

INSIGHTS FOR A CHILEAN NATIONAL DATA POLICY AND GUIDELINES FROM AN INTERNATIONAL PERSPECTIVE:

WORKING PAPER N°10

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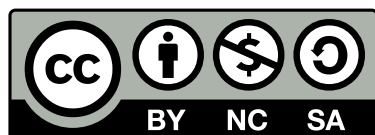
The Working Paper Series of Executive Secretariat of the National Council of Innovation for Development seeks to open discussion topics that would advance the consensual design of long-term strategies in science, technology, and innovation.

Here we present the work of Paloma Baytelman, which aims to contribute to the new Chilean National Data Policy from an international perspective. This white paper presents insights on how other countries are moving forward towards comprehensive guiding documents to unlock the power of public sector data to be a valuable asset for making better decisions by applying analytical approaches.

This report would not have been possible without the generous guidance of Prof. dr. ir Joep Crompvoets 'Information Management in the Public Sector' chair at the Public Governance Institute of KU Leuven (Belgium).

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Index

I. Research context and relevance	7
II. Country analysis	10
A. NEW ZEALAND	10
B. CANADA	17
C. URUGUAY	27
D. DENMARK	32
E. SPAIN	39
III. Insightful lessons for a Chilean national data policy	45
IV. Final remarks	52
V. References	54

I. Research context and relevance

All over the world, public sector institutions routinely store large volumes of data about individuals, businesses, and their own procedures and services (Brous, Janssen & Vilminko-Heikkinen, 2016). This scenario opens the opportunity of using analytical methods to turn data into information and knowledge, which provides the basis for improving decision-making at the strategic, tactical and operational levels of government. This knowledge can help policymakers and public officials to gather insights on existing policy problems and in relation to different stakeholders, to foresee opportunities and challenges, to design innovative policy approaches, and to monitor the activities undertaken and resources mobilized (Thompson, Ravindran & Nicosia, 2015; OECD, 2015b).

As data appear like a valuable asset for the public sector, several nations are moving towards achieving a Data-Driven Government model (Jetzek, Avital & Bjorn-Andersen, 2014) considering enablers, adoption activities, ethics and regulations needed¹. In fact, during the last decade, 95 countries have been implementing practices to promote accountability, transparency, and to create public value opening and sharing data (Global Open Data Index, 2019). Some of them are currently working on comprehensive national data policies and/or national data governance strategies, addressing further dimensions such as data interoperability; open data; ethics, data privacy, and data protection; artificial intelligence; and cybersecurity, among others.

The goal of such policies and strategies is to take the advantages of using and sharing public sector data, while simultaneously creating public value and guarding against potential risks (Research Data Netherlands). For that purpose, policies and strategies are expected to provide a principled guide comprising objectives, scope, guidelines, regulatory measures, courses of action, and funding priorities concerning data gathering, analysis, usage, archiving, sharing, and privacy management (Benfeldt Nielsen, 2017).

In the Chilean case, recent reports commissioned by the government have shown Data Policy as a key element to advance in the country's development (CNID, n.d.). According to those documents, in order to face challenges such as climate change, aging, and the Fourth Industrial Revolution (Schwab, 2016), the public sector needs a policy regarding data governance². This policy shall also improve how the Chilean government collects, manages and uses data to its own work while enhancing how public institutions serve citizens and

¹ Although governments have been using information technology to collect, store and manage data for decades, only recently they have been able to efficiently extracting intelligence from it. The concept of the Data-driver government refers to the ability of public agencies of making better decisions by applying analytical data approaches for all critical matters with actionable information when and where needed (Lutes, 2015).

² According to those reports, having a National Data Policy could provide a framework to use data for issues such as achieving better public institutions coordination for addressing water scarcity in agriculture; anticipate the need of help for elder who do not have support networks; or—as a country—to be aligned when facing the ethical implications of Artificial Intelligence.

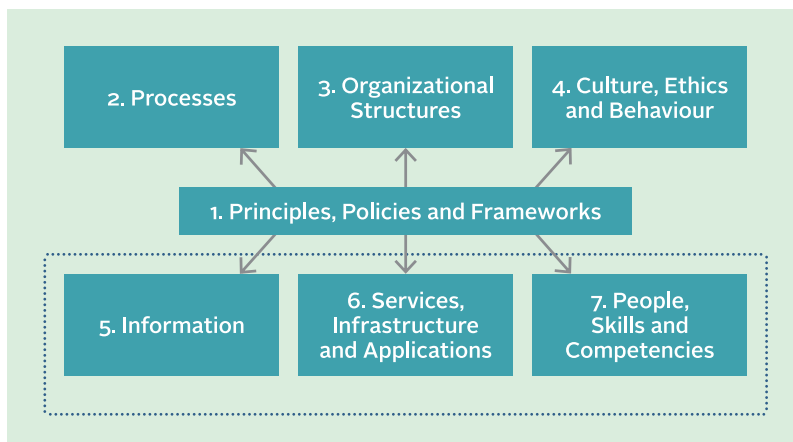
businesses. In association with several public offices, the Chilean eGov Office³ is currently working on the first Chilean National Data Policy. The initial draft is going to be presented in 2020 for public consultation (Bustamante, 2019).

To contribute to the new Chilean national data policy from an international perspective, this document aims to present an overview of how other countries are unlocking the power of public sector data to be a valuable asset in the economy, civil society, and government, while building public confidence in its use (Out-Law, 2018) increasing participation, personal data protection, security, transparency, and accountability.

The objective of the study is to exploratory map relevant aspects coming into play when creating national public data policies and strategies. To achieve that, this research uses the Cobit Model (Harmer, Governance of enterprise IT based on COBIT® 5, 2013) to describe the current situations of those nations. This model fosters systemic IT governance and management aiming to provide a structure to organize the enablers, manage their complex interactions, and facilitate successful outcomes of seven enablers:

- » **Principles, policies, and frameworks** to translate the desired data governance into practical guidance for national data management.
- » **Processes describing practices and activities** to achieve policy objectives and outputs congruent with policy goals.
- » **Organizational decision-making structures** to formally assign roles and responsibilities.
- » **Culture, ethics, and behavior** required as a success factor to govern and manage data policy activities.
- » **Information guidelines for all data produced and used by the public sector**, to assists in evaluating, directing, planning, building, running and monitoring of the government as a whole.
- » **Services, infrastructure, and applications** needed to collect, use, reuse, and share data.
- » **People, skills, and competencies required** for successful completion of all activities and for making correct decisions and taking corrective actions.

3 The Chilean eGov Office is the *División de Gobierno Digital*, which depends on the *Ministerio Secretaría General de la Presidencia* of the Chilean Government.

Figure 1. Cobit Enablers Model.

Source: 'Governance of enterprise IT based on COBIT® 5' by G. Harmer, 2013, p. 27.

Data collection for this overview was centered in countries with advanced and ongoing processes to develop their national data policies and/or strategies. The study considers countries where it was also possible to inquire the responsible authorities about the enabling elements of the policy documents and their constitutive processes. Taking into account these criteria, the scope of the analysis is focused on New Zealand, Canada, Uruguay, Denmark, and Spain.

The data gathering was made considering collecting the data policy and strategy documents and regulations of these countries, and inputs from their higher policy data or data strategy officials through questionnaires sent and answered via email, online meetings, as well as depth interviews. Beyond the seven Cobit enablers, the inquiries also considered approaches regarding the challenges and trends for government data, as well as the role of science data on their policies.

This document provides a review of each of the six selected countries, considering what is its context regarding its national data policy or data strategy, its current situation considering its enablers, and its future scope. After that, we discuss different challenges, good practices and lessons learned that might be of relevance for Chile, concluding with final remarks and suggestions for the further establishment of the Chilean national data policy from an international perspective.

II. Country analysis

A. NEW ZEALAND

Stats NZ Tatauranga Aotearoa is New Zealand's official data agency. In 2017, Stats NZ was given a functional leadership role for data and analytics across the government to maximize the value of data for all New Zealanders. To achieve it, the agency conducted multiple workshops and interviews with key stakeholders from central and local government, businesses, community organizations, and NGOs, which helped it to create the Data Strategy and Roadmap (Government Chief Data Steward, 2018). Launched in 2018 and considered as a living document, the Roadmap provides a shared direction and plan for the country's data system, which scope is broad and covers all constituent parts of the data system including government actors, people, and organizations that collect and use data. Data includes but is not limited to survey data, administrative data, and research data.

The roadmap defines supporting components, such as data access, common practices, and people's capabilities, and enablers, such as public trust and protection mechanisms that ensure data within the system is used in a safe way. It also has focus areas related to more effective and efficient use of data, reducing costs, and supporting innovation. The four priority areas are investing in making the right data available at the right time; growing data capability and supporting good practices; building partnerships within and outside government, and implementing open and transparent practices.

Cobit Model Analysis

1. Principles, policies, and frameworks

Principles, policies or regulatory frameworks being used for the National Data Policy in New Zealand, are based on the strong record the country has on transparency and openness that allow it to operate from a high degree of public trust which serves as an enabler for data use.

In the last couple of years, Stats NZ has understood that this trust needs to be maintained and enhanced to allow the further benefit to be generated from new and innovative data uses whilst continuing to safeguard public interests. To achieve that, the agency saw the need for modernizing the country legislation, particularly the Privacy Act and the Statistics Act, to ensure that data use is based on public trust and consent. In this process, Stats NZ has been considering the interests of all system actors to ensure that everyone can participate in the data system in a safe way. Stats NZ has been also promoting the ethical and positive use of data guaranteeing the privacy and security of data for individuals and maintaining appropriate data quality and independence.

Regarding Privacy, a new Privacy Bill has been introduced to Parliament to replace the Privacy Act 1993. The new bill focus on strengthening privacy protections, as well as promoting early intervention and risk management by agencies, rather than relying on people making complaints after a privacy breach has already happened (Parliament of New Zealand, 2018). As for the Statistic Act, Stats NZ is developing a new Data and Statistics

legislation proposal that modernize the country 1975 bill, recognizing that government-held data is a strategic asset that can be used to benefit people, government, and the economy addressing the challenges that come with more data being collected, managed, and used. The new Bill aims to get the balance right between increasing availability and use of data, and ensuring data is shared and used keeping people safe. The new legislation also aims to be inclusive considering in its core Māori society data needs, aspirations, rights, and interests (Stats NZ, 2018 a).

While progress is being made in the modernization of these regulations, the Privacy Commissioner and Stats NZ together have published 6 principles for the safe and effective use of data. The objective is to support agencies on best practices for the use of data for decision-making (Stats NZ, 2018 b).

- » **Deliver clear public benefit**, considering the views of all relevant stakeholders, and ensuring all associated policies and decisions have been evaluated for fairness and potential bias.
- » **Ensure data is fit for purpose**, avoiding generating potentially harmful outcomes like bias or discrimination. Decision-makers need to promote the accuracy, precision, consistency, and completeness of data quality, and take special care when re-using data that was originally collected for another purpose. They should also consider analytical models to evaluate any automated decision-making occurring as part of this process.
- » **Focus on people**, making data valuable for people at the same time that protecting them against the misuse of information considering the privacy and ethical implications of any analytical process that draws on data collected about people, as using data and analytics for decision-making can have real-life impacts.
- » **Maintain transparency** to support collaboration, partnership, and shared responsibility ensuring New Zealanders know what data is held about them; how it's kept secure; who has access to it; and how it's used, making sure all data uses are managed in a highly trusted, inclusive, and protected way. Having the public to understand how their data is being used it would also help them to see the benefit that it creates.
- » **Understand the limitations**, avoiding perpetuate or intensify poor outcomes for particular groups, designing systems and processes helping to ensure unfair or discriminatory outcomes aren't generated.
- » **Retain human oversight**, ensuring significant decisions based on data involve human judgment and evaluation by developing mechanisms to preserve fundamental rights and freedoms and to ensure that automated decision-making processes are regularly reviewed to make sure they're still fit for purpose. Decision-makers need to be aware of data quality limitations and other sources of error.

