
		OUP 3d		0.90	Keep
OUP 4	**Integrated petition and claim system**		**0.40**		**Weak**
		OUP 4a		0.35	Keep
		OUP 4b		0.28	Keep
		OUP 4c		0.28	Keep
OUP 5	**Online transparency**		**0.50**		**Weak**
		OUP 5a		0.29	Keep
		OUP 5b		0.35	Keep
		OUP 5c		0.68	Remove
OUP 6	**Open government data**		**0.09**		**Non-robust**
		OUP 6a		0.04	Remove
		OUP 6b		0.33	Remove
		OUP 6c		0.07	Remove
		OUP 6d		0.05	Remove
		OUP 6e		0.04	Remove

Table F.1. Cronbach's Alpha test for composed indicators *(continued)*

Code	Indicators	Sub-indicators	Cronbach's Alpha scores	Sub-indicator Cronbach's Alpha scores	Recommendations
OUP 10	**Data quality**		**0.92**		**Robust**
		OUP 10a		0.93	Keep
		OUP 10b		0.92	Keep
		OUP 10c		0.92	Keep
		OUP 10d		0.92	Keep
		OUP 10e		0.92	Keep
		OUP 10f		0.92	Keep
		OUP 10g		0.91	Keep
		OUP 10h		0.92	Keep
		OUP 10i		0.91	Keep
		OUP 10j		0.92	Keep
		OUP 10k		0.92	Keep
OUC 1	**Digital service use**		**0.00**		**Non-robust**
		OUC 1a		0.58	Remove
		OUC 1b		0.00	Keep
		OUC 1c		0.00	Keep
		OUC 1d		0.00	Keep
OUC 7	**Open government data reuse**		**0.67**		**Robust**
		OUC 7a		X	
		OUC 7b		X	
		OUC 7c		X	Removed
OUC 8	**Digital participation**				**Non-composed**
		OUC 8a		X	
		OUC 8b		X	Removed

Table F.1. Cronbach's Alpha test for composed indicators *(continued)*

Code	Indicators	Sub-indicators	Cronbach's Alpha scores	Sub-indicator Cronbach's Alpha scores	Recommendations
OUC 11	**Shared ICT provisions**		**0.79**		**Robust**
		OUC 11a		0.74	Keep
		OUC 11b		0.69	Keep
		OUC 11c		0.71	Keep
OUC 12	**Data sharing public sector**		**0.35**		**Weak**
		OUC 12a		X	
		OUC 12b		X	
OUC 13	**Strategic data use**		**0.34**		**Weak**
		OUC 13a		X	
		OUC 13 b		X	
OUC 16	**Digital security incident resolution**		**0.01**		**Non-robust**
		OUC 16a		X	
		OUC 16b		X	
IMP 3	**Public sector integrity**		**0.92**		**Robust**
		IMP 3a		0.90	Keep
		IMP 3b		0.92	Keep
		IMP 3c		0.90	Keep
		IMP 3d		0.89	Keep
IMP 4	**User efficiency**		**0.07**		**Weak**
		IMP 4a		0.07	Keep
		IMP 4b		0.06	Keep
		IMP 4c		0.36	Remove
		IMP 4d		0.06	Keep
		IMP 4e		0.03	Keep

Table F.1. Cronbach's Alpha test for composed indicators *(continued)*

Code	Indicators	Sub-indicators	Cronbach's Alpha scores	Sub-indicator Cronbach's Alpha scores	Recommendations
IMP 8	**Transparency on contracting**		**0.74**		**Robust**
		IMP 8a		0.58	Keep
		IMP 8b		0.70	Keep
		IMP 8c		0.64	Keep
IMP 9	**Government efficiency**		**0.00**		**Non-robust**
		IMP 9a		0.00	Remove
		IMP 9b		0.00	Remove
		IMP 9c		0.00	Remove
		IMP 9d		0.00	Remove
		IMP 9e		0.11	Remove
		IMP 9f		0.00	Remove

