
DG Joint Research Centre

B6 - Digital Economy

# Digital Government Benchmark

# Study on Digital Government Transformation

*Final Report*

ISA$^2$ action 2016.10: ELISE

European Location Interoperability Solutions for e-Government

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# Executive Summary

This report is part of a larger study which provides an analysis of digital transformation of government, analysed in conjunction with the role of data and of technological areas, specifically APIs and blockchain. While digital transformation of government is much wider than the technologies which can potentially support it, an analysis of the role of APIs and blockchain in the public sector is highly relevant to illustrate how technology can enable the transformation of government.

This report focuses on the work package on Digital Transformation of Government report is the first of the following three reports delivered in the scope of this benchmark study, which are published separately:

1. **Digital Government Transformation** - The aim of this work package has been to better understand components of the Digital Transformation of Government, and to propose a method to help the public sector better shape its Digital Government Transformation activities.
2. **The API landscape in the Public Sector** - The aim of this work package has been to identify areas of further research for the Joint Research Centre, including the ability of APIs to assist Member States with enabling their digital transformation. Areas of specific focus include cross-border interoperability between Member States and the opportunity for the EU to become involved in developing or advocating API standards.
3. **Blockchain and Distributed Ledger Technologies and their relevance for Digital Governments** - The aim of this work package has been to identify the relevance of this technology for Digital Government and investigate key pilot deployments of this technology for governments within Europe. The study focusses on the functionalities, governance, usage, technical architecture, costs and benefits of the pilot deployments and explores their potential to be scaled across borders.

**Digital Government Transformation**

The work package has analysed existing frameworks and definitions of Digital Government and the Digital Transformation of Government, in the light of a proposed Framework for Transformation and a related definition for ‘Digital Government’. This Framework consists in five levels of transformation, from e-government to a fully transformed and ‘smart government’. Each level is qualified by characteristics following seven themes, which include, for example, drivers for transformation and the types of ecosystems.

The mapping of the different analysed frameworks (e.g., from OECD, UN and EC sources) against the proposed Transformation Framework shows that examples mostly relate to its levels one (e-government) and two (open-government), with some elements of level three (data-centric). The gaps identified relate to the notion of capacity building (in project management and procurement) to accompany digital transformation, which we propose to add to the definition of Digital Government. Another set of gaps relates to the enablers of transformation measured by the different frameworks: human capital, technical infrastructure or digital skills and the uptake of technologies. Enablers relating to technology and skills are also referred to in the EU definition of e-government, together with organisational change to “strengthen support to public policies”.

The study illustrated Digital Transformation of Government with a series of case studies in several domains, where we learned: (1) the importance of the context of a Digital Transformation Initiative: the outcomes of an initiative are influenced by the political, organisational and technical opportunities and threats; (2) the drivers

and the link with the key motivations of Digital Transformation; (3) the relation between the different themes – and their levels of maturity - used in the proposed Framework to qualify this transformation.

Leveraging the lessons learned, the study drew four sets of conclusions and proposed areas for further research. The first one, the challenges of change, relate to managing change and setting the right path for transformation. This included, capacity building for change and adequate access to skills are key. The second one, the reasons and means of transformation, considers drivers, where key motivations and leadership of digital transformation initiatives and the service model are related to digital systems and a technology focus. Key research points relate to researching the benefits of digital transformation and what is the role of the ecosystem, also from a social or policy perspective. The third one, the roles of policy and interoperability in transformation initiatives, highlights the driving force of policies in transformation, and research points address how policy opportunities can support the higher levels of transformation.

# 1. Introduction

The aim of this work package has been to better understand components of the Digital Transformation of Government, and to propose a method to help the public sector better shape its Digital Government Transformation activities. Digital Government Transformation (also referred to as Digital Government in this report) differs from e-Government. This chapter will address the following questions:

- How is Digital Government defined?
- What is the difference between Digital Government and e-Government?
- What are the different levels of Maturity of Digital Government for an organisation? What are the key themes used to qualify them?
- What are the existing Digital Government frameworks and how do they compare?
- Can we illustrate Digital Transformation of Government with case studies and what can we learn from them in terms of state-of-play in Europe? What are the key contextual elements which influence or impact a Digital Government Transformation initiative?

Each research question is referred to in the related sections.

The following sections will present:

- The methodology used to collect answers to the research questions
- An analysis of existing digital government definitions and frameworks, analysing their similarities and differences
- An overview of the case study insights and lessons learned. The complete case studies are presented in the appendices.

# 2. Methodology

## 2.1 A four step process

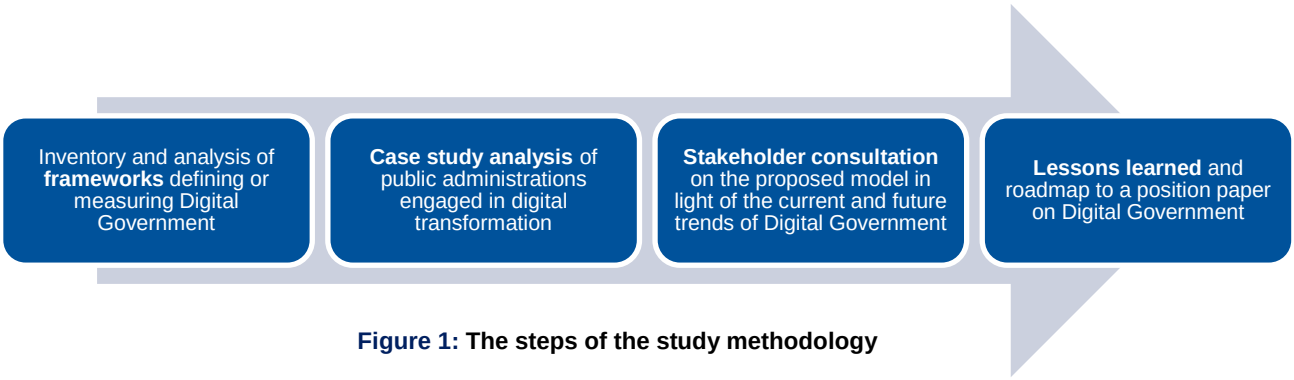


**Figure 1: The steps of the study methodology**

The methodology is based on a four-step process:

1. An inventory of **existing frameworks and models** used to understand and measure Digital Transformation of Government or Digital Government.

The aim is to provide recommendations on the reuse of existing Digital Government frameworks and models. While there are many frameworks and models – and these have been extensively analysed and compared in research[1] – this report has looked into the main ones used at international level and found that the following approaches were mostly used: benchmarking (e.g.: eGovernment benchmark[2]), maturity models (e.g.: Digital Government Model Gartner), adherence to principles and reference frameworks (e.g.: European Interoperability Framework[3], OECD integrated policy framework[4]), visions

[1] Examples are:
From Practice to Theory and back to Practice: Reflexivity in Measurement and Evaluation for Evidence-based Policy Making in the Information Society (2013), Misuraca, G., Codagnone, C. and Rossel, P., Government Information Quarterly, 01/2013 (pp. S68–S82)

Understanding the eGovernment Paradox: learning from literature and practice on barriers to eGovernment adoption, (2014), Savoldelli, A., Codagnone, C., Misuraca, G., in Government Information Quarterly, Volume 31, Supplement 1, June 2014, (pp. S63–S71)

Institutional isophormism, policy networks, and the analytical depreciation of measurement indicators: the case of the EU eGovernment benchmarking (2015), Codagnone, C., Misuraca, G., Savoldelli, A., Lupianez-Villanueva, F., in Telecommunications Policy Vol. 39, Issue 3-4

Measuring the public value of e-Government: the eGEP2.0 model, (2014), Savoldelli, A., Misuraca, G., Codagnone, C, in Electronic Journal of eGovernment (EJEG)

Evaluating e-government: A comprehensive methodological framework to assess policy impacts, (2014) Misuraca, G., Savoldelli, A., Codagnone, C., in Government e-Strategic Planning and Management: Practices, patterns and roadmaps, L. G. Anthopoulos and C. G. Reddick (eds.), Public Administration and Information Technology 3, DOI: 10.1007/978-1-4614-8462-2_2, Springer Science, New York, USA

Measuring the public value of e-Government: trust in measurement processes or processes of building trust?, Codagnone, C., Misuraca, G., Savoldelli, A., (2013) in proceedings of the 13th European Conference on e-Government, Como, Italy, 13-14 June 2013

[2] https://ec.europa.eu/digital-single-market/en/news/new-study-egovernment-services-europe-improving-cross-border-availability-services
[3] https://ec.europa.eu/isa2/eif_en
[4] http://www.oecd.org/going-digital/framework

etc. These are detailed in the section 1.3. A phased "maturity" approach supports the transformation itself - with key elements relating to the organisation - rather than only evaluating the transformation.

This study leverages Gartner research in the area of Digital Government Maturity and proposed a framework to qualify Digital Government Transformation[5]. The advantage of the proposed model is that it provides several levels of maturity, rather than one single future state to comply with, and it is recent; it is not proposed as "the best" model, but only one of the possible ones for evaluating the transformation path and, as such, was selected as a base to analyse all frameworks with a twofold objective:

- evaluate what aspects individual frameworks are currently assessing
- complement the base Digital Government Transformation Framework.

We acknowledge that the proposed framework has a strong "public service" dimension, and that the policy dimension and the socio-organisational dimension are not a focus of this framework.

2. Conducting an analysis of **real examples** (i.e.: case studies) of public administrations in Member States engaged in digital transformation (recent or in-progress) with an aim to identify:
   - the level of maturity of the initiative and of the organisation leading it
   - patterns linked to the context of the initiative, i.e.: the cultural, historical, social, political, geographical and digital capabilities context for specific countries and/or regions.

   The assessment has been done against the proposed framework within each case study.

3. Conducting a **stakeholder consultation** to collect feedback on the proposed model in light of the current and future trends of Digital Government. This is achieved with:
   - the testing of the proposed Framework with the case study experts and its adaptation based on the lessons learned

4. Outline the **lessons learned** from the study and propose an approach for developing a position paper on the Digital Transformation of Government, taking into account the priorities of the European Commission and the evidence gathered from the field through the case studies.