Stats NZ is also developing the country's **data stewardship framework** to provide a structure and common language for organizing and describing the different elements of effective data stewardship. The aim is to establish goals, boundaries, and principles to allow agencies to implement stewardship in ways that work for them. The current draft of the data stewardship framework (Stats NZ, 2019a) has the following elements:

-
- » **Strategy and culture**, providing a shared vision, clear direction, and enabling strategy implementation and sustaining good data stewardship practice.
 - » **Rules and settings**, modernizing legislation, policies, principles, and sanctions providing boundaries and guiding how the data system should operate.
 - » **Roles, responsibilities, accountabilities**, defining governance structures, role definitions and expectations, and leadership.
 - » **Common standards**, providing consistent ways of describing and recording data to make sharing, comparing, and reusing data more efficient.
 - » **Data capability and quality**, defining tools, processes, designs, metadata structures, and platforms for managing, storing, describing, and sharing data.
 - » **People capability and literacy**, fostering skills, knowledge, and services for accessing, managing, analyzing, and communicating data and insights.
 - » **Influence and advocacy**, creating effective relationships and networks to endorse, promote, and support good data practice.
 - » **Monitoring and assurance**, assessing environmental trends and developments, measuring stewardship performance, and adapting the stewardship framework to respond to changing circumstances or new information.

2. Practices and activities

New Zealand's data policy's main objective is to provide a shared direction and plan that organizations within and outside the government can collectively work towards and align their efforts to generate maximum impact to increase the value of data for all New Zealanders—including communities, businesses, government, and non-government organizations—.

To achieve that objective, Stats NZ understood the need of earning and maintaining public trust and confidence through deliberate and continued engagement with the public, in order to allow different uses, collection methods, and data management practices to be unlocked. One of those efforts is the New Zealand Data Portal www.data.govt.nz a system that supports and enables data use for all New Zealanders.

The agency has also fostered practices and activities to achieve specific objectives connected to the main policy focus areas:

- » **Improving the availability and accessibility of government data**, by investing in making high-quality data available; improving the visibility, consistency, and accessibility of data; and explore new and innovative data sources, supporting openness and transparency; having an “open by design” culture and release data in a format that allows businesses, communities and, the public to use and benefit from our data assets. Statistics NZ is creating means for fostering the visibility over what data assets are held by who and what data people need now and in the future; a clear view of data gaps and a coordinated approach to how public institutions address them; helping people to understand who holds what data, what rights they have to access it, and how they make data requests; and how much is charged or spend on government-held data.

- » **Growing data capability and supporting good practices** across the public sector to better understand and address capability challenges, support greater digital uptake across government, identify and leverage existing expertise, and to support data leaders and decision-makers to effectively use data and data capability to make informed decisions.
- » **Building partnerships within and outside of government**, to share expertise, capability, and new perspectives to foster innovation and solve complex problems impacting New Zealand. One example is the *Data Futures Partnership*, an independent Ministerial advisory group founded by the New Zealand Government to allow the country data to create economic, social and environmental public value for all.
- » **Implementing open and transparent practices**, maintaining and enhancing public trust and confidence by allowing different uses, collection methods, and data management practices to be unlocked and enable greater use and innovation with data, whilst continuing to safeguard public interests.

3. Organizational decision-making structures

In July 2017, Statistics NZ (Stats NZ) was given a Functional Leadership role for data and analytics across government. Stats NZ Chief Executive Liz MacPherson was appointed as the Government Chief Data Steward (GCDS) to support the government's priority to get more value from data. As well as developing policy and infrastructure, the GCDS provides support and guidance so agencies can use data effectively while maintaining the trust and confidence of New Zealanders. The GCDS together with data leaders from the public sector (The Information Group) are co-developing a Data Stewardship Framework to enable agencies to manage data as a strategic asset and benchmark their data maturity.

The Information Group is integrated by the GCDS, the Government Chief Privacy Officer, the Government Chief Digital Officer, a representative of the Iwi Leaders Forum (Aotearoa Māori society), the Inland Revenue Commissioner, the Chief Archivist, a representative of Te Mana Raraunga (Māori Data Sovereignty Network), the Public Service Chief Executives, the Sector leads, and the Government Statistician. The group leads the information management strategy for the public sector, identifies opportunities to unlock and use government information, provides advice on data challenges, and provides governance for all-of-government data initiatives.

4. Culture, ethics, and behavior

From a cultural perspective, New Zealand's strong transparency and openness records, as well as its comprehensive policies regarding the Māori society inclusion, are key success factors that allow it to operate from a high degree of public trust which serves as an enabler for data use.

Likewise, an ethical perspective is at the core of the Roadmap. "Greater data use needs to be balanced with the protection of privacy rights and ethical use. The roadmap outlines five major considerations for safe data use: Ethical use, privacy and control, safety and

security, transparency, and rules and protections. Each government agency manages these considerations differently. As system stewards, one initiative we are running to responsibly manage risk and harms as a result of new and emerging data is an Advisory Group on Trusted Data Use”, said Jeanne McKnight, Senior Advisor, System Policy – Data System Leadership at Stats NZ.

In fact, the document states the need to be permanently seeking the balance between enabling greater data use whilst ensuring the protection of privacy rights and ensuring that data is treated ethically, securely and safely. The Roadmap advises decision-makers to always reflect on how do they ensure that people understand when they can use data versus should use data, how can they maintain responsible use of data and that it is used for positive outcomes.

To understand and foster positive behaviors towards creating public value with data for all, Stats NZ has been proactive in engaging with the public around data issues and has enabled a number of channels through which the government agencies and the public can raise their concerns. One example is that Stats NZ publishes a quarterly dashboard highlighting key deliverables of the Roadmap and how they contribute to the relevant visions of success: innovation, data-driven decisions, and valuable data. The dashboard also documents the number of data-related engagements within and outside of government for each quarter and captures the number of international connections that have occurred (Stats NZ, 2019b).

5. Information guidelines and standards

Until now in New Zealand there hasn’t been one agreed format for government agencies to collect and record data, meaning the same information is collected and recorded in many different formats across government (Stats NZ, 2019c). Consistent to its authority to set mandatory standards across government, the Government Chief Data Steward (GCDS) is currently working across the government to co-design, develop, and implement short data content standards, tapping into specialized expertise. To be eligible for implementation, new standards must meet 5 guiding principles:

- » **Quality**, meaning that the standard supports the collection of consistently high-quality data.
- » **One size fits all**, meaning that the standard has wide application and suitability.
- » **Full alignment to full standard**, meaning that the standard aligns with related standards or guidance.
- » **Easy to follow**, meaning that the standard is easy to follow and comprehend.
- » **Fit for purpose**, meaning that the standard summarizes the features needed to collect the data.

Until now, they have agreed in standards for collecting and recording data regarding dates, names, and addresses. While ISO format standards are used for dates and addresses, an OASIS Customer Information Quality (CIQ) is being used as the standard for names (Stats NZ, 2019d).

Along with this process, Stats NZ and the Information Group are currently developing the country's data stewardship framework to provide a structure and common language for organizing and describing the different elements of effective data stewardship (Stats NZ, 2019a). One of the main elements to be defined is common standards allowing consistent ways of describing and recording data to make sharing, comparing, and re-using data more efficient.

New Zealand signed up to the International Open Data Charter in 2017, building on its six principles and supporting actions that state that data should be: open by default; timely and comprehensive; accessible and usable; comparable and interoperable; for improved governance and citizen engagement, and for inclusive development and innovation. The country also has its own Information Management Principles, approved by its Cabinet in 2011, stating that data and information held by the NZ Government should be managed to a high standard, so data should be:

- » **Open** for public access unless grounds for refusal or limitations exist.
- » **Protected** when the information is personal, confidential and classified.
- » **Readily available** being released online proactively and without discrimination;
- » **Trusted and authoritative**, supporting the purposes for which they were collected and are accurate, relevant, timely, consistent and without bias in that context.
- » **Well managed**, considering that data and information are a core strategic asset held and owned by the government on behalf of the public, should only be collected or generated for specified public policy, operational business, or legislative purposes, and its management require good practices over their life-cycle, including catering for technological obsolescence and long-term preservation, as well as including collaborating with other agencies and the public, facilitating access, strengthening awareness, and supporting international cooperation.
- » **Reasonable priced**, use and reuse of government-held data and information are expected to be free. Charging for access is discouraged.
- » **Reusable**, fostering data to be discovered, shared, used and reused over time and through technological change, and released with the highest possible level of granularity in reusable, machine-readable format with appropriate metadata; and in aggregated or modified forms if they cannot be released in their original state.

6. Services, infrastructure, and applications

Stats NZ is committed to building a future where data is highly valued and treated as an essential part of New Zealand's infrastructure playing an integral role in the country. The Roadmap proposes taking a holistic approach to ensure greater consistency and interoperability of data, fostering data integration and sharing, supporting new data uses, generating new insights, and enabling scalability for future growth with economic and social value for New Zealand.

“It is important to note that implementing the guidelines is recommended, but not mandatory. Each government agency is starting from a different baseline when it comes to implementing the data policy, and the infrastructure required will change depending on what the core function of the agency is, what issue they are looking to solve, and what impact they would like to have. As data system leaders, we guide and support agencies on these journeys”, Jeanne McKnight said.

7. People, skills, and competencies

One of the main aspects Stats NZ needs to move forward its Roadmap is to improve national data capabilities, including a range of skills, processes, and tools required to effectively work with and use data. The agency has detected that currently, capabilities are varied across the system and inconsistent data practices exist. Stats NZ is looking for creating a coordinated approach to building data capability across government to have consistent data practices and processes, and to attract technical specialist skills for working with data, translator skills to present insights in meaningful ways, and data literate decision-makers that use the information to make better decisions.

Further discussion

8. Trends

Stats NZ has also seen the need for the Roadmap to have a certain flexibility, considering the uptake in new technologies such as cognitive computing, algorithms, and Artificial Intelligence (AI) that are pushing the boundaries of what can be done with data.

Regarding the Roadmap implementation, the trends are more concrete. “The focus areas in this policy guide our key initiatives over the next 3-5 years. Since launching the policy 6 months ago, we have observed that our focus areas align with trends we see in relation to the policy. They are: Invest in making the right data available; grow capability and good practice; build partnerships; and implement open and transparent practices”, Jeanne McKnight added.

9. Challenges

There are challenges that serve as barriers to data use:

- » Lack of visibility and availability of existing data.
- » People are not clear on what rights they have to access different types of government data.
- » Processes for requesting data are not always consistent nor efficient.
- » Access to existing data is not always equitable and inclusive, and charging mechanisms can restrict access by creating inequities for certain individuals or organizations.

10. Data generated with public funds, and/or Open Science

Stats NZ's Roadmap includes research data as part of the broad and comprehensive data governance that is being designed, also considering data access, common practices, and people capabilities, and enablers, such as public trust and protection mechanisms that ensure data within the system is used in a safe way. One of the main initiatives in this regard is the Integrated Data Infrastructure (IDI), a large research database that holds microdata about people, households, and life events, like education, income, benefits, migration, justice, and health. The data comes from government agencies, Stats NZ surveys, and non-government organizations (NGOs).

B. CANADA

Canadian public institutions generate and hold a vast, diverse and growing amount of data, including program, geo-spatial, administrative, census and population data, among others. To unlock the power of all those data to support evidence-informed decisions, and design more effective programs and services the government has identified the need for tackling two dimensions. The first one is the public policy dimension, in charge of Innovation, Science and Economic Development Canada (ISED)⁴ organization responsible for digital investments, privacy in the private sector, and science investments. The second one is the technical dimension, where coexist aspects from the digital economy, interoperability, and cybersecurity, among others, with the lead of the Treasury Board⁵. “The Government used to see the policy perspective as the *sacred cow*, behind the program and the services fields. However, when we tried to tackle the value of data, just then, it became clear we need both the public policy *external-facing* dimension and the technical policy to work together. Both elements need to clutch and collide together holistically in a multidisciplinary way we are not used to”, says Alex Benay, Deputy Minister at the Treasury Board of Canada Secretariat and the Chief Information Officer (CIO) of Canada⁶.

While ISED has not developed a comprehensive data policy yet, several technical institutions are currently working on a joined technological policy framework guiding their work, under the leadership of Canada's CIO. As an initial step of that endeavor, in 2018 the Canadian government launched its national Data Strategy Roadmap (Government of Canada, 2019a) what nowadays is the country's main policy document in the matter from the technical perspective. This has been complemented by some indications of the new Policy on Service and Digital, presented in August 2019 and taking effect on April 1, 2020 (Government of Canada, 2019b).