Annex G. Correlations in the online government logic model

Table G.1. Correlations between input and activity indicators

			Dependent variables												
			ACT1	ACT2	ACT3	ACT4	ACT5	ACT6	ACT7	ACT8	ACT9	ACT10	ACT11	ACT12	ACT13
			Co-ordination	Planning: Services	Services policy	Training: Services	Implementation: Services	Monitoring: Services	Planning: Open government	Open government policy	Training: Open government	Implementation: Open government	Monitoring: Open government data	Planning: Management	Management policy
Independent variables	INP1	Financial	0.10***	P 0.04***	P 0.03***	0.06***	0.08***	P 0.01***	P 0.03***	NS	0.07***	0.04***	P 0.04***	0.12***	0.09***
	INP2	Human resources	0.04***	P 0.02***	P 0.03***	0.1***	0.13***	P 0.05***	P 0.03***	NS	0.06***	0.06***	P 0.02***	0.11***	0.11***
	INP3	Technical resources	0.07***	P 0.05***	P 0.01***	0.11**	0.12***	P 0.05***	P 0.06***	P0.01***	0.15***	0.16***	P 0.04***	0.13***	0.06**
	INP4	Institutional legal framework	0.12***	V 0.21***	V 0.22***	0.13***	NS	V 0.19***	NS	V0.12***	0.16**	0.15*	V 0.27***	0.26**	0.12**
	INP5	Strategic support	0.07***	0.16***	NS	NS	NS	V 0.13***	V 0.18***	V0.12***	NS	0.05*	V 0.13***	0.05**	0.04**
	INP6	Legal framework: Services	0.11***	0.07***	P 0.04***	0.15***	0.16***	P 0.05***	x	x	x	x	x	x	X
	INP7	Guidance: Services	0.18***	P 0.08***	P 0.04***	0.16***	0.2***	P 0.06***	x	x	x	x	x	x	x

	INP8	Legal framework: Open government	0.11***	x	x	x	x	x	P 0.09***	P0.02***	0.16***	0.14***	P 0.05***	x	X
	INP9	Guidance: Open government	0.15***	x	x	x	x	X	NS	P0.03***	0.22***	0.24***	P 0.07***	x	X
	INP10	Legal framework: Management	0.1***	x	x	x	x	x	x	x	x	x	X	0.33***	0.18***
	INP11	Guidance: Management	0.12***	x	x	x	x	x	x	x	x	x	X	0.34***	0.24***
	INP12	Legal framework: Security	0.13***	x	x	x	x	x	x	x	x	x	x	x	X
	INP13	Guidance: Security	0.11***	x	x	x	x	x	x	x	x	x	x	x	x

Notes: Unless otherwise stated all reported correlations are positive.
*** p-value < 0.01; ** p-value < 0.05; * p-value < 0.1; NS: non-statistically significant at the 10% level. By default, values of adjusted R^2 are reported. Otherwise: (P) = pseudo-R^2; (V) = V de Cramer. x: correlation non conducted as the independent and dependent variables are from different policy components.

Table G.1. Correlations between input and activity indicators *(continued)*

			Dependent variables							
			ACT14	ACT15	ACT16	ACT17	ACT18	ACT19	ACT20	ACT21
			Training: Management	Implementation : Management	Monitoring: Management	Planning: Security	Security policy	Training: Security	Implementation: MSPI	Monitoring: Security
Independent variables	INP1	Financial resources	0.09***	0.14***	0.11***	P 0.02***	0.1***	0.1***	0.14***	0.05***
	INP2	Human resources	0.07***	0.11***	0.13***	P 0.03***	0.06***	0.07***	0.013***	0.03***
	INP3	Technical resources	0.1***	0.14***	0.06***	P 0.04***	0.09***	0.08***	0.09***	0.03***
	INP4	Institutional legal framework	0.16**	0.18**	0.12**	V 0.22***	0.11**	0.16**	0.15***	0.05**
	INP5	Strategic support	0.05**	0.07***	0.04***	V 0.13***	0.04***	NS	0.06***	0.01**
	INP6	Legal framework: Services	x	x	x	x	x	x	x	x
	INP7	Guidance: Services	x	x	x	x	x	x	x	x
	INP8	Legal framework: Open government	x	x	x	x	x	x	x	x
	INP9	Guidance: Open government	x	x	x	x	x	x	x	X
	INP10	Legal framework: Management	0.18***	0.22***	0.18***	x	x	x	X	x
	INP11	Guidance: Management	0.22***	0.30***	0.25***	x	x	x	x	x
	INP12	Legal framework: Security	x	x	x	P 0.11***	0.16***	0.21***	0.23***	0.08***
	INP13	Guidance: Security	x	x	x	V 0.38***	0.2***	0.22***	0.28***	0.07**

Notes: Unless otherwise stated all reported correlations are positive.
*** p-value < 0.01; ** p-value < 0.05; * p-value < 0.1; NS: non-statistically significant at the 10% level. By default, values of adjusted R^2 are reported. Otherwise: (P) = pseudo-R^2; (V) = V de Cramer. x: correlation non conducted as the independent and dependent variables are from different policy components.