## 2.2 Case studies

The assessment of each case study is done against the proposed selected framework. The case studies were selected along the following criteria:

- to include cross-border and cross-sector initiatives

[5] The Digital Government Transformation Framework is presented in the next section

- to include initiatives at various levels of government: national, regional and local
- to include initiatives from various Member States
- to give insight into the various maturity levels of Digital Transformation through the description of relevant initiatives
- to illustrate initiatives in the following domains:
    - Taxation
    - Health
    - Utilities
    - Transport

Taxation and health domains address very large initiatives with huge budgets. Taxation systems usually are facing the need to transform for various reasons, including having to deal with legacy systems that are becoming obsolete and to leverage the potential of service automation thanks to the sharing and reuse of data. Health systems face the challenges of dealing with multiple actors (pharmacists, doctors, hospitals, laboratories, emergency services) while developing a patient-centric approach to services.

Utilities and transport domains address initiatives where location[6] data and its applications are key elements of the public service. They are also domains which see services contributing to smart cities and face challenges linked to the interoperability of various types of location data, sometimes needed in real time.

The case studies describe digital transformation initiatives/ projects managed by a public administration (a ministry, an agency etc.…). They address an organisation, and not a digital service or a country, as for example the European eGovernment benchmark[7] does by evaluating the online services in each Member State.

*Note*: These case studies were selected based on the criteria explained above, and not on their level of transformation. The outcome of the case studies does not provide insight in high levels of transformation. In order to counter these limitations, a specific section in the conclusions will pose further research questions which are not related to the findings of these limited case studies, but which relate to the overall transformation framework proposed. Moreover, because of the regional aspect of many case studies, this study provides insight in specific initiatives and not a nation-wide experience in Digital Government.

### *Data collection*

The case studies provide evidence about the initiatives in terms of their maturity and describe the context in which the initiatives are taking place. The information collected is the following:

- the organisation leading the initiative and the level of government covered
- the context in which the initiative is developed
    - **cross-border** aspect, countries involved, parts of the service which are cross-border
    - **cross-sector** aspect, sectors involved

[6] Focus of the ELISE Action
[7] https://ec.europa.eu/digital-single-market/en/news/new-study-egovernment-services-europe-improving-cross-border-availability-services

- the **public service**(s) provided by this organisation, who are the end users, the types of data used and produced, the role of location data in the service and the channels of delivery
- the **historical background**, the start date, which initiative it builds on, which larger initiative it is part of
- the **motivation** to start the initiative, the enablers and benefits pursued
- the **strengths** of the initiative, how much of the aimed results have been achieved ad the unplanned positive outcomes
- the **weaknesses** of the initiative, pitfalls encountered and their impact
- the **opportunities** that the initiative leveraged (political, cultural, organisational, technical, legal, such as interoperability aspects...)
- the **threats** to the initiative (political, cultural, organisational, technical, legal, such as interoperability aspects ...) and how they were overcome
- the **level of complexity** of the service, taking into account the number of organisations involved, the use of sensitive data, the geographical scale, the volume of transactions or data processed.

- the **take-up** of the services
- the way **success is measured**
- the **maturity** level of the organisation leading the transformation initiative, based on the proposed framework.

The data collected aims to provide insight into what has enabled the (different levels of) transformation.

The data is collected through a case study questionnaire, which is pre-filled based on desk research.

The draft questionnaire is analysed during an interview with the organisation leading the initiative. The case is updated following the interview, then completed and validated by the organisation.

## 2.3 Digital Government Transformation Framework

*Reference to the research questions:*

How is Digital Government defined?

What is the difference between Digital Government and e-Government?

What are the different levels of Maturity of Digital Government for an organisation? What are the key themes used to qualify them?

This section proposes:

- a definition for Digital Government
- a related Digital Government Transformation Framework

### *A definition for Digital Government*

This definition is proposed in the scope of this study. It leverages Gartner research and is adapted to the context of this study. This proposed definition is analysed and compared with other definitions in the section on existing frameworks, below.

Digital Government leverages advances in technologies and relies on the use and reuse of data and analytics to simplify (digital as well as offline) transactions for end users (citizens, businesses and government agencies). It creates information from data to support and enhance decision making of government and it fosters the creation of new, collaborative and more efficient service delivery models. In the process, underlying service models are redesigned and re-engineered. The overall ambition that organisations could be aiming for through such an activity not only includes improving mission effectiveness and efficiency, but also optimised outcomes, such as transparency and openness, long-range cost savings, better governance and, in turn, better quality of life for citizens.

### *A proposed Digital Government Transformation Framework*

This study leverages Gartner research which analyses various levels of maturity of Digital Government[8]. This analysis is based on in-depth market research carried out by the specialized Gartner analysts, through interviews with numerous government and non-government CIOs and CEOs, analysis of case studies and forecasting of technological trends.

The proposed framework has been used in the case studies and has been adapted based on the feedback of the case study interviewees, mainly on aspects related to clarification of language. These adaptations are highlighted in the description of the framework below.

### *From e-government to digital government*

Transforming public services requires digital transformation initiative leaders to assess where their organisation stands in relation to its goals and, if they wish to do so and if it is in scope of their mission, take steps to increase digital transformation.

The framework leverages the maturity model of Gartner and consists of five levels, starting with an initial level where organisations can operate within the traditional e-government paradigm. At its most fully mature level, digital transformation becomes a continuous process which is self-sustainable. Intermediate levels leverage the value of data as an asset and analytics as a critical capability. Full maturity is not a goal in itself, an organisation can decide to stay on a defined level, and can be at different levels of maturity for different services, for example.

Data-centric government represents the turning point to trigger and accelerate true digital transformation.

The shift from e-government to digital occurs along a continuum. At initial levels, government services simply consume and produce transactional data with limited use of its analytic value. This service-centric orientation

[8] https://www.gartner.com/smarterwithgartner/5-levels-of-digital-government-maturity/

is upended when organisations adopt data-driven practices that apply advanced analytics to achieve the greatest potential for business optimisation.

E-government metrics primarily focus on operational efficiency for vertical workflows, such as business registration and licensing. In contrast, higher levels of digital maturity measure the performance of entirely new service and business models, made possible by data and analytics. Improved performance is the result of data flowing and information sharing throughout an ecosystem that anticipates the best outcome for any interaction. Examples include connecting a new business with other government agencies, education programs, prospective employees, local suppliers and the like.

## *Description of the proposed Digital Government Transformation Framework*

The Digital Government Transformation Framework proposes five transformation stages, described in detail below, and qualified using a set of themes.

The five transformation stages are:

1. **e-government**: The focus is on having services online for user convenience and cost savings.
2. **Open government**: Open government often takes the form of public programs intended to promote transparency, citizen engagement and the data economy. E-government and open government programs often coexist, with different leadership and priorities.
3. **Data-centric government**: On this level, the focus shifts from collecting citizens' or user needs to proactively explore new possibilities inherent in strategically collecting and leveraging data.
4. **Fully transformed government**: On this level, the organization, agency or department has fully committed to a data-centric approach to improving government, and to innovation in government.
5. **Smart government**: On this level, the process of data-centric digital innovation is embedded across the entire government. The innovation process is predictable and repeatable, even in the face of disruptions or sudden events that require rapid responses.

The six themes used to qualify the transformation path are:

1. **Service Model**: Government services can be delivered through a combination of governmental and non-governmental channels, as well as with varying balances between reactive services (that is, responding to an explicit request by the constituent) and proactive services (that is, triggered automatically when an event occurs or a certain pattern is recognized).
2. **Digital System**: A digital business system is composed of five distinct systems: IT-centric systems, citizen-centric systems, data-centric systems, things-centric systems and ecosystems-centric systems and data use/intelligence. While all five can be embedded at different levels of transformation depending on an agency's mission, each transformation level tends to emphasize a different area.
3. **Ecosystem and users**: Due to their nature, governments have been operating internal government-sector ecosystems for delivering better public services to their users (citizens, business, and other governments) for the last decade. In the advent of digital government transformation, more emphasis will be put on engaging with suppliers, partners and intermediaries to co-create new public-private services and engage users in the design and implementation to further evolve services.

4. **Leadership**: While collaboration between technology and business leaders remains at the core of successful transformation, the key roles in accomplishing progress in digital transformation vary at different levels.
5. **Technology Focus**: Several technologies contribute to digital transformation but at each stage of maturity some require greater focus and adequate skills to succeed. Government leaders recognise the critical role of data as a strategic asset. Leveraging its vast repositories of data, government leaders can drive transformative change by ensuring that data is semantically defined and available, accessible and readily shareable.
6. **Key Metrics**: In order to adequately measure the achievement of evolving objectives, the nature of measures changes accordingly. E-government metrics primarily focus on operational efficiency for workflows within an organisation or a silo vertical, such as business registration and licensing. Key metrics at higher levels of digital maturity measure the performance of entirely new service and business models made possible by data and analytics.

Each of the five levels is qualified using the six themes defined above:

## *E-Government*

At this stage, the focus is on having services online for user convenience and cost savings. The **drivers** are compliance and efficiency. The organisation delivers services through online channels to meet basic efficiency objectives. Drivers are further described in this report in relation to the key motivations of transformation, based on insight from the case studies.

The **service model** is reactive, services are delivered at the user's request. Access is through a portal and government apps. There remains a significant reliance on maintaining physical offices and human service agents to provide assistance for citizens trying to navigate government programs and forms.

Digital platforms support digital government[9] and are typically composed of up to five **Digital systems**, and at the e-government stage, the system is IT centric, comprising for example employee collaboration, back-office systems, intra-government exchange systems, core mission-critical applications, and operational systems:

The **ecosystem** is government-centric. The ecosystem is mainly composed of other agencies in the same government sector or across sectors, with which service and data integration is required to better achieve program objectives or improve delivery. Agencies have established and enforced effective interoperability frameworks and/or used cross-agency enterprise architecture approaches. User and supplier of data are clearly identified.

The **technology focus** is on Service Oriented Architecture. The most important architectural focus is to build an SOA that facilitates the integration of services across agencies.

**Leadership** for e-government initiatives generally sits within the IT department, and the strategy implementation is driven by technology teams, rather than the business.

[9] This is described in detail in the report of the Digital Platform Benchmark Study

**Key metrics** used are typically the percentage of services online, the percentage of services accessible through mobile devices, percentage of integrated services, and electronic channel utilisation.

### *Open government*

The **drivers** for open government are transparency and openness. The organisation evolves objectives to focus on opening data sources for third parties to leverage.

The **service model** is proactive. A more intense use of data allows government agencies to become more proactive. Examples include (1) tax advice coming from tax agencies that have a real-time view of a taxpayer's situation (2) preventative healthcare using data from environmental monitoring or (3) better management of emergency situations based on data coming from multiple governmental and non-governmental sources.