4 ISED is the department of the Government of Canada with a mandate of fostering a growing, competitive, and knowledge-based Canadian economy.

5 During the interviews with public officials, the difficulty of reconciling those two views was frequently highlighted: first, people trying to make data policies from their vision as public policy experts and, second, IT professionals who daily work with data and who are not satisfied with the public policy perspective.

6 The current analysis was made using the Data Strategy Roadmap, linked documents, and a personal interview with Alex Benay, Deputy Minister at the Treasury Board of Canada Secretariat and the Chief Information Officer of Canada, held in May 2019.

The National Data Strategy Roadmap follows recommendations from consultations with all federal departments and agencies, to focus on how the Government can enhance the ways it creates, protects, uses, manages and shares data to improve the lives of Canadians and support businesses, researchers and the not-for-profit sector. While recognizing that those are challenging tasks for Canada, the Roadmap sees that stating and implementing a Data Policy is an opportunity for addressing a number of important issues, including:

- » Leveraging data as a strategic asset for the benefit of Canadians.
- » Maintaining legitimacy and credibility in an increasingly complex society.
- » Directing resources appropriately and harnessing opportunities to improve impact.
- » Helping workers adapt and be competitive in a changing labor market.
- » Protecting citizens from the misuse of their data and the adverse impacts of technology.
- » Maintaining good resource management.

On that basis, to ensure coherence and transparency, the document builds on current federal data initiatives providing concrete steps that public agencies can take over the short and medium terms to generate a robust data governance, leadership, and stewardship; to increase the availability and interoperability of data; to increase data analytics capacity and broader data literacy; to integrate data and analysis into decision-making processes; to promote a culture of innovation and experimentation; to set a robust IT infrastructure, and to foster capacity building in data literacy and use.

The expected results of the Roadmap are improved services; greater public value from data; greater usability and availability of data; protection of people information and privacy by design; trusted and sound governance of data, which are treated as a valuable strategic asset; increased evidence-informed decision-making; better reporting on results; and increased intra and inter-governmental collaboration.

According to the plan set in the Roadmap, in the short term, by the end of 2019 in Canada:

- » All departments and agencies will have a data strategy in place appropriate to their line of work.
- » Each organization, as well as the government as a whole, will have defined their data steward in charge of improving and developing standards and guidelines that govern how to access, collect, use, safeguard and share data, and a clear process for developing and refining these over time.
- » The country will have improved recruitment and professional development practices to ensure access to the skills needed.
- » The country will have the right information technology (IT) environment that allows skilled professionals to use the disruptive technologies that will support the ambitious agenda outlined.

In the following years, the Roadmap considers expanding and scaling practices across the government, building capabilities, supporting progress, and implementing systemic changes needed for a holistic adoption and transformation.

Cobit Model Analysis

1. Principles, policies, and frameworks

Following world-leading initiatives, the Canadian National Data Roadmap is the main policy document providing a holistic view of the matter of data. The document provides guidance on issues such as how governing transparency, archiving, management, usability, interoperability, and privacy. Some of the recommendations acknowledge that —beyond standardized guidelines— there is also a need for efforts adapted to particular agencies' requirements.

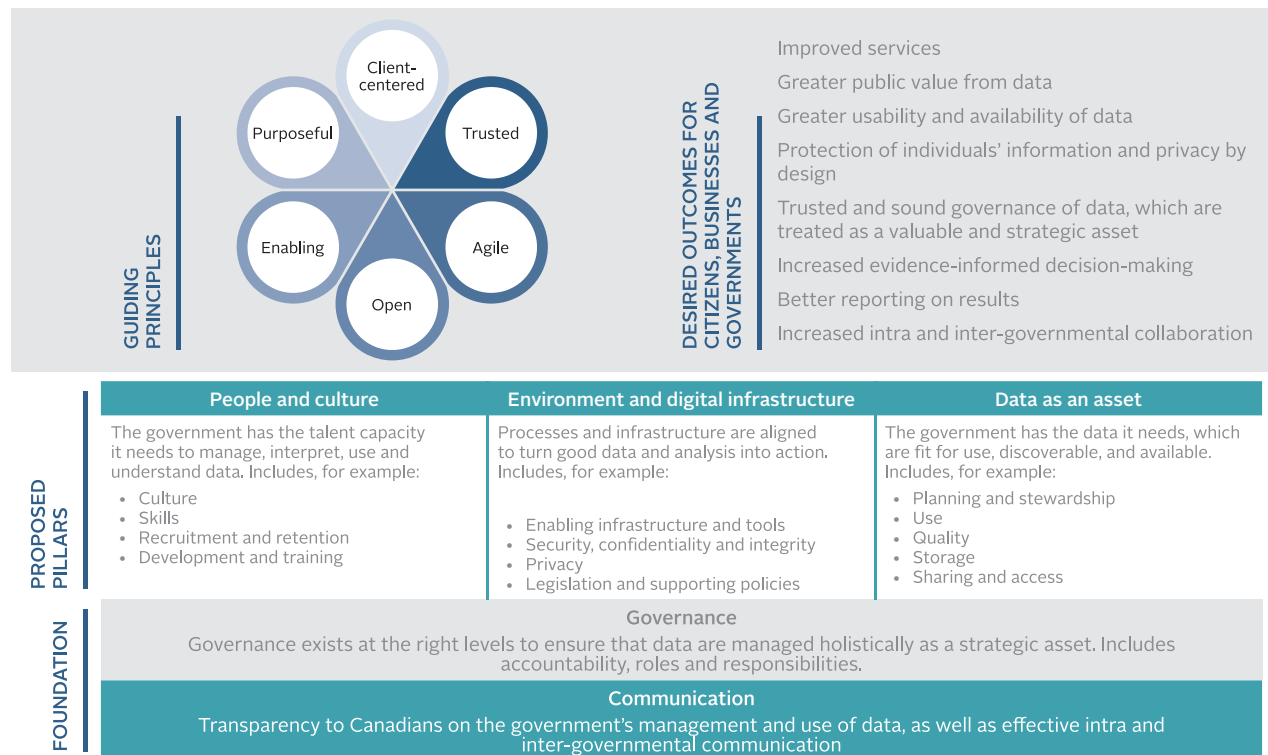
The Roadmap provides a well-defined data strategy framework for the federal public service, with principles, desired outcomes, pillars, and governance structure. The scheme aims to guide how to create, protect, use, manage and share data as a strategic asset, enabling informed decisions that lead to better outcomes and services for Canadians. It has six guiding principles: client-centered, trusted, agile, open, enabling, and purposeful, and a list of desired outcomes for citizens, businesses and governments:

- » Improved services.
- » Greater public value from data.
- » Greater usability and availability of data.
- » Protection of individuals' information and privacy by design.
- » Trusted and good governance of data, which are treated as a valuable and strategic asset.
- » Increased evidence-informed decision-making.
- » Better reporting on results.
- » Increased intra and inter-governmental collaboration.

The pillars proposed by the framework are (1) People and Culture, to ensure that the government has the talent and capacity needed; (2) Environment and digital infrastructure, to ensure that processes, rules, and enablers to turn good data and analysis into action; (3) Data as an asset, to ensure that the government has the data it needs, fit for use, discoverable, and available.

And, finally, the proposed governance is focused on ensuring that data are managed holistically as a strategic asset and includes accountability, roles, and responsibilities.

Figure 2. Data Strategy Framework for Federal Public Service



Source: 'Report to The Clerk of the Privy Council: A Data Strategy Roadmap' by Government of Canada, 2019, p. 10.

Adding to the Roadmap, in August 2019 the Government of Canada presented a new integrated policy piece that addresses data-related issues: the Policy on Service and Digital. This document will take effect on April 1, 2020, replacing the Policy Framework on Information and Technology, the Policy on Management of Information Technology, the Policy on Information Management, the Policy on Service, and the Policy on Acceptable Network and Device Use (Government of Canada, 2019b).

2. Practices and activities

Canada's data policy is intended to position the public service to provide the best possible advice to Ministers and support the more strategic use of data while protecting citizens' privacy. To achieve this, significant steps are being taken.

First, during 2018 and 2019 Canada has been conducting a number of reviews to its legal data and privacy frameworks building on and improving upon the European Union General

Data Protection Regulation (GDPR)⁷. These updates include a review of frameworks such as the Privacy Act, the Personal Information Protection and Electronic Documents Act (PIPEDA), the Statistics Act, and a legislative review to support integrated federal service delivery. The principles to support an ethical framework for control of personal information are also being explored. A modernized Privacy Act will focus on relevant contemporary data protection principles, including elements of transparency, accountability, and data security, to allow for responsible and innovative uses of personal information. PIPEDA will put in place safeguards for Canadians' privacy in the collection, use or disclosure of personal information. The Statistics Act will increase access to data for researchers and other departments and agencies of government, remove legislative barriers, enhance data sharing and interoperability, and lead to more detailed and timely statistical products and insights while ensuring confidentiality, privacy and increased responsible access. Services review will be focused on the "tell us once" approach while safeguarding privacy.

Second, the Government is working to set a National Identity Framework creating a national standard for all public and private, profit sectors, institutions, and initiatives. "Until now, we didn't have the means to set digital identities for everyone. The provinces have, but we haven't been able to design a federated approach to digital identity⁸. We need to achieve that in order to provide better services and share data in appropriate ways at a national level", says Alex Benay (Benay, 2019).

Third, similar to the Estonian X-Road, Canada is developing a back-office software that guarantees confidentiality, integrity, and interoperability to allow institutions and organizations to exchange information in a standardized and secure way to deploy and use services.

And finally, as a part of its Canada School of Public Service, the government created a Digital Academy to help those public servants who want to increase their digital literacy and understanding of key areas such as service design, data analytics, and new technologies. The curriculum is especially guided by the principles of open by default, collaborating wisely, and iterative development.

There are also a number of intersecting data-related initiatives, previous to the Roadmap, that have been already underway and now are contributing to the strategy, including:

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- 7 The GDPR is a regulation in EU law on data protection and privacy for all individual citizens of the European Union (EU) and the European Economic Area (EEA). Its relevance to the rest of the world lies in the fact that it also addresses the transfer of personal data outside the EU and EEA areas. Therefore, since its entry into force in 2016, the GDPR has meant that many regulatory frameworks have to adapt to meet the GDPR requirements when those nations need to interact with EU countries, businesses or individuals.
 - 8 Digital identity is equivalent to the real identity of a person or entity when used for identification in connections or transactions mediated by digital means. Agreeing on the parameters and standards regarding digital identity is one of the complex challenges that countries face today since it means harmonizing the needs and perspectives of diverse stakeholders.

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- » The launch of the Canadian Digital Service, and development of a digital policy to support the transition to a digital government.
 - » A national campaign to engage citizens on digital and data transformation in support of the Innovation and Skills Plan to turn Canada into a global innovation leader, by focusing on skills, innovation, privacy, and trust.
 - » Statistics Canada's (*StatCan*) modernization initiative, designed to increase access to data to foster innovation and inclusion.
 - » The development of the 4th National Action Plan on Open Government, which includes commitments to improve transparency, accountability, and public engagement.
 - » The creation of the Results and Delivery Unit (RDU) at the Privy Council Office (PCO) strengthening an evidence-based culture by helping public institutions to accelerate the adoption of data-driven approaches to deliver meaningful results.

3. Organizational decision-making structures

Analysis and consultations done by the Canadian government have shown the need for a single senior-level body organized as a directive committee that provides horizontal oversight of the strategic and technical uses of data and makes decisions on data management issues considering the whole of government. This directive committee could also drive cultural change; encourage greater data and analytics use; align and prioritize data-related investments or gaps; drive progress on data strategies; ensure open and sharing by default, and compel data decisions to be holistic.

Likewise, the Roadmap recommends strengthening and clarifying roles and responsibilities including establishing a Government of Canada Chief Data Steward; requiring to all departments, agencies or portfolios to develop data strategies that are relevant, scaled and customized to their needs and aligned with the Data Strategy; requiring all departments and agencies to ensure proper accountabilities, roles and responsibilities with respect to data.

While the work of implementing the Roadmap is carried out, the leading and coordination role of many government data related initiatives has been done by Alex Benay, Canada's Chief Information Officer (CIO). "We have realized we need to bring the technology to the strategy table because tackling the power of data is more a technical matter than a policy matter", Benay says (Benay, 2019).