Table G.2. Correlations between activity and output indicators

			Dependent variables														
			OUP1	OUP2	OUP3	OUP4	OUP5	OUP6	OUP7	OUP8	OUP9	OUP10	OUP11	OUP12	OUP13	OUP14	OUP15
			Digital service availability	Electronic authentication availability	Digital service quality	Integrated petition system	Online transparency	Open government data	Digital participation availability	Open innovation exercises	Automated procedures	Data quality	Data catalogues	Interoperable information services	Online incident reporting	Critical information assets	Incident information exchange
Independent variables	ACT1	Co-ordination	NS	NS	0.05***	P 0.02***	0.09***	0.01***	0.03***	P 0.03***	0.01***	0.04***	P 0.04***	0.01***	x	P 0.05***	P 0.03***
	ACT2	Planning: Services	0.004*	NS	0.1***	V 0.18***	x	x	x	x	x	x	x	X	x	x	X
	ACT3	Services policy	NS	NS	0.03***	V 0.18***	x	x	x	x	x	x	x	X	x	x	X
	ACT4	Training: Services	0.01**	NS	0.09***	P0.034***	x	x	x	x	x	x	x	X	x	x	X
	ACT5	Implementation: Services	0.02***	NS	0.17***	P 0.06***	x	x	x	x	x	x	x	X	x	x	X
	ACT6	Monitoring: Services	0.01***	NS	0.07***	V 0.17***	x	x	x	x	x	x	x	X	x	x	X
	ACT7	Planning: Open government	x	x	x	X	0.24***	NS	0.07**	V 0.31***	x	x	x	X	X	x	x
	ACT8	Open government policy	x	x	x	X	0.03***	0.01***	0.005***	V 0.06*	x	x	x	X	x	x	X
	ACT9	Training: Open government	x	x	x	x	0.11***	0.02***	0.02***	P 0.05***	x	x	x	X	x	x	X
	ACT10	Implementation: Open government	x	x	x	X	0.24***	0.03***	0.11***	P 0.06***	x	x	x	X	x	x	X
	ACT11	Monitoring: Open government data reuse	x	x	x	X	0.11***	0.03***	0.05***	V 0.28***	x	x	x	X	x	x	X
	ACT12	Planning: Management	x	x	x	x	x	x	x	X	0.01**	0.11***	P 0.09***	0.03****	x	x	X

ACT13	Management policy	x	x	x	x	x	x	x	X	0.002***	0.04***	P 0.13***	0.04***	x	x	X
ACT14	Training: Management	x	x	x	x	x	x	x	X	0.01***	0.09***	P 0.05***	0.01***	x	x	X
ACT15	Implementation: Management	x	x	x	x	x	x	x	X	0.02***	0.13***	P 0.26***	0.08***	x	x	X
ACT16	Monitoring: Management	x	x	x	x	x	x	x	X	0.005**	0.06***	P 0.21***	0.05***	x	x	x
ACT17	Planning: Security	x	x	x	x	x	x	x	x	x	x	x	X	x	V 0.31***	V 0.21***
ACT18	Security policy	x	x	x	x	x	x	x	x	x	x	x	X	x	P 0.11***	P 0.07***
ACT19	Training: Security	x	x	x	x	x	x	x	x	x	x	x	X	x	P 0.09***	P 0.04***
ACT20	Implementation: MSPI	x	x	x	x	x	x	x	x	x	x	x	X	x	P 0.24***	P 0.14***
ACT21	Monitoring: Security	x	x	x	x	x	x	x	x	x	x	x	X	x	0.1***	P 0.06***