The **digital system** is citizen-centric. Customer portals become more mature, with an interest in social networks. The exploitation of open data is mostly limited to external consumption as government itself is not yet mature enough to draw benefit from it.

The **ecosystem** focuses on service co-creation. At this stage, the ecosystem is geared toward external communities that can help leverage or benefit from open public data. The user and the supplier of data are clearly identified.

The **technology focus** is on an API enabled architecture. Mastering open data principles and technologies is essential at this stage. The main focus is on developing and managing APIs that support access to open data.

**Leadership** is data driven. As business owners do not yet buy into the transformative role of technology, the responsibility of open government programs is assigned to special roles like chief data officer or chief digital officer.

**Key metrics** are usually the number of open datasets and the number of apps based on / reusing open data.

### *Data-Centric government*

The **driver** for data-centric government is citizen value. The organisation and third parties deliver data-based services to users.

The **service model** is intermediated. Services can be accessed through aggregators and intermediaries, such as citizen-developed dashboards or third-party apps fuelled by open data and initiated by start-ups or developers through, for example, hackathons. The focus turns external, towards academics and citizen data scientists.

The **digital system** is data-centric. Reuse of data becomes predominant. Focus moves to data analytics.

The **ecosystem** is at the “aware” level. Organisations start to understand the complexity of the ecosystems in which they operate, their own objectives and the roles of the various actors (either actively or passively).

The **technology focus** is on “Share more data”. The organisation is starting to apply the same principles from the previous level to business data which is not originally intended for public consumption. The use of open data powers the development of innovative business apps and more effective analytics to support

decision making. The term 'share more data' here also refers to data that is not made for public consumption but that can be shared among all government organisations.

**Leadership** come from the business. It is up to business owners to take leadership for identifying the innovative use of data.

**Key metrics** are typically the number of new or transformed services based on shared business data, and the number of external players that build services on the open data.

### *Fully Transformed government*

By this level of fully transformed government[10], the organisation, agency or department has fully committed to a data-centric approach to improving government, and the preferred approach to innovation is based on open data principles. Data flows regularly across organisational boundaries, leading to easier interactions and better services for constituents. It's possible at this stage to encounter privacy-related backlashes, as citizens can be uncomfortable with how their data is being collected and used. Therefore, it is important to ensure that data is used within existing norms and regulations, and that this is clearly communicated.

The **driver** for a fully transformed government is insight-driven transformation. The organisation's business and IT leaders decisively pursue a 'transformation' of services systematically and at a larger scale based on lessons learned (success) of the previous level.

The **service model** is embedded. Services are available through a variety of channels, including non-government ones. Government services will be embedded into personal services that citizens receive from a commercial service provider and into a variety of devices, vehicles and infrastructure around citizens. Example include triggering a social worker intervention to assist a person affected by mild dementia based on the person's behaviour in an IoT-equipped house.

The **digital system** is thing-centric. Consumption of data from things increases. Digital systems focus on connectivity to things (such as body cams for police officers, GPS on taxis or remote locks on shared bikes) and on IoT analytics.

The **ecosystem** is at an engaged level, and is geared toward external communities that can help leverage or benefit from standardised and well-formed open public data. User and supplier of data are clearly identified.

The **technology focus** is on things as data. The ability to assemble data and service elements from multiple source to support transformation will require the use of a specific service architecture. This encapsulates services and exposes APIs at multiple levels and across organisational boundaries, balancing the demand for agility and scalability of services with composition and reuse of services.

**Leadership** is information driven. The value of data and information is broadly recognised across the organisation. The CIO (or the new incarnation of this role) takes the lead on innovation.

**Key metrics** are typically the percentage of services eliminated, and the percentage of new services and their take up ratio.

[10] The initial term used was "fully digital" but this proved confusing during the case studies. "Digital" was interpreted as "electronic" as in e-government, and not as in Digital Government as defined in this study.

### *Smart government*

At this point, the process of digital innovation using open data is embedded deeply across the entire government, with buy in and leadership from the top tier of policymakers. The innovation process is predictable and repeatable, even in the face of disruptions or sudden events that require rapid responses.

The **driver** of smart government is that digital services are self-defining[11]; with Smart government, transformation gives way to the new normal, i.e., sustained continuous improvement of digital services.

The **service model** is predictive. Services and interactions will take place through a variety of touchpoints. The pace of interaction is driven by the ability of government to anticipate a need or prevent an incident.

The **digital system** is ecosystem-centric. Services and operations are dynamically reconfigured to adapt to a shift in conditions and priorities. API management software deals with a huge variety of APIs (facing citizens, suppliers, and partners) and with both government-run and private sector-run ecosystems.

The **ecosystem** is evolving. At this level, the organisations start to understand the complexity of the ecosystems in which they operate, the agencies' objectives and the roles of the various participants.

The **technology focus** is on intelligence. AI and advanced machine learning become essential to deal with high volumes of data to understand, learn and predict.

**Leadership** is on innovation. The CIO will be the organisation's chief transformation officer/chief innovation officer. They will make digital transformation business as usual and sustainable.

**Key metrics** are the number of services replaced (or introduced) by improved data utilisation.

The proposed model described in detail above is summarised in the table below:

[11] The initial term used was “sustainable” but this proved confusing during the case studies. “Sustainable” was interpreted as the sustainability of the system, e.g.: it had overcome legacy and was not un-maintainable anymore.

**Table 1 - Glossary Table Digital Government**

| | 1. eGovernment | 2. Open Government | 3. Data-Centric Government | 4. Fully Transformed Government | 5. Smart Government |
|---|---|---|---|---|---|
| **Drivers** | Compliance, efficiency | Transparency and openness | Citizen value | Insight-driven transformation | Self-defining |
| **Service model** | Reactive | Intermediated | Proactive | Embedded | Predictive |
| **Digital System** | IT-centric | Citizen-centric | Data-centric | Thing-Centric | Ecosystem-centric |
| **Ecosystem and users** | Government-centric | Service co-creation | Aware | Engaged | Evolving |
| **Technology focus** | Service Oriented Architecture | API enabled architecture | Open any data | Things as data | Intelligence |
| **Leadership** | Technology | Data | Business | Information | Innovation |
| **Key metrics** | % Services online | Number of open datasets | Number of data-driven services | % of new and retired services | Number of new delivery models |

# 3. Inventory and mapping of existing frameworks

This section presents an inventory of a number of existing frameworks and models that currently assess the digital transformation of governments from different angles and compares them with the proposed Transformation Framework.

*Reference to the research questions:*

What are the existing Digital Government frameworks and how do they compare?

## 3.1 Introduction

This section explores the existing frameworks which relate to digital government and highlights their relevance in this study. For the needs of the study, the frameworks identified are those defined at an international level, rather than being country-specific. It presents the frameworks of the **OECD,** the **European Commission** and **United Nations e-Government Survey** and analyses the definitions of digital government and digital transformation of government.

## 3.2 The OECD framework – Going Digital Project – and definitions

### *Description*

The OECD proposes a framework for governments: the "going digital"[12] project. According to the OECD website, "*the Going Digital project aims to help policymakers in all relevant policy areas better understand the digital revolution that is taking place across different sectors of the economy and society as a whole. It will articulate recommendations for pro-active – rather than reactive – policies that will help to drive greater growth and societal well-being and help address the challenges of slow productivity growth, high unemployment and growing inequality in many countries. By leveraging the latest evidence and data across policy domains, it will give policymakers the tools they need to help their economies and societies prosper in a world that is increasingly digital and data-driven*.

Several key elements of this work by the OECD are described below, before placing them in the context of the Transformation Framework.

Once completed, the project's integrated policy framework[13] may be used to guide OECD reviews of the digital transformation in specific countries, helping countries self-assess how prepared they are for an increasingly digital world, supporting the development of national digital strategies, and analysing the digital transformation from a holistic perspective.

[12] http://www.oecd.org/going-digital/project
[13] http://www.oecd.org/going-digital/framework/

As explained on their website, Digital Government is one of the pillars supporting the digital transformation of society, along with innovation, effective use, trust, labour market adaptation and well-being.

The "Going Digital" project includes a self-assessment toolkit for countries to assess their Digital Government Strategies against 12 principles[14], which "*support the development and implementation of digital government strategies that bring governments closer to citizens and businesses*".

The OECD Science Innovation and Technology Scoreboard[15] of the OECD Science, Technology and Industry (STI) Scoreboard shows how digital transformation affects science, innovation, the economy, and the way people work and live. It, therefore, is relevant for assessing digital government, one of the pillars of transformation in the OECD Policy Framework.

OECD defines Digital government[16] and clarifies what is Digital Transformation of the public sector in an OECD publication[17]:

*Digital government explores how governments can best use information and communication technologies to embrace good government principles and achieve policy goals.*

The OECD publication[18] explains that digital transformation of government focuses on digital re-engineering organisation business models, user-driven approach, and interactive design of services, policies and processes. It also refers to more collaborative and distributed approaches such as shared data, shared services, and open data. There is government-citizen co-responsibility as well as data-driven and knowledge-based decision making. It details that e-government, in contrast, focuses on ICT-enabled processes that were analogue in design, a user-centred approach but supply driven, 'siloed' ICT development and government's full responsibility.

### *Mapping analysis*

The analysis of these OECD frameworks and definitions is done by mapping them against the proposed Transformation Framework and the definition of digital government. This section presents the mapping of the Digital Government and Digital Transformation of the Public Sector definitions and the 12 Principles of Digital Government Strategies, alongside the OECD Science Innovation and Technology Scoreboard .

## *Digital Government and Digital Transformation of the Public Sector definition*

The table below presents the definition of digital government according to the OECD and the Digital Government and Digital Transformation of the Public Sector definition in comparison to the proposed definition of digital government in this study.

The approach to data gathering in support of the reports purpose is made up of two core components:

- Desk based research coupled with industry analyst interviews.
- Case study investigation, and interviews with representatives from successful API implementations in the EU public sector.