Adding to the Roadmap, the new Policy on Service and Digital (Government of Canada, 2019b) brings more concrete guidelines regarding governance, planning and reporting, defining responsibilities for the Secretary of the Treasury Board of Canada, the CIO, as well as for Deputy Directors of each public agency regarding issues such as the strategic direction for the management of external and internal government data, including data standards and architecture for quality, accessibility, and data interoperability; defining cybersecurity requirements; and ensuring the responsible and ethical use of data and automated decision systems.

4. Culture, ethics, and behavior

Canada's government is already embracing significant new opportunities by better leveraging data, which also has implied leading jurisdiction with respect to the ethical use of data and the unintended consequences of its collection, manage and use. In fact, the Roadmap acknowledges that access to more data elicits concerns and potentially increases risks for citizens, notably from a privacy perspective.

Consequently, as part of the Roadmap short-term guidelines for successfully governing and managing data policy activities, the document recommends developing and implementing frameworks and standards addressing the ethical and secure use of data, as well as fostering a data-driven culture that is open and shares by default. It also proposes taking into account other cultural and behavioral issues by assessing the state of data literacy, skills, and competencies required, piloting a demand map for hiring targets, identifying talent supply sources, and launching a data scientist recruitment pilot.

Among other things, the guidelines look for ensuring the responsible and ethical use of automated decision systems, fostering that the decisions produced using these systems are efficient, accountable, and unbiased, as well as, ensuring transparency and disclosure regarding the use of the systems and ongoing assessment and management of risks.

5. Information guidelines and standards

As stated before, the Roadmap has short-term guidelines for successfully governing and managing data. However, according to the country CIO, Canada still needs to move forward regarding the definition of standards designed and/or defined specifically for governing public sector data. For the time being, broad frameworks from other areas are being used and the government has established an Enterprise Architecture Review Board to set government-wide tech standards, which also consider data. Adding to those efforts, a federated identity verification scheme (the Pan-Canadian Trust Framework (DIACC, 2016)) sets standards for identity verification across the public sector.

Alex Benay explains that, as a next step, the government plan to create a framework that allows public sector institutions to deliver services—even with private sector providers—whilst protecting Canadians' data rights following the ethical and secure use of data (Ross, 2019). "Instead of GDPR, we have the Personal Information Protection and Electronic Documents Act (PIPEDA). We also follow ISO standards in some cases, but we are not very mature in our own standards yet. We tend to follow the United States or the European Union, but there is still a lot of improvement that needs to be done".

6. Services, infrastructure, and applications

Prior to the Roadmap release, Canada government had already created or planned initiatives that today are also serving the implementation of the Canadian National Data Strategy, such as the new Digital Academy to build capability; the Canadian Digital Service,

to offer departments centrally-funded advice and support on user-focused services; and a secure cross-departmental information exchange network (an updated version of Estonia's 'X-Road' system) is under development to be launched in 2020 (Treasury Board of Canada Secretariat & Office of the Chief Information Officer of Canada, 2019).

"We are lucky in Canada because our technological infrastructure is managed centralized consolidated under one organization: Service Canada, which gathers all our servers, all our cloud, all our technology", Alex Benay says. Now the challenge is to merge applications and systems that are duplicated and used in silos such as CRMs⁹, finance systems, and email systems, he explains (Benay, 2019).

More services, infrastructure, and applications are going to be developed and/or implemented in the near future as the need for tools to collect, store, analyze, manage, share, and visualize data is increasing in all departments. Likewise, fostering open standards, open-source, interoperability, and the sharing of expertise requires access to a common set of data tools commensurate with common data needs.

In this line of action, the Roadmap recommends fostering an IT architecture that supports and facilitates data management and analytics, as well as to make available appropriate tools, infrastructure and processes expanding collaboration on federal data tools —such as the Federal Geospatial Platform (FGP)— to provinces and territories. The FGP is an initiative of the Federal Committee on Geomatics and Earth Observations (FCGEO), a committee of senior executives from 21 departments and agencies that are producers and/or consumers of geospatial data.

7. People, skills, and competencies

In the Data Strategy, the government has recognized its responsibility to ensure public institutions' workforce has the skills and tools to unlock the power of data. Currently, the Canadian public service is promoting digital literacy among all public servants, not only based on computer skills but in various technologies to extract, analyze and share insights from the available government data. The Digital Academy is training public servants in those topics and also in matters allowing to increase understanding of key areas such as service design, data analytics, and AI.

Fostering the talent and capacity needed to manage, interpret, use and understand data is also relevant for the Canadian government in order to enable a data-driven culture that is open and shares by default; to recognize all public servants as data agents; to hire, retain, cultivate, and empower the right talent and capacity; to grow data literacy in existing and new employees.

Adding to those capabilities is also needed to ethically leverage data to support the public good while protecting the personal data of Canadians. Achieving this implies to foster skills and competencies related to an ethical dimension and analysis capacities.

9 Customer relationship management systems.

“We launched our Digital Academy in 2018 with very specific streams for AI and Data Science. We also moved to a different type of recruitment system where the gig economy is more prevalent these days, called Talent Cloud (Government of Canada, 2018), Alex Benay says. Explains that the new system allows the government to offer 6, 12, 18 months’ short-term employment with fast hiring processes (Benay, 2019).

Further discussion

8. Trends

According to Alex Benay, the Canadian Government has been seeing and analyzing several new trends, from harnessing the use of artificial intelligence (AI) for the reduction of manual processes to using maps and data visualizations to support decisions. “In fact, Canada is one of the first countries that will have a National AI Standard” (CIOOSC, 2019) Alex Benay says (Benay, 2019). Also, for guiding the work inside Government, Canada has launched a Directive on Automated Decision Making (Government of Canada, 2019c), and an Algorithmic Impact Assessment Tool (Government of Canada, 2019d) to assess issues such as data bias and algorithmic black box bias.

Also, following a global advanced trend, Canada government is adopting a cloud-first strategy, as a cost-effective alternative to data centers, embracing the flexibility of the cloud to maintain information technology service as demand for online services increases and technologies evolve.

“We are going to start seeing governments that are going to understand that they can deliver a service or a policy in a very different way than we have done historically. Historically, we designed a service, we have an RFP¹⁰, we buy we deliver the service. Today, you can release the data, for free, work with a bunch of new partners without buying anything, and get them to deliver the service for you. For example, all our websites are now being changed for voice compatible. So, with publicly available data, Amazon Alexa, Google Home, Apple Home, General Motors Voice automobile, Samsung electronic features can take that data and deliver the service on our behalf, as taking health prescription calls”, Alex Benay Says (Benay, 2019).

According to Mr. Benay, from the technology perspective, the trend would be to look at the Government as the ultimate platform. “We only need to release the data in a way that empowers innovation, creativity and service delivery”. From the policy perspective, “the next evolutions are policies done outside of the walls of the organization so more people can contribute to it” (Benay, 2019).

¹⁰ Request for proposals.

9. Challenges

Canada had recognized its challenges for managing, using and sharing data between departments and agencies. Until now, they use data in fragmented ways preventing synergies across government. This situation happens due to a lack of awareness that data could be useful to others and a culture of reticence to share information, what makes it difficult to access, use, and reuse data between and within public organizations. Additionally, Canada has a complex regulatory and legislative structure affecting data and information sharing (Government of Canada, 2019a), because of its confederation model with federal and provincial governments. “It’s hard for us to have consistent national data strategies when many of the services are provided by the provincial governments. And data doesn’t care about borders. Another problem is that regulators don’t have a great understanding of crosscutting data and digital issues”, says Alex Benay (Benay, 2019).

Beyond those challenges, from the citizen’s perspective, there is a need of having access to the data they need; agencies need better information regarding the data held by others that may be relevant to their work; the public sector needs to foster permanent initiatives to collaborate or share data; all stakeholders need ways for effectively use data for evidence-informed decision-making; programs and services for Canadians need to be consistently improved through the use of timely data and analytics; and public employees need skills to use data effectively.

10. Data generated with public funds, and/or Open Science

Connected to the government efforts for leveraging data as a strategic asset for the benefit of Canadians, the Roadmap proposes several ways for making government data more open and transparent. In that line of work, the document recommends fostering greater data access and use for research and analysis. For example, regarding immigration, refugees, and citizenship, it recommends making immigrant-outcomes data accessible opens up research and analytical possibilities on topics and themes that are of strategic value by:

- » Providing access to researchers through the Canadian Research Data Centers.
- » Continually increasing the nature and volume of data available in the Open Data Portal¹¹.
- » Developing information-sharing arrangements with provinces and territories to provide shared access to data.
- » Collaborating directly with researchers and academics on immigration-specific projects and analyses.
- » Collaboration with other departments and other levels of government to connect and enrich data, making them more beneficial to more potential users.

¹¹ This website allows to search open data relevant to Canadians, learn how to work with datasets, and see what people have done with open data across the country. www.open.canada.ca

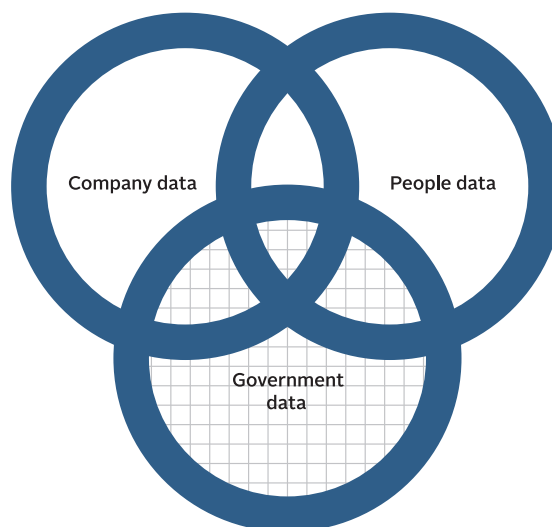
C. URUGUAY

Since 2010, the Uruguay digital agenda has shown a continuous and evolving growing process, positioning Uruguay as a leading country in the Latin American region. This work has been led by Agesic (Agency for Electronic Government and Information and Knowledge Society) unit that is part of the Presidency of the country with technical autonomy. In the last couple of years, Agesic has realized that “advancing in the digital transformation of the government implies to manage and use data strategically, and to enable the incorporation of digital trends and emerging technologies to create public value, to foster better decision-making and to adopt new models of relationship with citizens” (Agesic, 2019a). From this statement, Agesic decided moving forward towards a “Data-Driven Government” model focusing on the efficient and consistent use of data by public entities, in compliance with data protection and cybersecurity regulations.

For guiding this challenge, Agesic decided to create the National Data Policy, called “Data 360”, as a broad framework following and using some of the directives created by international organizations such as the European Commission on digital strategy, interoperability, data protection, and user-centered and data-driven government approaches; the OECD 12 principles for digital government strategies (OECD, 2015a) promoting the use of data to improve public sector intelligence to support policy formulation, as well as public services design and delivery.

Agesic has nailed the scope of the National Data Policy to digital government data, considering all digital data that public entities have in their organization, whether generated by themselves and/or collected. The data scope is categorized as *Company data*, *People data*, and *Government management data* showing that the different domains intersect.

Figure 3. Uruguay’s Data Universe for the National Data Strategy



Source: 'Estrategia de Datos para la Transformación Digital' by Agesic, 2019, p. 9.

The National Data Policy is part of the Uruguay Digital Agenda 2020 (AUD 2020), which proposes “advancing the digital transformation of the country in an inclusive and sustainable manner, with the intelligent use of technologies”. In 2019, Agesic has been working on two main documents: “Data Policy for Digital Transformation” (Agesic, 2019a), followed by the “Data Strategy for Digital Transformation” (Agesic, 2019b). While the first one gathers a set of principles, the second brings more detail and an actionable roadmap to execute them. In both documents, government data is described as a government asset for decision making, public policy formulation, and the development of proactive, efficient and personalized public services that anticipate citizen’s needs. The documents address issues such as data quality, rights, integrity, access, availability, sharing, and protection of personal data.

With the purpose of having a common ground to later compare with what other countries are doing, this report refers to Uruguay’s National Data Policy taking into consideration the content presented in both documents.