Table G.3. Correlations between output and outcome indicators

			Dependent variables							
			OUC1	OUC2	OUC3	OUC4	OUC5	OUC6	OUC7	OUC8
			Digital service use	Digital channel preference	Online petition processing	Electronic authentication use	Service satisfaction	Use of public information	Open government data reuse	Digital participation
Independent Variables	OUP1	Digital service availability	NS	0.03** N	NS	NS	0.006***	x	x	X
	OUP2	Digital authentication availability	NS	NS	0.01***	NS	NS	x	x	X
	OUP3	Digital service quality	0.09***	NS	0.03***	0.01**	0.33***	x	x	X
	OUP4	Integrated petition system	0.03***	NS	0.02***	0.01**	0.06***	x	x	X
	OUP5	Online transparency	x	x	x	x	x	P 0.006***	P 0.02***	P 0.08***
	OUP6	Open government data	x	x	x	x	X	NS	P 0.007**	NS
	OUP7	Digital participation availability	x	x	x	x	X	NS	P 0.03***	P 0.08***
	OUP8	Open innovation exercises	x	x	x	x	X	NS	V 0.24***	V 0.33***
	OUP9	Automated procedures	x	x	x	x	X	x	x	X
	OUP10	Data quality	x	x	x	x	x	x	x	x
	OUP11	Data catalogues	x	x	x	x	x	x	x	X
	OUP12	Interoperable information services	x	x	x	x	x	x	x	X
	OUP13	Digital incident reporting	x	x	x	x	x	x	x	X
	OUP14	Critical information assets	x	x	x	x	x	x	x	X
	OUP15	Incident information exchange	x	x	x	x	x	x	x	x

Table G.3. Correlations between output and outcome indicators *(continued)*

			Dependent variables							
			OUC9	OUC10	OUC11	OUC12	OUC13	OUC14	OUC15	OUC16
			Participation of vulnerable groups	Open innovation solutions	Shared ICT provisions	Data sharing public sector	Strategic data use	Privacy satisfaction	Digital incident level	Digital incident resolution
Independent Variables	OUP1	Digital service availability	x	X	x	x	x	x	x	X
	OUP2	Electronic authentication	x	X	x	x	x	x	x	X
	OUP3	Digital service quality	x	x	x	x	x	x	x	X
	OUP4	Integrated petition system	x	x	x	x	x	x	x	x
	OUP5	Online transparency	0.005*	P 0.07***	x	x	x	x	x	X
	OUP6	Open government data	NS	NS	x	x	x	x	x	X
	OUP7	Digital participation availability	0.05***	P 0.05***	x	x	x	x	x	X
	OUP8	Open innovation exercises	NS	V 0.91***	x	x	x	x	x	X
	OUP9	Automated procedures	X	X	0.01***	0.02***	0.01***	x	x	X
	OUP10	Data quality	X	X	0.04***	0.08***	0.09***	x	x	X
	OUP11	Data catalogues	X	X	0.04***	0.11***	0.15***	x	x	X
	OUP12	Interoperable information services	X	X	0.02***	0.011***	0.03***	x	x	x
	OUP13	Online incident reporting	X	x	x	x	x	x	x	X
	OUP14	Critical information assets	X	x	x	x	X	V -0.08***	NS	NS
	OUP15	Incident information exchange	X	x	x	x	x	V -0.08*	NS	NS

Notes: Unless otherwise stated all reported correlations are positive. ^{N}: negative correlation coefficient.
*** p-value < 0.01; ** p-value < 0.05; * p-value < 0.1; NS: non-statistically significant at the 10% level. By default, values of adjusted R^2 are reported. Otherwise: (P) = pseudo-R^2; (V) = Cramer's V. x: correlation non conducted as the independent and dependent variables are from different policy components.