[14] http://www.oecd.org/governance/digital-government/toolkit/12principles/
[15] http://www.oecd.org/sti/oecd-science-technology-and-industry-scoreboard-20725345.htm
[16] http://www.oecd.org/gov/digital-government/
[17] http://dx.doi.org/10.1787/9789264279742-4-en
[18] http://dx.doi.org/10.1787/9789264279742-4-en

**Table 2 - Comparison of digital government definitions**

| Definition of digital government | Digital Government OECD | Digital Transformation of the Public Sector OECD |
|---|---|---|
| Digital government leverages advances in technologies and relies on the use and reuse of data and analytics. | Digital government explores how governments can best use information and communication technologies | |
| …to simplify (digital as well as offline) transactions for end users (citizens, businesses and government agencies). | | Data-driven and knowledge-based decision making |
| It creates information from data to support and enhance decision making of government, businesses and citizens, | | Government-citizen co-responsibility |
| …and it fosters the creation of new, collaborative and more efficient service delivery models | | Digital re-engineering of organisational business models |
| In the process, underlying service models are redesigned and re-engineered | | User-driven approach, interactive design of approaches, services, policies and processes |
| …to improve mission effectiveness and efficiency, | …to embrace good government principles and achieve policy goals. | |
| …to achieve optimized outcomes, such as transparency and openness, | | |
| …long-range cost savings, | | |
| …better governance | | |
| …and better quality of life for citizens | | |

The brief definition of digital government by OECD does not explain how to “best use information and communication technologies” nor the importance of data, and leaves the “good government principles” open to interpretation.

However, the Digital Transformation of the public sector according to the OECD is similar to the proposed definition of Digital Government in how it focuses on data driving decision-making and on transformation of service models. It does not address the optimized outcome, such as cost savings and better governance.

The analysis shows that the proposed definition is comprehensive in comparison to the OECD definitions.

The Digital Transformation of the public sector according to the OECD is mapped onto the proposed Transformation Framework as shown in the table below. It defines digital transformation mostly at levels 2

and 3, with one element potentially reaching all levels (the service model). Technology focus and leadership are not addressed. This is probably because the OECD framework does not address maturity levels, which then allow to define a change in technology focus. Leadership can be perceived as a politically sensitive matter, which is maybe why it is not addressed in the OECD frameworks.

**Table 3 - OECD Mapping**

| | 1. e-Government | 2. Open Government | 3. Data-Centric Government | 4. Fully Transformed Government | 5. Smart Government |
|---|---|---|---|---|---|
| **Drivers** | | | X | | |
| | User-driven approach, interactive design of approaches, services, policies and processes | | | | |
| **Service Model** | | | X | | |
| | Digital re-engineering of organisational business models | | | | |
| **Digital system** | | | X | | |
| | Data-driven and knowledge-based decision making | | | | |
| **Ecosystem and users** | | X | | | |
| | Government-citizen co-responsibility | | | | |
| **Key Metrics** | | X | | | |
| | Data-driven and knowledge-based decision making | | | | |

## *12 Principles of Digital Government Strategies*

OECD refers to 12 principles[19], which support the development and implementation of digital government strategies that bring governments closer to citizens and businesses.

While the proposed Transformation Framework supports decision makers in maturing towards fully transformed government, it is not per se a Digital Government Strategy. Digital Government Strategies are usually defined at a country level. However, it is interesting to map the 12 principles proposed by the OECD to the Transformation Framework because the organisations following the Transformation Framework could then indirectly adhere to a country's Digital Strategy which applies the principles.

In the tables below, the mapping is detailed; the principles have been mapped onto the Transformation Framework. Most of these principles relate to level 3 and to a lesser extent, level 2. The service model is not addressed in the 12 principles.

[19] http://www.oecd.org/governance/digital-government/toolkit/12principles/

**Table 4 - OECD Mapping**

| | 1. e-Government | 2. Open Government | 3. Data-Centric Government | 4. Fully Transformed Government | 5. Smart Government |
|---|---|---|---|---|---|
| **Drivers** | | X | X | | |
| | Openness, transparency and inclusiveness<br>Development of clear business cases | | | | |
| **Digital system** | | | X | | |
| | Creation of a data-driven culture in the public sector | | | | |
| **Ecosystem and users** | | X | | | |
| | Engagement and participation in service delivery | | | | |
| **Technology Focus** | | | X | | |
| | Creation of a data-driven culture in the public sector | | | | |
| **Leadership** | | | X | | |
| | Leadership and (business) political commitment | | | | |

From the 12 principles, 7 of them cannot be mapped directly to the Transformation Framework. They are listed in the following table, with a reference when relevant to the European Interoperability Framework (EIF). This is done because the Transformation Framework refers to Interoperability Frameworks in the Ecosystem theme level 1. The principles which can be mapped to the EIF can be indirectly mapped to the Transformation Framework at that ecosystem theme, level 1.

**Table 5 - OECD and EIF comparison**

| 7 OECD principles mapped to the Transformation Framework | Elements of the EIF |
|---|---|
| Protecting privacy and ensuring security | Principle on security and privacy |
| Coherent use of digital technology across policy areas | Indirectly, the adoption and implementation of the National Interoperability Frameworks across policy areas (cross-sector) achieves this coherence.<br>Interoperability layers: Interoperability governance |
| Effective organisational & governance coordination framework | Interoperability layers: Integrated public service governance |
| Strengthen international cooperation with governments | Indirect link to the cross-border aspects |
| Reinforce ICT project management capabilities | |
| Procurement of digital technologies | |
| Legal and regulatory framework | Indirect link to Legal Interoperability |

## *OECD Science Innovation and Technology Scoreboard*

With some 200 indicators, the 2017 edition of the OECD Science, Technology and Industry (STI) Scoreboard[20] shows how digital transformation affects science, innovation, the economy, and the way people work and live. It aims to help governments design more effective science, innovation and industry policies in the fast-changing digital era.

One scoreboard measures the digital maturity in various sectors, including the sector related to public administration and defence.

The indicator used is the intensity of ICT service intermediaries. This indicator is not assessing the "transformation" of government, as per our proposed definition, it addresses the extent to which digital means are used to interact with citizens, suppliers, etc. It falls, therefore, under the **level 1** of the Transformation Framework which looks at how many services are online.

## *Conclusion*

The OECD framework/ definitions are coherent with the Transformation Framework, until level 3. The Framework is comprehensive, and builds on levels aligned with the OECD frameworks to reach the highest maturity levels, as depicted in the table below.

[20] http://www.oecd.org/sti/oecd-science-technology-and-industry-scoreboard-20725345.htm

**Table 6 - Conclusions on the mapping of the OECD framework and the Digital Government Transformation Framework**

| OECD frameworks and definitions | 1. e-Government | 2. Open Government | 3. Data-Centric Government | 4. Fully Transformed Government | 5. Smart Government |
|---|---|---|---|---|---|
| Digital Transformation of the Public Sector | | X | | | |
| Principles for digital government strategies | | X | | | |
| STI Scoreboard | X | | | | |

The mapping to the Digital Government Strategy Principles shows some gaps. In summary, the 12 principles are listed in the table below, together with the results of their mapping to the Transformation Framework and to the European Interoperability Framework[21] (EIF).

[21] https://ec.europa.eu/isa2/eif_en

**Table 7 - Transformation Framework and EIF mapping**

| 12 Principles of Digital Government Strategies | Mapping to the Transformation Framework | Mapping to the EIF |
|---|---|---|
| 1. Openness, transparency and inclusiveness | X | X |
| 2. Development of clear business cases | X | |
| 3. Creation of a data-driven culture in the public sector | X | |
| 4. Engagement and participation in policy making and service delivery | X | |
| 5. Leadership and political commitment | X | |
| 6. Protecting privacy and ensuring security | | X |
| 7. Coherent use of digital technology across policy areas | | X |
| 8. Effective organisational & governance coordination framework | | X |
| 9. Strengthen international cooperation with governments | | |
| 10. Reinforce ICT project management capabilities | | |
| 11. Procurement of digital technologies | | |
| 12. Legal and regulatory framework | | |

The gap analysis of the principles vs the Transformation Framework shows that the principles cover, in addition, *ICT project management capabilities* and *procurement of digital technologies*. We could consider adding these to the Transformation Framework, or to the proposed definition. Adding a theme to the Transformation Framework implies defining levels of maturity, which do not really apply for project management and procurement.

We propose to add in the definition the notion of capacity building to accompany the digital transformation, which would include efficient project management and procurement of technologies. We propose to enlarge the addition with: "*this is achieved through capacity building to support digital transformation, in particular in the fields of project management and procurement of technologies*".

The gap analysis of the principles vs the Transformation Framework shows that the principles cover additional elements relating to the regulatory and cooperation frameworks: *strengthen international cooperation with governments* and *legal and regulatory framework.* In the context of the EU, these aspects are extensively covered by EU Directives (e.g.: INSPIRE…) and frameworks (EIF). We suggest, therefore, to not add these elements to our Transformation Framework or definition.

## 3.3 European Commission initiatives

### *Description*

The European Commission proposes a vision and several initiatives to monitor public services, to measure digitalisation and monitor digital transformation.

This section provides an overview of the element listed below:

- a vision for public services[22]
- the eGovernment Action Plan 2016-2020[23]
- the eGovernment benchmark[24]
- the European Interoperability Framework[25] and National Interoperability Frameworks[26]
- the Digital Scoreboard[27]
- the Digital Transformation monitor[28]

Below, the mapping analysis shows how these elements complement each other to provide an overall framework for digitalisation and public service monitoring.

### *EC Vision for public services*

In 2013, the European Commission published a Vision for public services, outlining its long-term draft view for a modern and open public sector and the way public services may be delivered in an open government setting (enabled by ICT), i.e. how public services may be created and delivered seamlessly to any citizen and business at any moment of time. It proposes an open and collaborative government model, based on the principles of collaboration, transparency and participation.

In addition, it emphasises the importance of collaboration with citizens and users plays an increasing role in the transformation of public services towards new forms of production and delivery. ICT-enabled collaborative service production refers to any public service that is electronically provided by government, citizens, NGOs, private companies and individual civil servants, in collaboration or not with government institutions, based on government or citizens-generated data.

### *eGovernment elements, action plan 2016 - 2020 and benchmark*

There is a definition[29] of eGovernment by the European Commission: "*eGovernment is defined here as the use of information and communication technologies in public administrations combined with organisational*

[22] https://ec.europa.eu/digital-single-market/en/news/vision-public-services
[23] https://ec.europa.eu/digital-single-market/en/news/communication-eu-egovernment-action-plan-2016-2020-accelerating-digital-transformation
[24] https://ec.europa.eu/digital-single-market/en/news/new-study-egovernment-services-europe-improving-cross-border-availability-services
[25] https://ec.europa.eu/isa2/eif_en
[26] https://joinup.ec.europa.eu/collection/national-interoperability-framework-observatory-nifo
[27] https://ec.europa.eu/digital-single-market/en/policies/scoreboard
[28] https://ec.europa.eu/growth/tools-databases/dem/monitor/
[29] http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=celex:52003DC0567

*change and new skills in order to improve public services and democratic processes and strengthen support to public policies*".