Cobit Model Analysis

1. Principles, policies, and frameworks

- 1.1. **Legal framework:** during the last decade Uruguay has developed several norms creating a strong legal framework regarding government data, information, and knowledge. Those rules are linked to the electronic government, information security, privacy, and transparency. This legal framework, among other things, regulates the exchange of information and security policies that must be adopted by public entities, it also watches the protection of personal data, the mechanisms of access to public information and establishes the principles for a correct management of data. There are also initiatives linked to open government data, personal data and the exchange of information within the State.
- 1.2. **Architecture frameworks:** for many years, Agesic has used and adapted a set of standards and enterprise architecture frameworks as data governance tools, such as a government integrated enterprise architecture based on The Open Group Architecture Framework (TOGAF) that provides an approach for designing, planning, implementing, and governing an enterprise information technology architecture (The Open Group, 2019) including operational data standards; the DAMA (Data Management Association) international standards, and the European Commission Guidelines from the ISA² Programme (Interoperability solutions for public administrations, businesses, and citizens) which aims to increase administrative capacity of public administrations by implementing the European Interoperability Framework (EIF). For Agesic officials, the most relevant aspect of standards is the allowance to interchange data among public institutions and to allow making evidence-based decisions.

1.3. Principles:

The National Data Policy is based on the following principles:

- » Public data as a public asset: data must be accurate, consistent, timely, accessible, complete, auditable and traceable.
- » Data responsibility: the public sector will have a public entity responsible for its data management and custody throughout the data life cycle. Public entities that make use of data must respect the content, not change the integrity or consistency and report any errors detected.
- » Generation: each public entity generates (collects, produces, elaborates) data according to its specific tasks. The data must be generated allowing its use by other public entities, using country data catalogs of reference and standards.
- » Efficiency: each public entity must collect and efficiently manage only the data under its responsibility.
- » Quality: to ensure data accuracy, integrity, and consistency.
- » Access to public sector data: except for restrictions that might apply, public entities will provide mechanisms allowing data to be available to people and institutions who also should be able to access information about how their own data is being stored, managed and used.
- » Share and use: the data should be freely shared among public entities in such a way that it is easy to use and reuse, deliver and exchange, complying with the integration and exchange standards. Personal data can not be used for different purposes or incompatible with those that led to its collection, and the sources of the data used must be specified.
- » Open data: public sector data should be opened by default.
- » Data protection: public entities must protect personal data following principles of legality, truthfulness, purpose, prior informed consent, data security, reservation, and responsibility.
- » Security: public entities should implement procedures to provide an adequate level of data confidentiality, integrity, availability and authenticity.
- » Preservation: to maintain data integrity and ensure its availability.

2. Practices and activities

The main objectives of the National Data Policy are: improving access to information and its shared use; maximizing the use of data for policy formulation and digital services design; strengthening information and knowledge integration; generating a culture of knowledge and learning exchange, and empowering individual personal data ownership.

Consistent with those objectives, Agesic and the National Data Commission have promoted and are implementing an action plan with several initiatives to be executed in two years (2019-2020):

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- 2.1. **Platform and catalog:** defining common public data semantic vocabularies, metadata and protocols moving forward interoperability, creating a national data catalog and building a government data platform allowing a comprehensive view of all government data available or indicating the means by which it can be accessed.
 - 2.2. **Reference models:** designing and implementing a governance model to guide public entities around the strategy and its operation, creating commissions to facilitate the integration of the participating entities, providing data management, analysis, and quality models, encouraging public entities to make decisions, formulate public policies and design digital services based on data.
 - 2.3. **Outreach and knowledge:** implementing training and dissemination means for the data portal and associated initiatives, as well as for the governance model, good practices, frameworks, and tools.
 - 2.4. **Vertical data commissions:** business-oriented decision-making structures responsible for creating value for specific thematic or institutional challenges, such as health, education, and public finance sectors.
 - 2.5. **Assessments:** defining a model for evaluating public entities and vertical commissions performance.

All these actions are being built on existing initiatives, such as the Government Open Data initiative; the Personal Data Control and Regulatory Unit (created in 2008), and the Interoperability Platform (created in 2011).

3. Organizational decision-making structures

As a part of the Data Policy roadmap, Agesic created a National Data Commission, as well as vertical data commissions focused on specific thematic or institutional challenges. The National Data Commission has been responsible for creating a national data action plan to carry out the data policy.

4. Culture, ethics, and behavior

According to Paula Rodríguez, Agesic Data Policy Official, in order to move the policy forward to be truly implemented by each public agency is crucial that the action plan is connected to the core duties of each organization. Only then, public officials commit to the required implementation. “When they have problems to solve, for example, when the national authority for tax collection needs to cross its data with education data, then is when the institutions really embrace the policy implementation. Throughout those practical issues, agencies understand the relevance of having a centralized national data governance structure allowing coordinated evidence-based decisions. You can create a very refined adoption campaign, but it will only be successful if the institution really sees the need and urgency of it” (Rodríguez, 2019).

The government is also trying to involve and empower citizens in the management of their own personal data, fostering participation in the formulation of public policies by opening data, and bringing the perspectives of users to the design of public policies and services.

5. Information guidelines and standards

Following the Data-Driven Government conceptual model—to design, delivery and monitoring of public policies and services through the management and use of data—Uruguay’s National Data Policy guidelines are based on data integration, data exploitation, and digital transformation.

For the data produced and used by the Uruguayan public sector, Agesic has fostered the use of standards Source: TOGAF, DAMA, and ISA²/EIF. As mentioned before, for Agesic officials, the most relevant aspect of standards is allowing to interchange data among public institutions and to allow making evidence-based decisions.

6. Services, infrastructure, and applications

Agesic has been developing a government data platform that includes dimensions such as data by sector; personal data tracking and consents; interoperability within the public sector and beyond (including operability with the private sector), and data mining analytics to make evidence-based decisions. This platform aims to facilitate data sharing, data discovery, data mining, and data analysis. They have also developed a data API for open data and data management. In a centralized way, the API allows each public agency to manage and be responsible for their data regarding data quality and data security.

7. People, skills, and competencies

To move forward “Data 360”, competencies and skills needed are connected with the multi-perspective view of this National Data Policy considering legal aspects, transparency, accountability, technology, and organizational transformation.

To foster those competencies and skills, in association with academia, Agesic has created a robust training program to enhance public servants’ skills. As a first step, decision-makers are trained on those multi-perspective aspects, and also regarding the relevance and use of data of their specific policy area. After having been trained, those decision-makers constitute the technical advisory board creating the definitions for advancing in the data governance of their organizations. For some specific requirements, a group of data experts is hired to run intensive courses and support products and implementations.

Further discussion

8. Trends

Agestic is starting to focus more on ethics for data use, artificial intelligence (AI) and algorithms aiming to define how to include ethical principles when using personal data in evidence-based public decision-making processes. “Artificial intelligence is already changing our relationships, and public institutions need to make several transformations to adapt”, Paula Rodríguez says.

9. Challenges

To move forward a data-based digital transformation and achieving a data-driven government perspective, Agestic sees the challenge of data quality, as well as the challenge of empowering individual personal data ownership. “We are working on a digital consent component, so the government can access citizens’ private data with their consent when that information is relevant to take public evidence-based decisions... We hope citizens get empowered and informed about the information the public sector have of them”, says Paula Rodríguez.

10. Data generated with public funds, and/or Open Science

For Agestic, all data generated with public funds is considered government data and treated such as following the same National Data Policy principles that any other government data.

D. DENMARK

The Danish public sector has a long tradition for registering high-quality data about the country and its citizens (Danish Agency for Digitisation, 2019). In the last decade, several Danish agencies and ministries have been working on initiatives related to data and data policy, and the improvement of public data distribution has been an ongoing task for the Danish central administration.

In that context, two main initiatives have drawn the national data policy landscape in the country. The first one is *The Basic Data Programme* (Horst, Bjerre, Lind & Hvingel, 2014), an initiative launched in 2012 to set an official and authoritative infrastructure model for spatial information in the country, running in parallel and synergistically to the implementation of the INSPIRE Directive¹². The program provided a data governance framework regarding climate, cadasters, buildings, road systems, watercourses, lakes, and other issues with localized information in which data could be utilized both for the public and the private sector. The initiative expanded beyond geospatial data, setting the framework for joint, structured and coordinated work in a number of prioritized basic data areas improving public registries and making data available free of charge to public authorities, businesses

¹² The INSPIRE Directive is a legal act that establishes an infrastructure for spatial information in Europe to make it more accessible and interoperable for a wide range of purposes.

and citizens, also leading to efficiency improvements in government and the creation of new solutions and products. As a part of The Basic Data Programme, in the last couple of years, the Danish Agency for Digitisation¹³ has been working on the *Data Distributor* (expected to be launched by the end of 2019), a shared distribution platform, from where data it can safely and easily be used, with respect for personal and sensitive information.¹⁴

The second one is the *Danish Digital Strategy 2016-2020*, which incorporates The Basic Data Programme adding guidelines for doing a better use of data; embracing public sector data as a growth driver; and showing how the public sector should protect data.

According to the document, to achieve better use of data and quicker case processing:

- » Data held by the public sector needs to be used to benefit citizens and businesses wherever possible within the framework of legislation.
- » Simpler rules, better processes, and reductions in the administrative burden are needed to make the public sector more efficient and easier to use for people and businesses.
- » The public sector needs to ensure that data on citizens and businesses is only collected and used where necessary and where it produces value for the individual and for society.

To foster public sector data as a growth driver:

- » Take advantage of the fact that Danish public sector data is of high quality and holds a large commercial productivity and growth potential.
- » Businesses can use public sector data to optimize their business processes and to develop new products and services which create value for citizens, public authorities and fellow businesses.
- » There is work to be done to foster authorities and businesses to be more aware of the value of data.
- » Opening up for free access to public sector data should take place wherever this is relevant for businesses and cost-effective for the authorities, and, of course, within the framework of the law.

To move the Danish Digital Strategy further, the public sector must protect user data by:

- » Making citizens and businesses to feel confident and safe when submitting information to public administration as well as being able to trust that data will be used for relevant purposes and that it will not be lost or fall into the wrong hands.

¹³ The Agency for Digitisation is a Danish public institution within the Ministry of Finance. Established in 2011 to be in charge of the government's digitization policies, the agency is responsible for the implementation of the government's digital agenda and the use of digital welfare technology in the public sector.

¹⁴ Although the Data Distributor hasn't been launched yet, there is a Danish open data portal <https://datafordeler.dk/>

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- » Improving information security throughout the public sector, to prevent the misuse of data and breaches of security. Data protection will, as far as possible, be incorporated into the design and development of public IT solutions from the very outset. The public sector will work to spread the use of common public security standards.
 - » Ensuring that the public sector will use and manage sensitive and confidential data with care and with the appropriate level of security and privacy, establishing secure procedures and workflows.

Cobit Model Analysis

1. Principles, policies, and frameworks

Following the Digital Strategy for 2016-2020, a Steering Committee for Data and Architecture developed a framework for a common public-sector digital architecture and a coherent IT-infrastructure. The document (Danish Agency for Digitisation, 2017b) aims to ensure secure cross-organizational processes and efficient sharing of data across the public sector and between the public and private sectors. The goal is that citizens and businesses experience services that are efficient, coherent, transparent and targeted to their needs, and also provide good conditions for innovation, growth, and development in society.

To enable an easy and safe exchange of data between different public organizations, the document presents eight principles (Danish Agency for Digitisation, 2017b):

- » Architecture is managed at the proper level in accordance with the common framework.
- » Architecture promotes coherence, innovation, and efficiency.
- » Architecture and regulation support each other.
- » Security, privacy and confidence are ensured.
- » Processes are optimized cross-organizationally.
- » Good data are shared and reused.
- » IT solutions collaborate effectively.
- » Data and services are supplied reliably.