Table G.4. Correlations between outcome and impact indicators

Independent variables		Dependent variables	IMP1	IMP2	IMP3	IMP4	IMP5	IMP6	IMP7	IMP8	IMP9	IMP10
			Trust in government	Sustainable Development Goals	Public sector integrity	User efficiency	Responsiveness to petitions	Access to services	Participation	Transparency on contracting	Government efficiency	Internal process improvements
	OUC1	Digital service use	NS	NS	NS	NS	0.04*	NS	NS	NS	NS	NS
	OUC2	Digital channel preference	NS	NS	0.054***	NS	P 0.04***	P 0.02*	0.06***	0.14***	NS	NS
	OUC3	Online petition processing	NS	NS	NS	NS	P 0.03***	NS	0.036** N	NS	NS	0.014***
	OUC4	Digital authentication use	NS	0.012***	0.2	P 0.011***	NS	NS	NS	NS	P 0.007***	0.007***
	OUC5	Service satisfaction	NS	0.023***	0.07***	P 0.023***	P 0.015* N	NS	0.195*	0.04**	P 0.02***	0.033***
	OUC6	Use of public information	NS	0.028***	NS	P 0.005***	NS	V 0.12**	NS	NS	V 0.097***	0.027**
	OUC7	Open government data reuse	NS	0.041***	NS	NS	NS	NS	NS	NS	V 0.11***	0.022**
	OUC8	Digital participation	NS	0.036***	NS	V 0.096***	NS	NS	0.024**	NS	V 0.12***	0.07***
	OUC9	Participation of vulnerable groups	NS	NS	NS	P 0.0023*	NS	NS	NS	0.02*	P 0.013***	NS
	OUC10	Open innovation solutions	NS	0.028***	0.014* N	V 0.12	NS	NS	NS	NS	V 0.21***	0.1***
	OUC11	Shared ICT provisions	NS	0.09***	NS	NS	NS	NS	NS	0.014* N	NS	0.06***
	OUC12	Data sharing public sector	NS	0.046***	NS	P 0.014***	NS	NS	NS	NS	P 0.014***	0.1***
	OUC13	Strategic data use	NS	0.06***	NS	P 0.021***	P 0.007*	0.0023*	NS	NS	NS	0.19***
	OUC14	Privacy satisfaction	NS	0.02***N	NS	NS	NS	NS	NS	NS	V 0.14***	0.02***N
	OUC15	Digital incident level	NS	NS	NS	0.011*	NS	NS	NS	NS	NS	NS
	OUC16	Digital incident resolution	P 0.074*	NS	NS	NS	NS	NS	NS	NS	NS	NS

Notes: Unless otherwise stated all reported correlations are positive. N: negative correlation coefficient.
*** p-value < 0.01; ** p-value < 0.05; * p-value < 0.1; NS: non-statistically significant at the 10% level or failed robustness test. By default, values of adjusted R^2 are reported. Otherwise: (P) = pseudo-R^2; (V) = V de Cramer. x: correlation non conducted as the independent and dependent variables are from different policy components.

Annex H. Practical guide to assess the impacts of digital government policies and projects in Colombia

This implementation manual is a practical guide providing suggestions on how to leverage the transitional OECD Impact Assessment Methodology for Digital Government in Colombia for future impact assessments across different levels of government throughout the Colombian administration. It builds on Chapters 2, 3 and 4 of this report, which should therefore be considered the main points of reference when reading this practical guide. The implementation manual details step-by step how the Colombian government can shape follow-up impact assessments. Recommendations for both the short and medium to long term are provided. The manual contains references to specific data and coding files that have been provided exclusively to the Colombian government.

It is recommended to conduct digital government impact assessments on an annual basis. As such, this implementation manual should be used with the same frequency.

Methodological review and update

The methodology should be reviewed and updated every year before starting data collection. It comprises the following three elements, which should be revised simultaneously, since a change in one element has an impact on the other two.

- **The variable correlation model**, detailing the precise indicators for the different elements and the expected relations between them, to be analysed in the impact assessment. It consists of one general model and four component-specific ones, as presented in Chapter 2.
- **The indicator framework**, presented in Annex A. It provides the following details for all indicators in the variable correlation model:
    1. code: starting with either INP, ACT, OUP, OUC or IMP
    2. indicator name: description or names of sub-indicators
    3. data source: general source name
    4. source indicator/question: precise source indicator name or question(s) analysed to calculate the indicator
    5. response options: answering options for the questions used to calculate the indicator
    6. score calculation: formula specifying how the indicator is calculated.
- **Data sources and collection instruments**, the various indexes and questionnaires used to collect data from Colombian institutions:
    1. Online Government Index (GEL Index)
    2. Unique Form of Management Progress (FURAG)
    3. Territorial Form (TF)
    4. OECD questionnaire (OECD)
    5. Transparency Index (ITN/ITD/ITN)

6. Survey on National and Departmental Institutional Environment and Performance (EDI/EDID).

Short term

Table H.1 details recommended activities which should take place every year at the start of a new impact assessment so as to update the methodological framework.