The notion of effective eGovernment[30] is central to the EC's eGovernment Action Plan and benchmark: "*Effective eGovernment can provide a wide variety of benefits including more efficiency and savings for governments and businesses, increased transparency, and greater participation of citizens in political life*. *ICTs are already widely used by government bodies, as it happens in enterprises, but eGovernment involves much more than just the tools. It also involves rethinking organisations and processes, and changing behaviour so that public services are delivered more efficiently to people. Implemented well, eGovernment enables citizens, enterprises and organisations to carry out their business with government more easily, more quickly and at lower cost."* Efficiency, lower costs, increased transparency and citizen participation are the key elements of eGovernment.

The eGovernment benchmark[31] aligns with the Vision of the eGovernment Action Plan 2016-2020[32] stating that: "*by 2020, public administrations and public institutions in the European Union should be open, efficient and inclusive, providing borderless, personalised, and user-friendly, end-to-end digital public services to all citizens and businesses in the EU. Innovative approaches are used to design and deliver better services in line with the needs and demands of citizens and businesses. Public administrations use the opportunities offered by the new digital environment to facilitate their interactions with stakeholders and with each other.*"

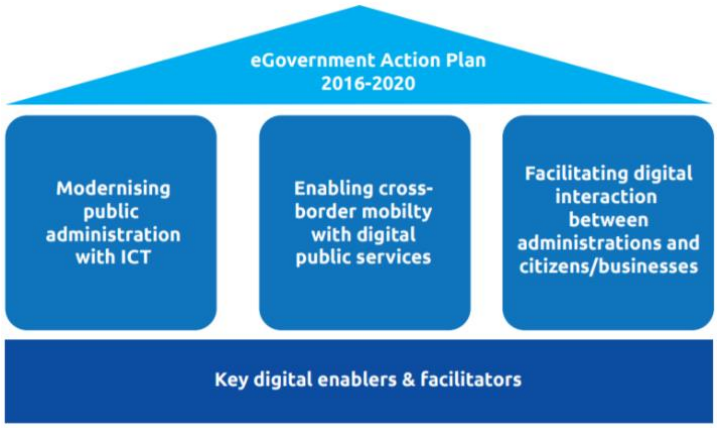


**Figure 2: The eGovernment Action Plan 2016 – 2020**

The eGovernment benchmark 2017 measurement delivers the 'baseline' against which the progress made by the actions under the new eGovernment Action Plan 2016-2020 can be benchmarked. The benchmark framework provides a measurement of progress in the main priority areas, in line with the Action Plan: modernisation of public administrations, cross-border mobility, and facilitation of digital interactions between citizens and administrations. The progress in these areas is measured via top-level benchmarks:

- User-centric Government (or User Centricity) assesses the availability and usability of public eServices. It is connected to the first pillar of public administration modernisation.

[30] https://ec.europa.eu/digital-single-market/en/policies/egovernment
[31] https://ec.europa.eu/digital-single-market/en/news/new-study-egovernment-services-europe-improving-cross-border-availability-services
[32] https://ec.europa.eu/digital-single-market/en/news/communication-eu-egovernment-action-plan-2016-2020-accelerating-digital-transformation

- Transparent Government (or Transparency) evaluates the transparency of government authorities' operations, service delivery procedures as well as with regard to the consultation of personal data by public administrations.
- Cross-border Mobility is constituted by the measurement of Citizen Mobility and Business Mobility. The benchmark measures the availability and usability of cross-border services.
- Key Enablers. This top-level benchmark assesses the availability of Key Enablers such as electronic Identification (eID), electronic Documents, Authentic Sources as well as Digital Post.

The measurement on each of the top level benchmarks is based on a number of questions and answers dealing with the quality and quantity of eGovernment services in four life events:

- Starting a business and early trading operations;
- Losing and finding a job;
- Studying;
- Family life

## *The European Interoperability Framework and National Interoperability Frameworks' implementation*

According to the EIF: "*Interoperability is defined as the ability of organisations to interact towards mutually beneficial goals, involving the sharing of information and knowledge between these organisations, through the business processes they support, by means of the exchange of data between their ICT systems.*

*A European public service comprises any public sector service exposed to a cross-border dimension and supplied by public administrations, either to one another or to businesses and citizens in the Union.*

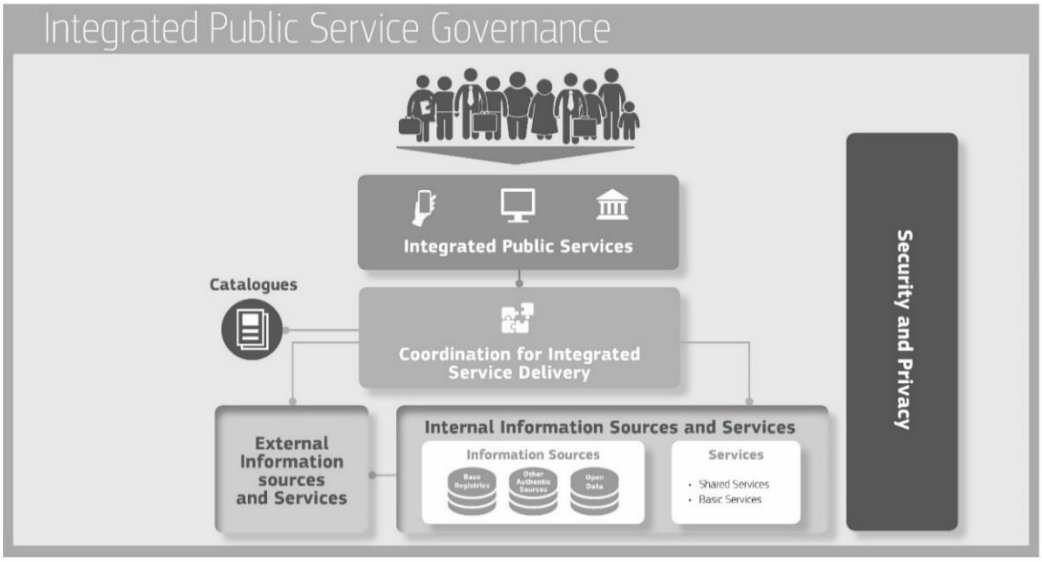


**Figure 3: EIF Conceptual model**

*The European interoperability framework is a commonly agreed approach to the delivery of European public services in an interoperable manner. It defines basic interoperability guidelines in the form of common principles, models and recommendations*".

The model's structure comprises:

- 'integrated service delivery' based on a 'coordination function' to remove complexity for the end-user;
- a 'no wrong door' service delivery policy, to provide alternative options and channels for service delivery, while securing the availability of digital channels (digital-by-default);
- reuse of data and services to decrease costs and increase service quality and interoperability;
- catalogues describing reusable services and other assets to increase their findability and usage;
- integrated public service governance;
- security and privacy

Where the EIF sets out this common frame at the European level, Member States are encouraged to develop their own national frameworks to complement it, supporting cross-border interoperability.

Open data is mentioned in the openness principle: "Open government data (here simply referred 'open data') refers to the idea that all public data should be freely available for use and reuse by others, unless restrictions apply e.g. for protection of personal data, confidentiality, or intellectual property rights. Public administrations collect and generate huge amounts of data. The Directive on the reuse of public sector information (PSI) encourages Member States to make public information available for access and reuse as open data. The INSPIRE Directive requires, in addition, sharing of spatial datasets and services between public authorities with no restrictions or practical obstacles to its reuse".

The EIF explains: "The Directive on the reuse of public sector information provides a common legal framework for reuse of public sector data. The focus is on releasing machine-readable data for use by others to stimulate transparency, fair competition, innovation and a data-driven economy. To ensure a level playing field, the opening and reuse of data must be non-discriminatory, meaning that data must be interoperable so that can be found, discovered and processed".

Recommendation 41 relates to the concept of "open any data" of the Transformation Framework: "Establish procedures and processes to integrate the opening of data in your common business processes, working routines, and in the development of new information systems".

## *The EC Digital Scoreboard*

The digital scoreboard[33] measures the performance of Europe and the Member States in a wide range of areas, from connectivity and digital skills to the digitization of businesses and public services.

The assessment of digitization of public services makes use of the following indicators:

- eGovernment Users (internet users)
- Pre-filled Forms
- Online Service Completion

[33] https://ec.europa.eu/digital-single-market/en/policies/scoreboard

- Open Data

## *The EC Digital Transformation monitor*

The principal objective of the Digital Transformation Monitor (DTM) is to monitor the transformation of existing industry and enterprises. European companies are increasingly adopting digital technologies, but there are still big disparities between EU countries with regard to digital transformation performance. The aim of the Digital Transformation Scoreboard 2017 is to provide evidence on the extent of digital transformation in Europe. This will help policy makers at EU and national level to create policies supporting EU companies in digital transformation processes.

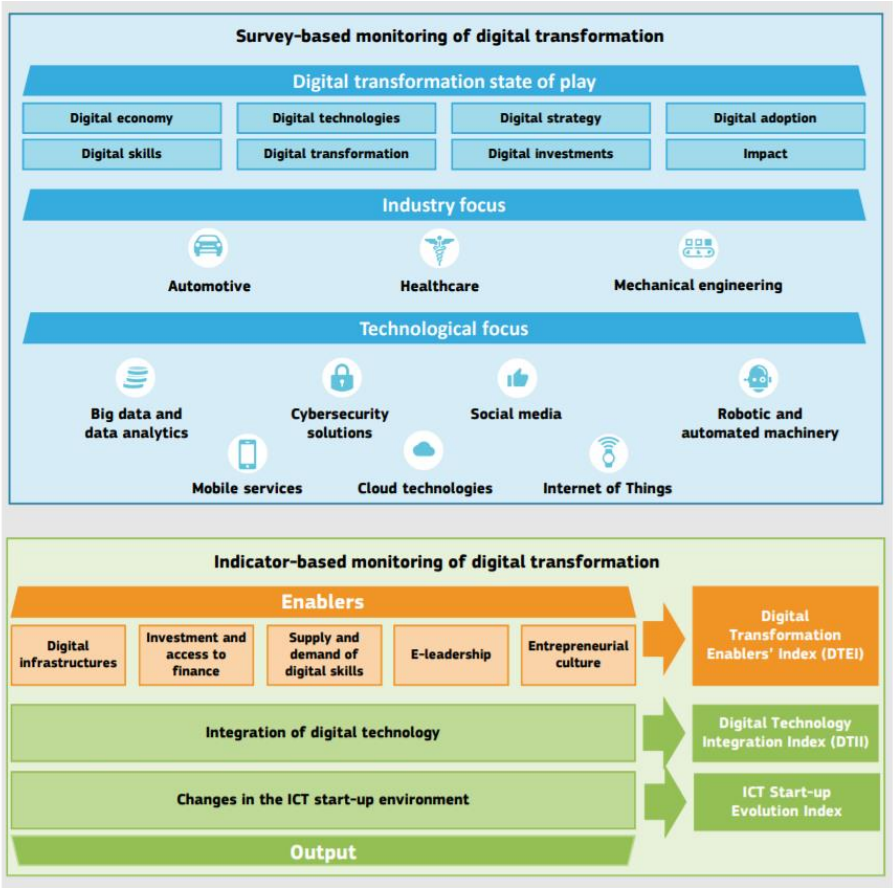


**Figure 4: Digital Transformation Monitor**

The approach is illustrated in the figure above. The scoreboard is relevant in the scope of digital government because government can be considered as one sector, which will most probably be monitored in the future. The different elements regarding digital economy, skills, technology focus (such as big data and analytics) and the enablers cited are relevant in setting the scene for digital transformation in government as well.