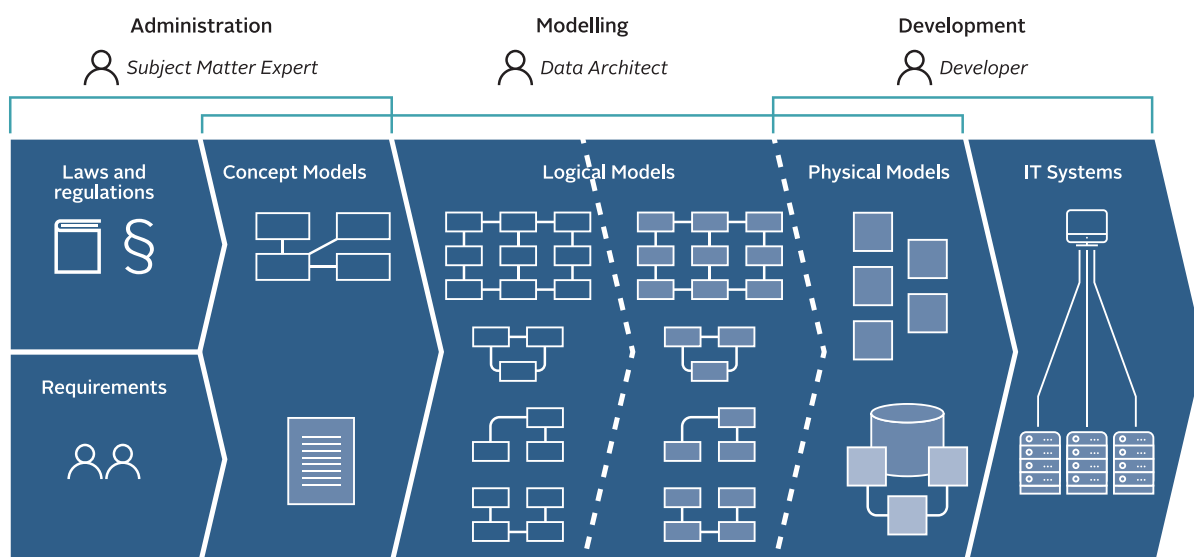
The principles specifically regarding data detail the need to share and reuse data; use common rules to document data; give data the quality requested; display information on data sources, definitions, and data models; and supply data and services in accordance with agreed service goals.

The common public-sector digital architecture has its own data model and associated rules, which the public organizations and related registers have to follow¹⁵. The rules for documenting data aim to provide a tool for public sector management helping to create a culture of good concept and data modeling that supports the goal of good data and efficient

¹⁵ Available only in Danish here <https://arkitektur.digst.dk/>

data sharing. The rules provide guidelines to operationalize the Danish digital architecture, ensuring that concepts and data are described and documented thoroughly, correctly and consistently (Danish Agency for Digitisation, 2017a), as well as to give a framework for achieving coherence between legislation and IT systems. Model rules are based on national and international methods, standards and experience contributing to have better data and increased sharing and reuse of good data across the public sector.

Figure 4. Danish's framework for achieving coherence between legislation and IT systems



Source: 'The Rules for Concept and Data Modelling' by Danish Agency for Digitisation, 2017, p. 5.

The model rules have three overall objectives:

1. To ensure that business knowledge is the basis for data modeling and development.
2. To ensure coherent data across the public sector.
3. To ensure reuse with the purpose of minimizing the total resources and time spent on developing and maintaining IT solutions.

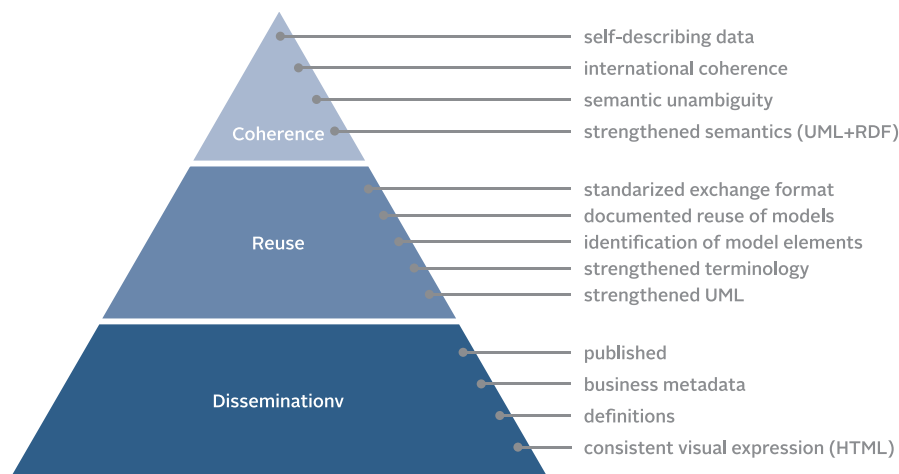
According to the Danish Rules for Concept and Data Modeling document (Danish Agency for Digitisation, 2017a), the benefits of applying these guidelines are:

- » To follow a collection of recognized and internationally rooted methods.
- » To apply the rules makes it easier to model well.
- » Concepts and data can be more easily reused when are described more consistently across authorities.
- » To rigorously and effectively transfer legal concepts to the interfaces of IT systems, which increases the quality and efficiency of public sector digitalization.

- » To have a shared language that promotes collaboration.
- » To be better prepared for new opportunities for using data.

The rules are organized in three successive levels: dissemination, reuse, and coherence. The choice of level can be adapted to the modeling capabilities of the organization and the specific purpose of the data to be modeled.

Figure 5. Danish's framework for achieving coherence between legislation and IT systems



Source: 'The Rules for Concept and Data Modelling' by Danish Agency for Digitisation, 2017, p. 6.

Following the rules is expected to ensure:

- » That concept and data models are developed.
- » That models at different abstraction levels are linked.
- » That the same modeling language is used.
- » That there is clarity about model ownership, versioning and approval status.
- » That models are available to users.
- » That concepts and data are named unambiguously and meaningfully.
- » That concepts and data are defined comprehensively.

2. Practices and activities

Denmark data policy main objective has been to ensure secure cross-organizational processes and efficient sharing of data across the public sector and between the public and private sectors, with the goal of allowing citizens and businesses experience services that are efficient, coherent, transparent and targeted to their needs, and also provide good conditions for innovation, growth, and development in society.

To achieve that objective, the Danish Agency for Digitisation has focused its activities on making Basic Data easily available, free to use for everyone including authorities, businesses, and citizens through a shared distribution platform with respect for personal and sensitive information.

3. Organizational decision-making structures

As a part of the Danish Agency for Digitisation, the Basic Data Board is responsible for the development and decision regarding the Basic Data initiative. The Board consists of executives from the Basic Data organizations and high-level stakeholder representatives.

4. Culture, ethics, and behavior

The Basic Data Program paves the way for new opportunities that require adjusting the culture of public organizations, as well as analyzing ethical implications. According to Niels Lykkegaard, Basic Data Programme team member, the initiative implies a unique challenge with a very comprehensive and complex business case where there is the need of demonstrating the effectiveness of public data usages after the implementation of the program. “Furthermore it is expected that the initiative will have effects on the data usage of private businesses. The initiative gives the public sector a better starting point for making its administration more effective. In municipalities, regions and central government, the Basic Data Program can deliver significant economic benefits. At the same time, private businesses are given the opportunity of using free Basic Data in developing new, smart solutions and products. In this way, the Basic Data Program can contribute to growth and innovation in the private sector”, Niels Lykkegaard explains (Lykkegaard, 2019).

“Regarding the ethical and cultural issues, it has become clear in the last couple of years that the usage of personal data in the public sector needs to address the trust of the people. The public sector needs to guarantee a secure and well-structured way of using the citizens’ data to ensure the Danish people’s trust and goodwill for the usage of personal information in the public sector. Therefore, secure storage and distribution of data are built-in features of the Basic Data Programme”, states (Lykkegaard, 2019).

A solid model for governance, the need for technical skills and stable funding are also key elements to successfully manage data policy activities.

5. Information guidelines and standards

All data registers in the Basic Data initiative have been standardized following the Basic Data Enterprise Architecture Rules document (Danish Agency for Digitisation, 2014), which includes guidance on Metadata. The rules are applicable to all the Basic Data organizations. In addition, the Digital Strategy provides rules for data modeling (Danish Agency for Digitisation, 2017a) and a White Paper on principles for data architecture (Danish Agency for Digitisation, 2017b), as mentioned above.

6. Services, infrastructure, and applications

The Basic Data Programme has developed the *Data Distributor Infrastructure*, which provides access to all the data registers in the initiative. The Data Distributor, expected to be launched by the end of 2019, provides several services from the different registers, includes REST (Representational State Transfer) API to create web services, allowing large scale downloads of entire datasets, data events, and subscriptions.

7. People, skills, and competencies

To move forward the current Danish Data Policy and its Basic Data Programme, the government has recognized that several people, skills, and competencies are required, such as data managers, IT project leaders, technicians/programmers, policy developers, data model experts, semantic experts, political analyst, economists, and legal experts.

Further discussion

8. Trends

For the Basic Data Programme one of the main trends they see arising is related to how to foster the trust of the people regarding the public sector usages of personal information. This is even more relevant due to the data centralization efforts made by the Basic Data initiative.

9. Challenges

What has been more challenging for the Basic Data Programme is coordinating the collaboration among different organizations with different traditions and domains of data, and finding common standardizations and rules. “The governance of a joint public initiative as the Basic Data initiative is difficult. Moreover, the technical development has proven more difficult than expected and the scope of the technical functionalities of the Data Distributor has changed throughout the project”, Niels Lykkegaard explains (Lykkegaard, 2019).

10. Data generated with public funds, and/or Open Science

The Basic Data are all produced with public funds including some research data, together with scientific data public agencies have. Some registers are updated and produced by the municipalities and others by centralized agencies. As part of the initiative, some data registers have been opened and are now free for use for all.

E. SPAIN

Promoted by the Ministry of Economy and Business, the Ministry of Territorial Policy and the Public Business Entity Red.es, the Aporta Initiative has been the key data policy element of the Spanish government during the last decade. The Aporta Initiative started in 2009, with the aim of promoting the opening of public information and the development of advanced services based on data, coordinating actions from the government agencies, the private sector, civil society, and academia.

In March 2019, a new agreement was signed between Red.es and two agencies belonging to the General State Administration —the State Secretariat for the Digital Progress and the State Secretariat of Public Function— to continuing moving forward the Aporta Initiative. The idea of the agreement is to promote the opening and the reuse of information from the public sector in coordination with the regional and local administrations of Spain, fostering the emergence of new products and services that create public value in collaboration with the private sector and civil society. Beyond boosting the opening of public sector information and the creation of new products and services, the agreement has a third axis that focuses on making data use and re-use easier regarding its findability, access, download, and analysis.

Figure 6. Aporta Initiative's strategic lines



Source: the Aporta Initiative's website, 2019.

Cobit Model Analysis

1. Principles, policies, and frameworks

Spain doesn't have one integrated Data Policy document including open data, privacy and security regulations, data-driven approach, Artificial Intelligence, and ethics. Instead, there are several regulatory frameworks that have been used in the practice as a non-formally written National Data Policy. This not-formal framework has been operationalized by the Aporta Initiative.

One of those regulatory frameworks is the 2003/98/CE Directive for public sector information reuse, which states that the information held by the public sector constituted an important asset for the creation of various products and services and it would become an increasingly important resource with the broad development of the digital ecosystem. This directive was made part of a law in 2007, giving even more relevance to the economic and social potential of data reuse. In 2011, the Royal Decree 1495/2011 for the public sector gives details and specifies in the aforementioned area the previously existing legal regulation. Later, the Directive 2013/37/ EU of the European Parliament comes to update the contents of the previous Spanish directives and laws.

To move forward the Aporta Initiative, adapting current European Union regulations, the country has consolidated a legal framework oriented to foster public information reuse guiding the work of all stakeholders involved in the data publishing process. Regarding privacy and data protection, Spain has a 2018 Law for Protection of Personal Data and a guarantee of digital rights and a National Data Protection Agency that is integrating the GDPR directives. In March 2019, the Spanish government launched its R&D Strategy in Artificial Intelligence (Ministerio de Ciencia, Innovación y Universidades, 2019), which recognizes the need of fostering an integrated national digital data ecosystem, as well as reflecting on the ethical aspects of the new scenarios. A month later, in April, it launched the National Cybersecurity Strategy 2019, which also acknowledges the relevance of guaranteeing the privacy and protection of personal data within the framework of the citizen's digital rights.

2. Practices and activities

The Aporta Initiative has aimed to capitalize on the value of the data in different socioeconomic sectors where can be translated into employment, innovation and professional and business opportunities.