Table H.1. Short-term methodological update

	Activity	Description
Variable correlation model	Perform a global review of indicators and expected relationships	Allow for transversal links in the formulation of expected relationships between indicators of different strategy components (e.g. an activity such as training on information security and privacy should be kept in the methodology, while opening up possibilities for analysis beyond the information security and privacy component, such as the effect on digital service quality as an output indicator).
Indicator framework	Review indicator robustness	While maintaining the overall indicator categories, review the sub-categories in light of the recommendations to eliminate or adapt sub-indicators as provided in Annex F.
	Review response	Review the indicators specified in Chapter 4 having a low response rate and adapt the indicators with a view to increase data availability.
Data-collection sources and instruments	Liaise with all stakeholders involved in the collection of data relevant to the indicator framework	Contact the Public Service Department (FURAG), DANE (EDI/EDID) and Transparency Colombia (Transparency Index) to discuss the planning and content development related to indicators specified in the impact assessment framework and ensure alignment. Verify key issues such as: – whether the necessary indicator data will still be gathered through the respective instruments – whether the respective instruments are being sent to the desired institutions – when the necessary data will become available.
	Eliminate questions	Eliminate all questions related to eliminated (sub-)indicators from the Territorial Form and FURAG.
	Adapt questions	Adjust questions for the (sub-)indicators according to the necessary adaptations based on the response and robustness analysis. Update questions so that data collection will reflect the situation in the year following the previous measurement.
	Add questions	Integrate the OECD questionnaire into a data-collection instrument of the Colombian government, as has been done previously for the Territorial Form. Design new questions for the sub-indicators that have been added to the indicator framework. Consider adding questions originally presented in other data sources, if the data collection through those sources is not guaranteed.

Medium to long term

Table H.2 details recommended activities to be introduced in the medium to long term to strengthen the explanatory quality of the methodology and align it with the shift from the Online Government Strategy to the Digital Government Strategy.

Table H.2. Medium- to long-term methodological update

	Activity	Description
Variable correlation model	Systematically include non-digital control variables correcting for exogenous influence on impact indicators	Identify external variables that are likely to influence digital government policy outcomes and impacts. These could, for example, be identified through additional literature research or the organisation of focus groups with Colombian stakeholders in the digital government ecosystem (see Chapter 3 for more information on control variables).
	Enhance the time-sensitivity and time lag consideration of the model	Adapt the model in such a way as to analyse inputs and activities in year x in relation to outputs in year x+1, outcomes in year x+2 and impacts in year x+5.
	Incorporate more advanced digital government indicators	Add new indicators on citizen-driven design and delivery of policies and services, strategic data use, and digital government stakeholder collaboration (see Chapter 4).
Indicator framework	Specify new digital government indicators and update existing ones to incorporate sub-indicators aimed at measuring digital government	Besides designing entirely new indicators, it is advised to systematically review existing indicators to ensure that that they take digital government criteria into account (e.g. measuring the incorporation of user input as a criterion of digital service quality; see Chapter 4)
	Introduce citizen-driven metrics for outcome and impact indicators to move from an institutional to a citizen perspective	Research the possibility of capturing actual user experiences on digital government, instead of asking institutions what they **think** the user is experiencing. In order to enable the calculation of correlations, it is essential that such metrics are gathered for institutions as the unit of analysis (e.g. user data on digital services (co-)produced by a particular institution).
Data-collection sources and instruments	Explore alternative methods for data sharing	In order to increase the efficiency of the data-collection process for impact assessment and alleviate the current burden on public institutions of filling out questionnaires, look into the possibilities of leveraging other methods and channels to obtain the needed data for the impact assessment. For instance, institutions could share data as open government data through the central open data portal or could possibly share more sensitive data through internal interoperability platforms. Automated capturing of data might also be a possibility to explore. The latter could also be beneficial to gathering more citizen-driven metrics.
	Adopt a business case component in the management of ICT projects throughout the Colombian public sector	The business case approach for ICT projects is expected to support a culture of monitoring and data-driven performance management, including a higher availability of data relevant for impact assessment. Such a component should include the following five elements: a project profile, strategic and normative alignment, cost-benefit analysis, service commissioning, and risk assessment and management. It should be developed according to the specifications provided in Chapter 4.
	Complement quantitative impact assessment methods with qualitative ones	Qualitative methods (e.g. interviews, focus groups) can help to identify more relevant metrics for indicators which have proven to be difficult to measure quantitatively and could help foster a clearer understanding of the reasons behind certain indicator scores.