The Digital Transformation Enablers' Index (DTEI) (access to finance, infrastructure, e-leadership …) sets the scene also for digital transformation in government. For example, E-leadership is described as the capacity to offer training and/or digital devices to the staff.

## *Mapping analysis*

## *Definition of e-government*

**Table 8 - Definition mapping**

| Definition of digital government | e-Government (EC) |
|---|---|
| Digital government leverages advances in technologies and relies on the use and reuse of data and analytics | eGovernment is defined as the use of information and communication technologies in public administrations combined with organisational change and new skills in order to improve public services |
| …to simplify (digital as well as offline) transactions for end users (citizens, businesses and government agencies). | |
| It creates information from data to support and enhance decision making of government, businesses and citizens, | |
| …and it fosters the creation of new, collaborative and more efficient service delivery models | |
| In the process, underlying service models are redesigned and re-engineered | |
| …to improve mission effectiveness and efficiency, | |
| …to achieve optimized outcomes, such as transparency and openness, | |
| …long-range cost savings, | |
| …better governance | and democratic processes and strengthen support to public policies. |
| …and better quality of life for citizens | |

The comparison of the definitions shows that the EC definition leverages new service models (from technology and organisation) to improve service delivery.

It also focuses on improving democratic processes which could be included in “better governance” of the proposed definition. It mentions that e-government strengthens support to public policies which is not explicitly mentioned in the proposed definition, though it could relate to the “mission effectiveness and efficiency”.

## *A Vision for public services*

The table below shows the mapping of the Vision for public services to the Transformation Framework.

**Table 9 - EC Vision for Public Services mapped to the Transformation Framework**

| | 1. e-Government | 2. Open Government | 3. Data-Centric Government | 4. Fully Transformed Government | 5. Smart Government |
|---|---|---|---|---|---|
| **Drivers** | X | X | X | | |
| | Openness and transparency to monitor how the public sector works<br>Co-production of services contributes to efficiency<br>“Public value” from the point of view of citizens | | | | |
| **Service Model** | | X | | | |
| | Collaborative service production | | | | |
| **Digital system** | **Not defined** | **Not defined** | **Not defined** | **Not defined** | **Not defined** |
| | Types of infrastructure where public value is created by the ability to share, interact and collaborate between actors | | | | |
| **Ecosystem and users** | | X | | | |
| | Collaborative service production | | | | |
| **Technology focus** | | | X | | |
| | Availability of information and data | | | | |
| **Leadership** | | | X | | |
| | Strong political commitment and leadership | | | | |

## *Key elements of eGovernment, the eGovernment Action Plan and eGovernment Benchmark*

**Table 10 - EC Vision for Public Services mapped to the Transformation Framework**

| | 1. e-Government | 2. Open Government | 3. Data-Centric Government | 4. Fully Transformed Government | 5. Smart Government |
|---|---|---|---|---|---|
| **Drivers** | X | X | X | | |
| | Public administrations should be open, efficient, in line with the needs and demands of citizens and businesses | | | | |
| **Service Model** | Not defined | Not defined | Not defined | Not defined | Not defined |
| | New service models meeting needs | | | | |
| **Digital system** | X | X | | | |
| | New digital environment to facilitate interactions with stakeholders and with other administrations | | | | |
| **Ecosystem and users** | | X | | | |
| | Citizen participation | | | | |
| **Key metrics** | X | | | | |
| | Quantity of eGovernment services in four life events | | | | |

Elements which are not directly mapped onto the Transformation Framework relate to the cross-border mobility and the key enablers.

## *European Interoperability Framework (EIF) and National Interoperability Frameworks (NIFs) implementation*

**Table 11 - EC EIF, NIFs implementation and the Transformation Framework**

| | 1. e-Government | 2. Open Government | 3. Data-Centric Government | 4. Fully Transformed Government | 5. Smart Government |
|---|---|---|---|---|---|
| **Drivers** | X | X | | | |
| | Principles of Effectiveness and efficiency, Openness and Transparency | | | | |
| **Digital system** | | X | | | |
| | Principle of User-centricity | | | | |
| **Ecosystem and users** | X | | | | |
| | Effective interoperability frameworks: this is measured by the National Interoperability Framework Observatory.<br>"*The overall average of the NIF implementation level for 2016 is 56%, with 16 countries scoring over 50% and 5 of these scoring over 80%"*[34]. | | | | |
| **Technology focus** | X | X | X | | |
| | Conceptual model for integrated public services provision, semantic interoperability of data | | | | |

## *The EC Digital Scoreboard (DS) and the EC Digital Transformation Monitor (DTM)*

**Table 12 - EC DS, DTM and the Transformation Framework**

| | 1. e-Government | 2. Open Government | 3. Data-Centric Government | 4. Fully Transformed Government | 5. Smart Government |
|---|---|---|---|---|---|
| **Drivers** | | X | | | |
| | Openness is assessed through open data (DS) | | | | |
| **Digital system** | X | X | | | |
| | Pre-filled forms (DS) – Mobile services (DTM) | | | | |
| **Technology focus** | | | X | X | X |
| | Technology adoption (AI, Analytics, Automation, IoT) (DTM) | | | | |

### *Conclusion*

The results of this mapping show that the EC initiatives are coherent with the Transformation Framework until level 3. Some initiatives focus on monitoring and can be used to monitor uptake of some themes of the

[34] https://joinup.ec.europa.eu/sites/default/files/inline-files/Report_SoP_2016_rev9_single%20pages.pdf

Transformation Framework up to level 5, as depicted in the table below. The gap analysis shows that key enablers are mentioned (e.g.: e-Identity). The definition refers to the use of information and communication technologies in public administrations combined with organisational change and new skills in order to improve public services and democratic processes and strengthen support to public policies. The "support to public policies" is not directly comparable in the proposed definition, which refers to better processes and better quality of life.

**Table 13 - Conclusions on the Transformation Framework and the EC initiatives**

| | 1. e-Government | 2. Open Government | 3. Data-Centric Government | 4. Fully Transformed Government | 5. Smart Government |
|---|---|---|---|---|---|
| **A vision for public service** | X | X | X | | |
| | The Framework reflects values put forward in the Vision, reaching to the level 3 "Data-centric". | | | | |
| **eGovernment, Action Plan 2016-2020 and benchmark** | X | X | | | |
| | The Framework reflects elements of the eGovernment Action Plan and the eGovernment benchmark can provide insight in level 1 and in some cases level 2 of the transformation framework. Key enablers (eIdentity) mentioned in addition. Supporting public policies is part of the definition of e-Government. | | | | |
| **EIF and National Interoperability Frameworks Observatory (NIFO)** | X | X | X | | |
| | The Framework reflects the EIF and the NIFs at level 1 under the theme of ecosystems and the NIFO[35] can provide insight at MS level of level 1 "effective" interoperability frameworks. The Framework also reflects elements of the EIF on citizen centricity and openness and on "open any data" | | | | |
| **Digital Scoreboard (DS) and Digital Transformation Monitor (DTM)** | X | X | X | X | X |
| | The DS provides insight in elements of eGovernment (pre-filled forms) and open data, levels 1 and 2.<br>The DTEI index of the DTM complements the Framework by providing insight in the presence of digital transformation enablers relevant for government. One enabler is the uptake of technologies, some of them mentioned in levels 3, 4 and 5 of the Transformation Framework. | | | | |

[35] https://ec.europa.eu/isa2/solutions/nifo_en

## 3.4 United Nations e-Government Survey

### *Description*

According to the United Nation's website[36], The United Nations E-Government Survey presents a systematic assessment of the use and potential of information and communication technologies to transform the public sector by enhancing efficiency, effectiveness, transparency, accountability, access to public services and citizen participation in the 193 Member States of the United Nations, and at all levels of development. The latest survey results[37] are titled: "United Nations E-Government Survey 2016: E-Government in Support of Sustainable Development".

The E-Government Development Index (EGDI) presents the state of E-Government Development of the United Nations Member States. Along with an assessment of the website development patterns in a country, the E-Government Development index incorporates the access characteristics, such as the infrastructure and educational levels, to reflect how a country is using information technologies to promote access and inclusion of its people. The EGDI is not designed to capture e-government development in an absolute sense; rather, it aims to give a performance rating of national governments relative to one another.

The EGDI is a composite measure of three important dimensions of e-government, namely: **provision of online services, telecommunication connectivity and human capacity**.
These measurements are further described below.

To arrive at a set of Online Service Index (OSI) values for 2016, a total of 111 researchers, including UN experts and online United Nations Volunteers (UNVs) from over 60 countries with coverage of 66 languages assessed each country's national website in the native language, including the national portal, e-services portal and e-participation portal, as well as the websites of the related ministries of education, labour, social services, health, finance and environment as applicable.

The Telecommunication Infrastructure Index (TII) is an arithmetic average composite of five indicators: (i) estimated internet users per 100 inhabitants; (ii) number of main fixed telephone lines per 100 inhabitants; (iii) number of mobile subscribers per 100 inhabitants; (iv) number of wireless broadband subscriptions per 100 inhabitants; and (v) number of fixed broadband subscriptions per 100 inhabitants.

The Human Capital Index (HCI) consists of four components, namely: (i) adult literacy rate; (ii) the combined primary, secondary and tertiary gross enrolment ratio; (iii) expected years of schooling; and (iv) average years of schooling.