Each year, the Aporta Initiative presents an Action Plan, which nowadays is mainly focused on open data policy and strategy, considering:

- » **Awareness of data management culture**, to create awareness of the value of public sector data for reuse, covering key sectors; to amplify activities linked to data developed within public and private institutions; to generate fruitful relationships between the actors of national and international open data ecosystem. The activities include organizing working groups and one annual summit for data managers for the public sector, as well as participating in relevant international events; publishing

reports fostering data reuse and public sector innovations based on public data for prioritized sectors such as forests and agriculture, sanitization, and cities, among others; as well as coordinating an outreach program.

- » **Analysis and statistics**, to characterize good practices, solutions and/or visualizations generated based on the reuse of information from the public sector; to evaluate the evolution of open data initiatives in the public sector in Spain, and to report to international institutions on the situation of Spain based on the indicators of progress and impact set.
- » **Regulation**, to participate in the preparation of EU directives; to adjust to the Technical Standard for Interoperability for information reuse; to incorporate DCAT¹⁶ considering StatDCAT, and to update vocabularies for 40 reference smart-cities datasets.
- » **National and international cooperation**, to strengthen the collaboration framework with public administrations and the private sector linked to the priority sectors such as agriculture data, geo-data, environmental data, and city data; to foster transparency and citizen participation; to guide data improvement.
- » **National catalog and support**, to increase the visibility of public sector datasets of greater impact, and publicizing solutions developed around them on the data.gob.es platform; to enrich the national catalog of private sector data; to improve data.gob.es usability for users; to create in datos.gob.es particular spaces for priority sectors data.
- » **Innovation**, to promote open challenges to create value for specific sectors; to highlight experiences using open public data; to create outreach material showing how open data is an enabler for disruptive technologies and solutions.

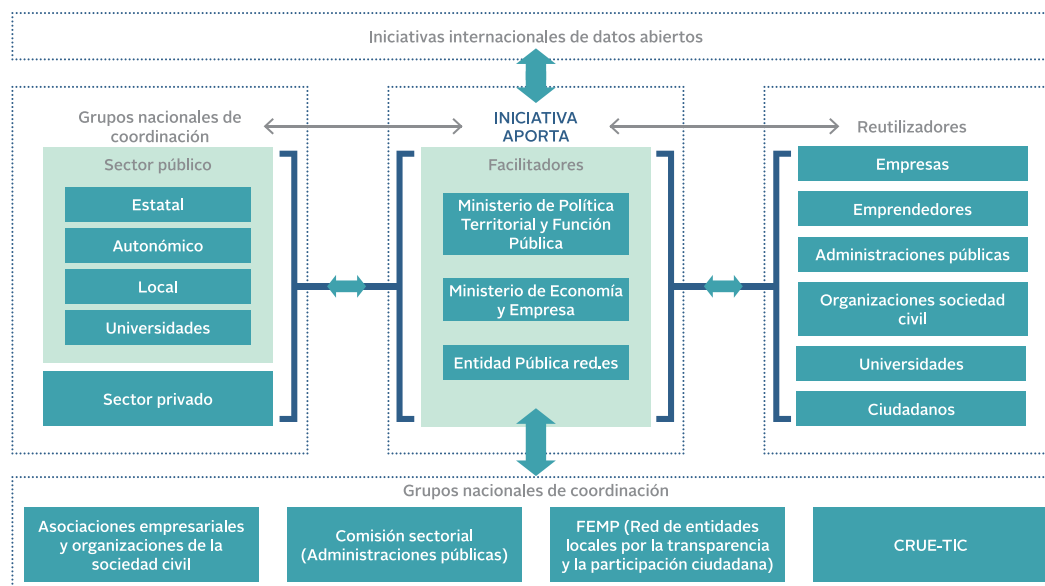
3. Organizational decision-making structures

The 2011 Royal Decree set roles for public agencies regarding the creation, management, and interoperability of public data instruments such as the catalog of reusable public information (data.gob.es).

Currently, Red.es and two agencies belonging to the General State Administration —the State Secretariat for the Digital Progress and the State Secretariat of Public Function— are the ones leading the decision-making regarding the Aporta Initiative as key national data policy endeavor, interacting with other stakeholders when needed.

¹⁶ The Data Catalog Vocabulary (DCAT) is a Resource Description Framework (RDF) vocabulary, designed to facilitate interoperability between data catalogs published on the Web, to increase discoverability and to enable applications to consume metadata from multiple catalogs.

Figure 7. Aporta Initiative's open data governance model



Source: the Aporta Initiative's website, 2019.

4. Culture, ethics, and behavior

For the Aporta Initiative, success factors to govern and manage data policy activities, considering cultural, ethical, and behavioral issues, are directly related to having a solid regulatory framework, specialized and involved technical teams, leadership and commitment from institutions and organizations, and collaborative bases. “The scope of the strategy is of such magnitude that only from the joint work and the contribution of the different agents is viable. Furthermore, in our global world, all this must be addressed by working in a network with other public and private, national and international institutions”, says Pilar Polo Assistant Deputy Director of Digital Economy Directorate at Red.es (Polo, 2019).

5. Information guidelines and standards

Based on the Spanish National Interoperability Scheme (Spanish Government, 2013), the country created a Technical Interoperability Standard on the reuse of information resources, that establishes common conditions on the selection, identification, description, format, conditions of use and availability of documents and information resources prepared or held by the public sector, relating to numerous areas of interest such as social, economic, legal, tourism, business, and education, among others. These rules are intended to facilitate and guarantee the process of reusing public information from public administrations, ensuring the persistence of information, the use of formats as well as the appropriate terms and conditions of use.

6. Services, infrastructure, and applications

The National Catalog of open data (data.gob.es) is considered as the flagship infrastructure of the National Data Policy, offering a single access point to all data that the Spanish public administration makes available for reuse. The platform increases visibility and facilitates access to datasets published in local and regional catalogs. Thanks to its convergence with European standards it is connected to the European data portal. The catalog presents multiple mechanisms to locate and access data, integrates a content management tool, a multi-language module that allows having a symmetric navigation for each of the languages, an engine to integrate data catalogs of several public publishing organizations, and a Linked Data API and a SPARQL query point.

As a technological solution, the national catalog uses a federated metadata system with optimal response times; comply with accessibility and usability high standards; uses open source technology; follows current interoperability regulations; has a multi-platform design and a technological architecture model that facilitates the scaling of the solution.

7. People, skills, and competencies

In order to have the right people, skills, and competencies to successfully implement the Spanish national data policy, regarding open data and creation of products and services, key success factors are institutional leadership, technical experience, knowledge of the public sector, knowledge of the data management and sharing enabling technologies, knowledge of use and analysis of data, knowledge of sector areas, as well as communication and outreach skills. “The profiles needed to address a comprehensive data policy are increasingly varied because we have advanced from the opening of public data to the understanding of the value the data can produce regarding employment, innovation or serving citizens. This is only the beginning. From the technical point of view, a data policy will require building and maintaining technological architectures of a certain complexity, so we need experts in the technical norms and their implementation, experts in data publication and exploitation, data managers and analysts, knowledgeable about the business in different sectors. We need innovative and result-oriented managers informed about the latest strategic frameworks of reference and capable of reconciling long-term projects with short-term results, as well as the interests of the different stakeholders”, says Pilar Polo (Polo, 2019).

Further discussion

8. Trends

For the National Policy Data, and specifically for the Aporta Initiative, main trends are related to create new value with data, improve data quality, keep data updated, and use data safely to build solutions and public services for businesses, professionals and citizens. The Spanish government has also seen an increasing demand for specialized, local and sectorial data, as well as higher interest in data-visualization systems, data-based decision-making tools, artificial intelligence, and natural language processing, among other technologies.

9. Challenges

As the data economy should consider including private sector data, one of the current Spanish government main challenges with fostering companies to share their data, which implies overcoming organizational, technical and legal challenges.

- » Organizational challenges: before launching an initiative of this sort a company needs to collect, validate and prepare its database. These costs are easy to measure, while the benefits can not always be estimated in a simple way. Also, could be complex to face possible ethical implications, lack of company leadership, and the reaction of customers regarding their data to be shared even if is anonymized.
- » Technical challenges: data providers need to guarantee a series of basic management processes, such as the collection and selection of data, and also address aspects such as the accuracy and integrity of the data, avoiding duplicity, and ensuring data privacy.
- » Legal challenges: there are still a lack of specific legal frameworks and reference cases regarding including private sector data into public sector initiatives. Therefore, current initiatives have to rely on a mix of different legal frameworks, including Spanish intellectual property rights, data protection rights, and competition laws.

10. Data generated with public funds, and/or Open Science

The Spanish State Plan for Scientific and Technical Research and Innovation 2017-2020 (Spanish Government, 2017) has set the objective to promote open access to results and research data financed with public funds, as well as to promote a responsible research model that is open to society, allows the reuse and exchange of information, and respects intellectual property rights.

With the European Commission, the country also participated in actively promoting the design of the European Open Science Cloud (EOSC). Launched in 2018, the platform offers a federated system to store, share and reuse in an interdisciplinary way the data generated in scientific and innovation projects financed with public funds, using common quality standards, certification, and participation rules.

III. Insightful lessons for a Chilean national data policy

Many countries around the world are increasingly moving forward data-related initiatives, along with survey and statistical data, administrative data, and research data. Some of those countries, including Chile, are working to create comprehensive frameworks or roadmaps allowing to address jointly, structurally and coordinately the different pieces of the public data ecosystem: open data, interoperability, data protection, and ethical considerations, among other aspects.

To contribute to the forthcoming Chilean National Data Policy from an international perspective, this document has presented an overview of how New Zealand, Canada, Uruguay, Denmark, and Spain are addressing the challenge of creating frameworks to unlock the power of public sector data. Although their contexts, approaches, methods, and priorities are quite different between them and present a wide range of maturity, it is possible to identify several lessons that could echo as a valuable reference for the upcoming Chilean National Data Policy. Below we detailed ten areas of recommendations founded on the countries' initiatives analyzed.

1. Recommended principles and frameworks for national data management

1.1. Formulating principles for using data for improving government and public decision making, including:

- » Public data as a public asset: data should be taken as an increasingly important resource with the broad development of the digital ecosystem.
- » Citizen centered: whenever possible, public data initiatives should be focused on creating value for people.
- » Open, sharing and reuse by default: data should be ready for been used, reused, discoverable and available.
- » Transparency: whenever possible public institutions should display information on data sources, definitions and data models.
- » Trust: public institutions should ensure protection for individuals' information and privacy by design, making certain that data is used based on public trust and consent, retaining human oversight, and recognizing and understanding the biases to avoid perpetuate or intensify poor outcomes for particular groups, designing systems and processes helping to ensure unfair or discriminatory outcomes aren't generated.
- » Secure: public institutions should ensure data are shared and used keeping people's privacy and confidential data safe.

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- » Purposeful: public institutions data initiatives should deliver clear public benefit, ensuring data is fit for purpose or task in accordance with agreed service goals, designed to increased evidence-based decision-making, enabling turning data and analysis into action whenever possible.
 - » Agile: public institutions should promote intra and inter-government collaboration fostering the talent and capacities needed.

1.2. Developing or enhancing frameworks to foster national data policy and strategies:

- » Developing or enhancing a legal framework oriented to:
 - Regulating the work of all stakeholders involved in the data lifecycle.
 - Regulating statistics, security, and transparency.
 - Fostering public information use, reuse, and sharing.
 - Protecting personal data and guaranteeing digital rights.
 - Fostering R&D.
 - Regulating Artificial Intelligence and other cutting edge technologies.
- » Establishing an ethical framework oriented to:
 - Stating guiding values to generate, analyze, and disseminate data.
 - Building confidence in public sector data use for people, businesses and academia.
 - Setting standards for transparency and accountability when using new technology in the public sector.
 - Setting principles for how data should be used in the public sector stating clear user need and public benefit.
 - Maintaining human oversight and responsibility along the data lifecycle.
 - Forestalling and preventing situations or initiatives that could favor bias towards certain people or companies, or be in some way harmful to the country and its inhabitants.
- » Creating a data stewardship framework oriented to:
 - » Describing the role of the entity responsible for the public sector data management and custody of its integrity and quality throughout the data life cycle, as well as the role of the responsible official in each main service or agency.
 - » Fostering the use of standards and agreed architectures across authorities to plan, manage, document, and describe data thoroughly, correctly and consistently, implementing monitoring and assessment processes.