Data collection

Once the variable correlation model, indicator framework and data-collection instruments have been updated, data collection can take place. Ideally, data should be collected for at least the same 1 280 public institutions that were involved in the transitional impact assessment (please consult the file *Colombia – Final Dataset.dta* for a complete overview).

Adapt the communication strategy *vis-à-vis* Colombian public institutions on the monitoring and evaluation of digital government, focusing on conveying the strategic value of these activities instead of a ranking of institutions. Such a change is likely to stimulate public institutions to report the data they have, even in the case of perceived low scores, and at the same time increase awareness about the shift from e-government to digital government.

Support public institutions in developing their capacities in collecting, managing, analysing and sharing relevant evaluation data to increase the data availability on certain indicators, notably on indicators with low data availability (e.g. information security and privacy outputs and outcomes), and as part of broader efforts to foster a data-driven public sector in Colombia.

Data analysis

Once the raw data from in-house and external sources are available, a number of steps should be taken to ensure a statistically solid processing and analysis of the data.

Descriptive results

a. Create one single database: As a first step in the analysis of the data, the relevant data from the different sources need to be merged into one single database. This involves the homogenisation of the names of public institutions, following the style used in the file *Colombia – Final Dataset.dta*.
b. Calculate indicator scores per institution, using the formulas specified in Annex A. A score between 0 and 100 was established for each indicator. Indicators may already have a 0-100 form, but if they do not, establishing percentile-based groups allows the data to be divided into evenly populated and meaningful groups. There are three types of indicators:
    i. Simple indicators: these are the indicators which are copied directly from the source and do not require any additional treatment.
    ii. Composed indicators: scores for this type of indicator are calculated based on a formula involving at least two source variables (e.g. OUC 4: Electronic Authentication Use).
    iii. Scaled indicators: these indicators are based on open-ended questions requiring the creation of a scale (e.g. ACT 4a: Frequency of training sessions).
c. Assess missing data and outliers: To ensure the external validity of the mean indicator scores and an appropriate significance level of correlations to be calculated to analyse the relationships between indicators, (sub-)indicators for which more than 75% of data is missing shouldn't be taken into account for further analysis. For mean calculations, it is also important to remove significantly abnormal scores as they might completely distort the results.

This should be done with parsimony and only for responses which oddly contrast with the rest of the institutions or which affect very strongly the computation of one average (when the group in question is small for instance).

d. Transfer the cleaned dataset into an appropriate statistical software programme and implement the necessary form changes (e.g. coding missing data with '.'), following the general structure and indicator names as defined in the dataset *Colombia – Final Dataset.dta* to ensure the statistical commands developed for the transitional impact assessment methodology operate correctly.

e. Calculate aggregated indicator scores: For the following categories and sub-categories, mean scores (i.e. average scores) are calculated (see **Error! Reference source not found.** for more details on the categorisation).

- **Overall mean score (1 score)**
- **Institutions at the national level of government (1 score)**
  - sector scores (24 scores)
- **Institutions at the territorial level of government (1 score)**
  - governorates (1 score) and municipalities (1 score)
  - regions (5 scores)
  - development environment (3 scores).

The computation can be done via statistical software, running the commands compiled in the do-file *Coding for averages.do*.

f. Conduct the robustness test on all composed indicators (i.e. all indicators containing sub-indicators). The computation can be done via statistical software, running the commands compiled in the do-file *Cronbach's Alpha Robustness Tests.do*.

Regression analysis

The last step in the impact assessment is performing a regression analysis to evaluate the relationships between the indicators in the variable correlation model. Four types of relationships are evaluated, as indicated in Table H.3. Then, the steps to be taken in the regression analysis are detailed.