The detailed survey report provides insight in how each of the measurements relate to the sustainable development goals of the UN. For example, referring to Goal number 8, "Decent Work and Economic Growth", the Survey evaluates online information and services offered by ministries or government agencies responsible for labour and employment, or the labour sector in general.

The e-participation index (EPI) is derived as a supplementary index to the UN E-Government Survey. It extends the dimension of the Survey by focusing on the use of online services to facilitate provision of

[36] https://publicadministration.un.org/egovkb/en-us/#.Wt9ENPluapo
[37] http://workspace.unpan.org/sites/Internet/Documents/UNPAN97453.pdf

information by governments to citizens (“e-information sharing”), interaction with stakeholders (“e-consultation”) and engagement in decision-making processes (“e-decision-making”).

### *Mapping analysis*

The table below shows the mapping of the E-Government Development Index (EGDI).

**Table 14 - UN EGDI mapped to the Transformation Framework**

| | 1. e-Government | 2. Open Government | 3. Data-Centric Government | 4. Fully Transformed Government | 5. Smart Government |
|---|---|---|---|---|---|
| **Key Metrics** | **X** | | | | |
| | The EGDI consists of three components, one being the OSI (online service index).<br>The online service assessment looks also at the open data portals, but does not look at the number of open data sets, so the open government level is not mapped | | | | |

Elements which are not directly mapped onto the Transformation Framework relate to human capital and telecom infrastructure.

### *Conclusion*

The results of this mapping show that the EGDI reflects mostly the key metrics of level 1 of the framework. Enablers of digital transformation are measured (human capital and technical infrastructure).

## 3.5 Overall conclusions

Research has compared various e-Government and Digital Government Frameworks[38]. However, the mapping of the selected initiatives against a common framework on a path of digital transformation of government has not been done before.

The findings relating to this mapping show that most of the frameworks are coherent with the levels 1, 2 and 3 of the proposed Transformation Framework.

The gap analysis highlights elements that could complement the proposed Transformation Framework in various ways:

- A first finding led to the proposal of adding the notion of capacity building into the definition of Digital Government in order to accompany the digital transformation, which would include efficient project management and procurement of technologies.
- A second finding relates to the enablers of transformation measured by the different Frameworks: human capital, technical infrastructure or digital skills and uptake of technologies. These enablers are also referred to in the EC definition of e-government, together with organisational change to "strengthen support to public policies".

[38] Examples include:
Digital Government for E-Government Service Quality: a Literature Review | María Isabel Arias, Antônio Carlos Gastaud Maçada. Proceedings from ICEGOV 2017

# 4. Case Study Insights

## 4.1 Introduction

*Reference to the research question*: Can we illustrate Digital Transformation of Government with case studies and what can we learn from them in terms of state-of-play in Europe?

The case studies gathered insight into the actual trends in Digital Government, illustrating digital transformation of government. As described in the methodology, the choice of the case studies includes criteria on level of government, a geographic spread and a focus on the four sectors of health, transport, taxes and utilities. The table below presents the case studies in light of the criteria.

Whereas the case studies are of a limited number, we cannot conclude anything from their analysis in terms of state-of-play across Europe other than a qualitative view on examples of digital transformation.

**Table 15 - Overview of the case studies and criteria**

| # | Case study | Country | Level of government | Domain |
|---|---|---|---|---|
| 1 | My-Tax, Automation and AI in Finnish Tax | Finland | National | Tax |
| | The initiative is the Valmis program which aims to provide all services related to taxation on one platform called MyTax, giving access through a user-friendly interface to all relevant data about taxation to the users (the tax agents and the citizens) and pre-filling the information for the citizens. The initiative has a strong change management element linked to the change of the work processes, and has high support from the top management. | | | |
| 2 | Andalucía: Citizen-centred Health Digital Ecosystem | Spain | Regional | Health |
| | The Andalucía health system has, in recent years, actively sought to create an open and interoperable digital ecosystem to avoid vendor lock-in, encourage innovation and build a solid platform that meets business requirements. The initiative from the Region of Andalucía is a successful community-wide open-standards-based platform that puts the citizen first: all data collected in health records and relating to the patient is accessible though one system by the various health practitioners, and by partners of the wider ecosystem, for instance the pharmacists and the emergency services. | | | |
| 3 | Digital Transformation Team in Italy | Italy | National, Regional, Local | All |

| | | | | |
|---|---|---|---|---|
| | The initiative introduces a new model for digitizing the public administration sector in Italy, providing an “operating system” of the country as a series of building blocks upon which digital services for citizens and enterprises are built by other agencies. These building blocks include base registries, an electronic identifier, a data and analytics framework, and are complemented with a service design team leveraging citizen participation and an open source community providing innovative services reusing open data. | | | |
| 4 | Leveraging open data for digital transformation of transport in the UK | United Kingdom | National | Transport |
| | This initiative from the Department of Transport aims to make transport data reusable and discoverable to facilitate the creation of new businesses and opportunities for the commercial sector which then innovates and creates new services for travellers reusing this data. | | | |
| 5 | Wallonia: Base Registries Cross-roads Bank | Belgium | Regional | All |
| | The Base Registries Cross-Roads Bank (BRCB) in the Walloon Region provides access to base registry data to end-users (citizens, businesses or public administrations) connecting today 18 different base registries. End-users can access data in a secure way, which is managed following the Once Only Principle: data is provided only once by the businesses and citizens. The BRCB also provides services such as authentication management, operations traceability and other personalized services (data filtering, data aggregation, etc.). The BRBC provides also project management services, data quality and assurance, and simplification as well as process improvement and simplification. The BRBC provides thus a data infrastructure (and related services) to be reused by various services developed by the different “business” agencies of the Region. | | | |
| 6 | Sustainable Smart City Management with the urban GIS system in the city of Kielce | Poland | Local (Municipality) | Smart City and Utilities |
| | The city of Kielce implemented a system to manage the integrated development of the city. The system is used by various urban units (environmental department, smart city department, tax department, department of spatial planning and architecture, road department etc.). It enables cross-sector analysis and sharing of data and therefore the integration of urban strategies along geographical data (maps). The system also supports citizen participation. | | | |
| 7 | The European Chemicals Agency (ECHA) : creating value from data | Multinational | EU | multiple |

| | |
|---|---|
| | ECHA is the driving force among regulatory authorities in implementing 4 chemicals legislations. The Agency develops IT tools and formats that are provided free of charge to the chemical companies and Member State Competent Authorities, engaging efficiently the ecosystem. The initiative includes three services: Data collection, Data Dissemination and Analytics used to improve operations though predictive analysis. As outcome of this initiative, ECHA has leveraged the value of data to become the Chemicals knowledge hub of the EU. |

The section below presents the factsheets with key information on each case study. The factsheets provide an overview of the maturity of the initiative in the maturity level table. The level of maturity is represented with an “X” in the tables. In the case where the private sector provides services, based on open data shared by government, as part of the aimed outcome of the initiative, the maturity level is defined with the following symbol: (X). (An analysis of the maturity is provided in section 2.4.6).

It then provides an analysis of the various contextual element data that has been gathered in the case studies.

*Reference to the research question*: What are the key contextual elements which influence or impact a Digital Government Transformation initiative?

The analysis covers the following points:

1. analysis of key motivations and benefits pursued in light of the drivers
2. analysis of strengths and weaknesses of digital government initiatives
3. analysis of opportunities and threats to digital government initiatives
4. digital government maturity insight based on the case studies
5. mapping of maturity trends in relation to the service model maturity

## 4.2 Case studies factsheets

This section presents an overview of the key facts and elements from each case study. The maturity is assessed on operational services and activities; levels which relate to a pilot project are highlighted with an "*".

### *Case study 1: My-Tax, Automation and AI in Finnish Tax*

**My-Tax, Automation and AI in Finnish Tax**

**Overview**

| Country | Sector | Scope | Cross-border | Cross-sector | Organisation | Complexity |
|---|---|---|---|---|---|---|
| FI | Taxation | National, Municipal | Yes (EU and US) | Yes (financial, business…) | Taxation agency | High |

**Description**

| History and context | Services and data | |
|---|---|---|
| The Valmis programme is multi-year project, aiming at renewing all the tax applications, the eservices, and back office which were separate applications. Valmis started in 2013, started the implementation in 2014 and will end in 2019. | **End users:** taxpayers and tax agents<br>**Aim:** users can access all the needed data in one place and tax forms are pre-filled<br>**Channels of delivery**: mobile and desktop. | **Data re-used** from financial institutions, business (salaries), public bodies (benefits), from registries (population, real estate…)<br>**Location data**: address data<br>**Data produced:** Tax returns |

**Motivation**

**Benefits pursued**

- Increase the level of automation, relocate workforce to more productive tasks
- User friendliness in filing tax returns, enhanced customer service
- Enhanced tax compliance, better overview of all relevant data on one customer
- Secure taxation capabilities for the future, technology was getting old, obsolete with no maintenance
- Reduce IT costs spent on maintenance

**SWOT**

| Strengths | Weaknesses | Opportunities | Threats |
|---|---|---|---|
| Experienced implementation partner. High management and political support (multi- | Use of a solution not tailored to Finnish taxation legislation. | A common effort of the whole agency, the ministry of finance and top | New system and new processes, minimal tailoring. |

| | | | |
|---|---|---|---|
| year funding). A large program on time, on budget. | Use of English as working language. | management highly involved. | Financial risk linked to large programs. Adaptation of legislation, change of scope. |

**Outcomes**

| Measuring success | Take-up |
|---|---|
| Better fraud detection, shrink of the tax gap: hard to measure. Cost savings: 20 Million per year. | **Target user base:** 5,5 million individuals, 200 000 companies<br>**Take up:** Requirements implemented are fully used. |

**Maturity Level**

| Case 1 | 1 e-Government | 2 Open | 3 Data-Centric | 4 Fully Transformed | 5 Smart |
|---|---|---|---|---|---|
| **Drivers** | X | X | X | | |
| Cost savings, user value and transparency how they are taxed, based on the information they can access in one place. | | | | | |
| **Service model** | | | X | | |
| The service provides all the relevant data in an automated way. The user only has to check completeness. | | | | | |
| **Digital system** | | | X | | |
| This system is focused on reusing data; even data is provided on paper and is digitized/optically read. | | | | | |
| **Ecosystem and users** | | | X | | |
| The ecosystem automatically provides the needed data for taxation. Some analytics pilots reuse data from social media. | | | | | |
| **Technology focus** | | | X | | |
| All needed data is made available by the data owners to the tax administration. | | | | | |
| **Leadership** | | | X | X | |
| It is a business transformation programme. The business and IT work as one team to create information. | | | | | |
| **Key metrics** | | | X | | |
| The number of data driven services on-line | | | | | |