- » Advocating and promoting a data-driven approach and culture across public institutions, implementing interoperability frameworks, and enhancing people's capabilities and literacy to use and reuse data.
- » Fostering coherence between legislation and IT systems, ensuring architecture, security, privacy, and regulation soundness, as well as optimized processes cross-organizations.

2. Recommended activities to achieve policy objectives:

- 2.1. Boosting campaigns to foster a government awareness of data management culture, citizen engagement, and partnerships regarding data-related issues and initiatives in order to earn and maintain public trust and confidence within and outside of government. Setting reference models to guide public entities on data management, analysis, and quality models, encouraging them to make business-oriented decision-making value creation for specific thematic or institutional challenges, formulating public policies and designing digital services based on data.
- 2.2. Creating, reviewing and/or updating—when need it—legal, ethics and privacy, and stewardship frameworks regarding issues such as data analysis, statistics, identity, interoperation, transparency, accountability, science, national and international cooperation.
- 2.3. Agreeing on country data architectures and standards, defining common public data semantic vocabularies, metadata and protocols enabling interoperability and considering the quality and updating assessments.
- 2.4. Reviewing and updating back-office software guaranteeing confidentiality, integrity, and interoperability.
- 2.5. Improving the findability, availability and accessibility of government data, promoting the free use of data for everyone including authorities, businesses, and citizens implementing open and transparent practices, such as a shared distribution platform with respect for personal and sensitive information.
- 2.6. Creating a public digital academy to grow data capability and support good practices.

3. Recommended data organizational structures and roles needed for all departments, agencies, and portfolios:

- 3.1. Senior-level directive committee or a National Data Commission: strategic and technical horizontal oversight with a chief data steward with a functional leadership role for data and analytics across government. This leading role would allow getting more value from data concordant with government priorities, and responsible for creating a national data action plan to carry out the data policy.

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- 3.2. Vertical data commissions or advisory boards focused on specific thematic or institutional challenges. Advisory boards are needed for agreeing on very technical issues, such as standards, privacy, cybersecurity, and ethical scope.
 - 3.3. A Data Stewardship Framework to enable agencies to manage data as a strategic asset and benchmark their data maturity, setting roles for public agencies regarding the creation, management, and interoperability of public data instruments such as the catalog of reusable public information.

4. Recommended factors to govern and manage data policy activities, considering cultural, ethical, and behavioral issues:

- 4.1. Ensuring and communicating the support of the highest authorities regarding the relevance of implementing data-driven government initiatives.
- 4.2. Identifying gaps and moving forward on data literacy, skills and competencies needed.
- 4.3. Developing and/or enhancing jurisdiction, frameworks, and standards regarding the ethical use of data. Fostering the protection of privacy rights and ethical use of data as core values.
- 4.4. Fostering trust regarding data-driven government initiatives among public officials, public sector data practitioners, businesses, academia, and civil society. Creating an advisory board on trusted data use.
- 4.5. Promoting public servants' engagement with data driven government initiatives, by creating specific data action plans connected to the core duties of each organization.
- 4.6. Ensuring a solid model for governance with stable funding, specialized and involved technical teams, leadership and commitment from institutions and organizations, and collaborative bases.

5. Recommended information guidelines and standards:

- 5.1. Choosing an enterprise architecture framework that allows setting standards for identity verification and personal information protection across the public sector, to interchange data among public institutions, and to allow making evidence-based decisions. The enterprise architecture should ensure that concepts and data are described and documented thoroughly displaying information on data sources, definitions and data models, correctly and consistently, as well as to give a framework for achieving coherence between legislation and IT systems.

- 5.2. Working across the government to co-design, develop, and implement the country's data stewardship framework, to set consistent ways of describing and recording data to make sharing, comparing, and re-using data more efficient.
- 5.3. Using standards that ensure: data collection fits a purpose and agreed service goals, data good management consistent with a purpose and a data life-cycle, data trust and authority, data quality, data technical interoperability across government, data has wide application and suitability, data proactive release, data is easy to follow and comprehend, and data privacy protection.
- 5.4. Subscribing Open Data Charter six principles. Data should be: open by default; timely and comprehensive; accessible and usable; comparable and interoperable; for improved governance and citizen engagement, and for inclusive development and innovation.

6. Recommended services, infrastructure, and applications:

- 6.1. Developing a secure cross-departmental information exchange network, such as Estonia's 'X-Road' system¹⁷.
- 6.2. Mapping all the existing services, infrastructure, and applications, to merge those duplicated and used in silos such as CRMs, finance systems, email systems, and national geospatial data platforms.
- 6.3. Committing to consider data itself as a part of the country's infrastructure, ensuring interoperability as a core national value.
- 6.4. Fostering specific infrastructure required for the core function of each agency, the issues they are looking to solve, and what impact they would like to have.
- 6.5. Developing and/or enhancing a government data platform that includes dimensions such as data by sector; personal data tracking and consents; interoperability within the public sector and beyond (including operability with the private sector), and data mining analytics to make evidence-based decisions.
- 6.6. Developing a data API for open data and data management that allows each public agency to manage and be responsible for their data regarding data quality and data security, as well as creating web services allowing large scale downloads of entire datasets, data events, and subscriptions.
- 6.7. Offering or enhancing a single access point to all public data available for reuse, fulfilling accessibility and usability high standards, using whenever possible open source technology, following current cutting edge interoperability international regulations, having a multi-platform design and a technological architecture model that facilitates the scaling of the solution.

¹⁷ Estonia's 'X-Road' system <https://e-estonia.com/solutions/interoperability-services/x-road/>

7. Recommendations on people, skills, and competencies:

- 7.1. Focusing on ensuring public institutions' workforce has the skills and tools to unlock the power of data, by promoting digital literacy among all public servants. Hiring, retaining, cultivating, and empowering the right talent and capacity. Those talents should include innovative and result-oriented managers informed about the latest strategic frameworks of reference and capable of reconciling long-term projects with short-term results, as well as data managers, IT project leaders, technicians/programmers, policy developers, data model experts, semantic experts, political analyst, economists, and legal experts.
- 7.2. Improving data capability across government to have consistent data practices and processes, and to attract technical specialist skills for working with data, translator skills to present insights in meaningful ways, and data literate decision-makers that use the information to make better decisions.
- 7.3. Creating and/or enhancing training programs to setup and/or improve public servants skills regarding institutional leadership, data legal aspects, transparency, accountability, technology, organizational transformation, knowledge of data on the public sector, knowledge of the data management and sharing enabling technologies, knowledge of use and analysis of data, knowledge of sector areas, as well as data communication and outreach skills.

8. Recommendations regarding trends to keep in mind:

- 8.1. Using artificial intelligence (AI), georeferenced data, and data visualizations to support decisions.
- 8.2. Evaluating a cloud-first strategy.
- 8.3. Planning for voice compatible services, and natural language processing.
- 8.4. Contributing to civil society and the private sector for creating services, and solve public problems. Fostering flexible frameworks that can be adaptable to how new technologies are pushing the boundaries of what can be done with data.
- 8.5. Empowering individual personal data ownership to restore trust, by fostering knowledge, discussion, and legal frameworks on this topic.

9. Challenges recommended to keep in mind when developing a national data policy:

- 9.1. Data in the public sector is fragmented, even inside a single organization, and data quality is often not assured.

- 9.2. Many times in public sector organizations there is a lack of visibility and availability of existing data, a lack of awareness that data could be useful to other public institutions, lack of skills to use data effectively, and often a prevalence of a culture of reticence to sharing information.
- 9.3. It can be highly challenging coordinating the collaboration between organizations with different traditions and domains of data and finding common standardizations and rules.
- 9.4. The regulatory and legislative structure affecting data tends to be very complex.
- 9.5. Inside of public institutions, there is often a lack of skills to use data effectively.
- 9.6. People are not clear on what rights they have to access their own data, as well as to access different types of government data.
- 9.7. Processes for requesting data are not always consistent nor efficient, plus access to existing data is not always equitable and inclusive, and charging mechanisms can restrict access by creating inequities for certain individuals or organizations.
- 9.8. Initiatives for contributing with the private sector can be challenging when it comes to fostering companies to share their data, which implies overcoming organizational, technical and legal barriers.

10. Recommendations regarding how open science is being addressed in the framework of data policies:

- 10.1. Making the right data available by investing in and fostering public data initiatives and smart disclosure on topics such as spatial data, climate, aging, cities, health, labor, and immigration opens up research and analytical possibilities with strategic value.
- 10.2. Explicitly including research data as part of the national data strategy to encourage evidence-based decision-making and public policy formulation.
- 10.3. Promoting open access to results and research data financed with public funds, using common quality standards, certification, and participation rules.
- 10.4. Creating and enhancing a national research database that holds microdata about people, households, and life events, like education, income, benefits, migration, justice, and health, always guarding the privacy a sensitive data.
- 10.5. Promoting responsible research models that are open to society, allowing the reuse and exchange of information, while keeping respect to privacy, the industrial protection and patents using common quality standards, certification, and participation rules.

IV. Final remarks

Along with this document, we have mapped and learned from the experience of five countries moving forward towards comprehensive guiding documents to drive their national data policy. The common goal those countries have is taking advantage of the efficient and consistent use of data for policy formulation and digital services design, in compliance with data protection and cybersecurity regulations. Beyond this common objective, the countries present a wide range of maturity level as well as heterogeneous approaches to their national data policy and strategy processes, showing interesting lessons from their differences, but also providing the opportunity to identify common ground components present in most of them.

The most noteworthy difference among countries is the authority leading or coordinating their data policy documents and initiatives. While sometimes the leading role is held by a national transversal structure, in other cases a specialized or autonomous public agency is in charge. This fact might respond to a political vision or, simply, came given by a leading role held historically from a specific institution. Differentiating nuances are also observed, depending on the balance that each country gives to issues that generate tension such as privacy versus security.

In spite of the differences, there are common enablers elements present in all national data policy and strategy framing documents:

- » **Political will:** A country's strategic vision of treating data as a valuable asset to benefit citizens and businesses, to make better decisions, to design better programs and deliver more effective people-centric services. This vision must consider a solid model for governance, the need for technical skills and stable funding, also considering adoption activities, ethics and regulation, and a robust intra and inter agencies coordination, including constant capabilities training.
- » **Co-creation:** An inclusive process for creating the main pillars of the policy or strategy document with relevant stakeholders that collect and use data from central and local government, but also from business, community organizations, and NGOs—including marginalized groups, such as youth, people with disabilities, ethnic groups— assessing and harnessing previous initiatives and capabilities regarding data as well as balancing aspects from the policy perspective and the technical perspective.
- » **Assessment:** A data governance system designed considering to monitor and evaluate social, economic and geopolitical potential and risks while setting rules to ensure data quality while balancing security, competitiveness, and privacy. There is also coincidence in the need of treating the policy frameworks as living documents, considering that they provide guidance to complex and dynamic contexts.
- » **Intra and global intelligence:** The analyzed countries have recognized the need of having tailor-made guidelines for specific cases and institutions, as well as the value of building on and strengthening their own existing initiatives regarding data architectures, open data, and privacy. However, the most important step to advance has been using leading world policies and initiatives as reference frameworks for

developing their national data policy, strategies, and standards, such as the European Interoperability Framework (EIF); the Directive on open data and the re-use of public sector information; the EU General Data Protection Regulation (GDPR), and INSPIRE Directive (Infrastructure for Spatial Information in Europe); the FAIR Data Principles (findability, accessibility, interoperability, and reusability); the OECD 12 principles for digital government strategies (OECD, 2015a); and the Open Group Architecture Framework (TOGAF), among others.

While in the last decade many countries have done considerable advances in their public data initiatives, we are just starting to see the first attempts for having robust policy roadmaps on the matter. There is plenty of need for further research for gathering evidence and understanding what works. Continuing mapping these policy documents and practices could help to better understand how to create policy documents that are feasible to be implemented.

Those future research could bring light on issues such as the ones mentioned by the Cobbit model to understand, among other things, how to translate the desired data governance into practical guidance for national data management; practices and activities to achieve policy objectives and outputs congruent with policy goals; functional organizational decision-making structures; culture, ethics, and behavior required as a success factor to govern and manage data policy activities; the best information guidelines for all data produced and used by the public sector; services, infrastructure, and applications needed; people, skills, and competencies required for successful completion of all activities and for making correct decisions and taking corrective actions.

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