Table H.3. Indicator relationships for analysis

	Relationship 1	Relationship 2	Relationship 3	Relationship 4
Independent variables	Outcomes	Outputs	Activities	Inputs
Dependent variables	Impacts	Outcomes	Outputs	Activities

g. For indicators that have been added which are modified during the methodological update, determine the nature of the variables (continuous, dichotomous, ordinal, categorical).

h. Calculate correlations between all outcome (independent) and all impact indicators (dependent variables) using Table H.4 to determine the appropriate type of correlation model to be used to find the nature of each indicator. The

calculation can be done via statistical software, running the commands compiled in the do-file *Coding for regressions.do* in the section "Impacts & outcomes".

Table H.4. Nature of variables and associated correlation models

Dependent variable	Independent variable	Correlation model	Statistical intensity	Statistical significance	Interpretation
Quantitative	Quantitative	Simple linear regression	R^2	p-value	Coefficient value
Quantitative	Qualitative ordinal	Simple linear regression with mention of the qualitative variable	R^2	p-value	Coefficient value
Qualitative ordinal/dichotomous	Qualitative ordinal	Cross tabulation	Cramer's V	p-value	Percentage differences
Dichotomous	Quantitative	Logistic regression	Pseudo-R^2	p-value	Odds ratio
Qualitative ordinal	Quantitative	Ordered logistic regression	Pseudo-R^2	p-value	Coefficient value
Qualitative ordinal	Quantitative	Generalised ordered logistic regression	Pseudo-R^2	p-value	Coefficient value

Note: The generalised ordered logistic regression method is to be used when the parallel regression assumption test fails for ordered logistic regression.

i. Remove non-statistically significant correlations, using the selected threshold (e.g. $p < 0.1$ or 0.05).

j. Determine the list of strong correlations using the statistical criteria indicated in Table H.5 and continue the following steps only with the remaining outcome indicators. Specific instructions include:
   1. For linear regression, look at the p-value, and then the sign of the correlation coefficient. Then report the R^2.
   2. For linear regression with the mention of the qualitative variable, check the statistical significance and sign of every value of the categorical variable. Then report the R^2.
   3. For cross tabulation, look at the p-value, sign and value of Cramer's V, and then qualitatively look at the table to evaluate the relation between the two variables.
   4. For logistic regression, remember that only odds ratios are reported so any value superior to 1 equals a positive relationship between the two variables. Look for the p-value and the pseudo-R^2.
   5. For qualitative ordinal value, run the parallel regression assumption test. If it fails, opt for the generalised ordered logistic model. If it succeeds, look for the p-value and the p-value of the correlation coefficients, and then to the R^2.

Table H.5. Assessment criteria to determine the strength of statistical relationships

Strong	Intermediate	Weak
$R^2 > 0.05$ in relation to two or more outcomes	$R^2 > 0.02$ in relation to one or more outcomes	$R^2 \leq 0.02$ in relation to one or more outcomes
OR	OR	
$V > 0.2$ in relation to two or more outcomes	$V \geq 0.17$ AND multiple $R^2 \geq 0.01$	

k. Calculate correlations between output and outcome indicators. Repeat the steps previously described in relation to outcomes and impacts for outputs and outcomes from the same components and any additional output-outcome relationships that may have been added to the variable correlation model during the methodological review. The computation can be done via statistical software, running the commands compiled in the do-file *Coding for regressions.do* in the section "Outcomes & Outputs".
l. Calculate correlations between activity and output indicators. Repeat the previously described steps for activities and outputs from the same components and any additional activity-output relationships that may have been added to the variable correlation model during the methodological review. The computation can be done via statistical software, running the commands compiled in the do-file *Coding for regressions.do* in the section "Outputs & Activities".
m. Calculate correlations between input and activity indicators. Repeat the previously described steps for inputs and activities from the same components and any additional input-activity relationships that may have been added to the variable correlation model during the methodological review. The computation can be done via statistical software running the commands compiled in the do-file *Coding for regressions.do* in the section "Inputs & Activities".
n. Visualise the found correlations in correlation trees, as demonstrated in Chapter 3. Among the computed correlations, select the strongest (highest [pseudo R^2 and/or Cramer's V] and most significant ones [highest p-value]. Given the variety of results, no absolute number can be communicated for this selection process. Look for coefficients which significantly stand out. There can be up to four of them.

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