## *Case study 2: Andalucía, Citizen-centred Health Digital Ecosystem*

### Andalucía, Citizen-centred Health Digital Ecosystem

**Overview**

| Country | Sector | Scope | Cross-border | Cross-sector | Organisation | Complexity |
|---|---|---|---|---|---|---|
| ES | Health | Regional | No | Yes (social services) | Health Agency | High |

**Description**

| History and context | Services and data | |
|---|---|---|
| 2000: EHR project - an e-health record for all citizens. 2010: redesign to address scalability issues.<br><br>2015: creation of a common system for all hospitals<br><br>2018: Diraya platform is a government private cloud-hosted, citizen-centric multiagency care record. | **End users:** Patients and healthcare practitioners<br><br>**Aim:** Single-point-of-access patient portal and clinician portal<br><br>**Channels of delivery**: desktop, mobile | **Data re-used**: all data relating to a patient in his/her different interactions<br><br>**Data produced:** all data needed by healthcare practitioners (Emergency, pharmacists, doctors) |

**Motivation**

| Benefits pursued |
|---|
| • Place the patient at the centre of the healthcare system<br>• Avoid multiple health records; all information is linked to one single identification<br>• Guarantee the continuity of care throughout the different services<br>• Measuring compliance to a legislation on warrantee for waiting time |

**SWOT**

| Strengths | Weaknesses | Opportunities | Threats |
|---|---|---|---|
| Strong political leadership and support from the Ministry.<br><br>Open-standards environment and interoperability office. | Budget issues linked to the size of the initiative. Lack of bandwidth in some provinces. Managing legacy and change. | Immediate visible benefits.<br><br>Patients driving change.<br>Ecosystem on board (e.g.: pharmacists) | Mixed adoption rates. |

**Outcomes**

| Measuring success | Take-up |
|---|---|

| | |
|---|---|
| Better organisation of the logistics of delivering healthcare (referrals, bookings, prescriptions etc...)<br>Avoiding "administrative" visits to family physician for obtaining a prescription for chronical disease: 15% reduction<br>Savings on paper printing: 11 Million Euros (3M/year).<br>Savings for citizens who don't have to travel to the administration to book appointments. | **Target user base:** Population served 8.43 million<br>Number of primary care centres 1,550 ; 49 hospitals<br>93 million appointments with clinicians per annum<br>100 million prescriptions per annum<br>**Take up:** undefined |

**Maturity Level**

| Case 2 | 1 e-Government | 2 Open | 3 Data-Centric | 4 Fully Transformed | 5 Smart |
|---|---|---|---|---|---|
| **Drivers** | X | X | X | | |
| Third parties include analysis results from laboratories etc. | | | | | |
| **Service model** | X | X | * | | |
| Intermediated: Patient apps collect data from IoT devices for health activity monitoring (using consumer-grade wearables). | | | | | |
| **Digital system** | X | X | X | | |
| Data centric: all patient data is accessible and reused for new services. | | | | | |
| **Ecosystem and users** | X | * | | | |
| Some pilots are focusing on the use of 3rd party apps for patients to have access to their data | | | | | |
| **Technology focus** | X | X | | | |
| The interoperability office manages SOA governance and API management/governance under a single process | | | | | |
| **Leadership** | X | | X | | |
| Lead by the technology and the business with support from the political level because of the very large budget. | | | | | |
| **Key metrics** | | | X | | |
| The number of data driven services online, avoidance of administrative visits | | | | | |

## *Case study 3: Italian Digital Transformation Team*

### Italian Digital Transformation Team

**Overview**

| Country | Sector | Scope | Cross-border | Cross-sector | Organisation | Complexity |
|---|---|---|---|---|---|---|
| IT | All | National, Regional, Local | No | Yes (all sectors relating to citizenship) | Presidency of the Council of Ministers | High |

**Description**

| History and context | Services and data | |
|---|---|---|
| Created in 2016 by Decree of the President of the Council of Ministers and supervises the activity of the Agency for Digital Italy - AgID. It was modelled after the United States Digital Service and UK Government Digital Service | **End users:** citizens<br>**Aim:** a model for digitalizing the public administration sector, based on building blocks<br>**Channels of delivery**: Mobile first | **Data used:** citizens personal data, digital identity, digital payment, national registries<br>**Data produced:** metadata discovery repository<br>**Location data**: address register. |

**Motivation**

| Benefits pursued |
|---|
| • Accelerate the implementation of the digital agenda<br>• Create political endorsement and a strong and centralized governance to boost transformation.<br>• Provide citizens with a richer service experience (e.g. for taxpayers, transportation) |

**SWOT**

| Strengths | Weaknesses | Opportunities | Threats |
|---|---|---|---|
| Stakeholders involvement for agile and open data<br>Engaged community of developers and designers<br>Evolving architecture<br>New cultural framework | Public sector lacks execution culture<br>Procurement leads to lock-in and long projects with few providers | Policy founded the initiative<br>Dedicated budget | Lack of continuity: current mandate is until 2018<br>Political change |

**Outcomes**

| Measuring success | Take-up |
|---|---|

| | |
|---|---|
| Population Registry: number of migrated municipalities<br>Public Identity System: number of identities provided<br>PagoPA: number of transactions<br>Open Source Developers: number of projects hosted<br>Data & Analytics Framework: number of agencies on-board | **Target user base:** entire population 60M people<br>**Take up:** Current reach depends on the project, for instance:<br>Population registry: our user-base is ~1,7M people,<br>For Public Identity System, there are 2M identities<br>for Digital Transactions, 7M transactions |

**Maturity Level**

| Case 3 | 1 e-Government | 2 Open | 3 Data-Centric | 4 Fully Transformed | 5 Smart |
|---|---|---|---|---|---|
| **Drivers** | | X | X | | |
| An approach strongly oriented to user-centricity and open source | | | | | |
| **Service model** | | X | * | | |
| Building blocks (SPID digital identity, ANPR national registry) are used by third parties to create enhanced services. | | | | | |
| **Digital system** | | X | X | X | |
| Data and Analytics Framework - DAF: an interface for administrations to share data and APIs in a free and open way | | | | | |
| **Ecosystem and users** | | X | | | |
| Developers Italia, Designer Italia and Data & Analytics Framework are three projects aimed at engaging the external community and co-create applications and services | | | | | |
| **Technology focus** | | X | X | X | |
| The Data & Analytics Framework organizes data in the public sector, supporting agencies to share data and co-create joint analysis using big-data and machine learning models. | | | | | |
| **Leadership** | X | X | | | |
| Technology is the gap to be filled and the driver because in most of the agencies there are no CIOs. | | | | | |
| **Key metrics** | % Services online | No. open datasets | No. data-driven services | % new/retired services | No. new models |
| Not applied | | | | | |

## *Case Study 4: Leveraging open data for digital transformation of transport in the UK*

### Leveraging open data for digital transformation of transport in the UK

**Overview**

| Country | Sector | Scope | Cross-border | Cross-sector | Organisation | Complexity |
|---|---|---|---|---|---|---|
| UK | Transport | National | No | No | Department for Transport | Medium |

**Description**

| History and context | Services and data | |
|---|---|---|
| 1990s: eServices on rail time tables.<br>2000: Transport Direct (journey planner, common fare card, multimodal transport). Location data and location based technologies supported the transformation.<br>2010 - 2012, political support of open data and drive for transparency. | **End users:** open data users, travellers<br>**Aim:** Reusable datasets, create new business, choice in services<br>**Channels of delivery**: Data sites, multichannel service delivery | **Data produced:** metadata discovery repository<br>**Location data**: specific location data sets. |

**Motivation**

| Benefits pursued |
|---|
| • There was a huge demand for reusing transport data in new travel services |

**SWOT**

| Strengths | Weaknesses | Opportunities | Threats |
|---|---|---|---|
| High demand for transport information<br>Market for data used by apps developers<br>High impact of services on travellers' commute | Most demanded data sets were in the private sector.<br>DfT set up a governance board to manage the progressive opening of data sets. | Political focus on openness<br>Market opportunities that created new business. | People had to go to different sites to find the different data |

**Outcomes**

| Measuring success | Take-up |
|---|---|
| Direct: Number of open datasets viewed and downloaded<br>Indirect: Example for London: live transport information related developments have been estimated to have | **Target user base:** not indicated<br>**Take up:** Views and downloads of data sets |

| | |
|---|---|
| generated a value of between £15 – 58 million each year in saved time for the users of Transport for London. | Live traffic information: 65473 views17131 downloads<br>Indirectly: number of developers reusing the data though an API: ex: 2013 – single API, over 5,000 developers |

**Maturity Level**

| Case 4 | 1 e-Government | 2 Open | 3 Data-Centric | 4 Fully Transformed | 5 Smart |
|---|---|---|---|---|---|
| **Drivers** | | X | X | (X) | |
| Leverage the business opportunities driven by open data to create transformation | | | | | |
| **Service model** | | X (X) | X | | |
| Developers and private sector provide services reusing the open datasets | | | | | |
| **Digital system** | | | X | | (X) |
| A metadata repository. The service providers are focused on their ecosystem. | | | | | |
| **Ecosystem and users** | | X | | X | |
| DfT does not ask for registration of data users, but the private sector creating services engages with their ecosystem. | | | | | |
| **Technology focus** | | X | X | | |
| A mixture of datasets and APIs. | | | | | |
| **Leadership** | | | X | X | X |
| The government initiative was a policy driven. The business is transport. The service providers are focused on information and innovation. | | | | | |
| **Key metrics** | | X | | | |
| Measure datasets viewed and downloaded. The final aim is to enable the development of new models by the ecosystem partners. | | | | | |

## *Case Study 5: Wallonia, Base Registries Cross-roads Bank*

### Wallonia, Base Registries Cross-roads Bank (BCED)

**Overview**

| Country | Sector | Scope | Cross-border | Cross-sector | Organisation | Complexity |
|---|---|---|---|---|---|---|
| Belgium | all | Regional | No | Yes (citizenship, environment…) | e-Wallonia<br>Bruxelles Simplification | High |

**Description**

| History and context | Services and data | |
|---|---|---|
| This multi-year cooperation program was launched in 2013 between the Walloon Region and the French Community of Belgium. | **End users:** citizens, public administrations (all levels), businesses<br>**Aim:** create new base registries, ensure data exchange<br>**Channels of delivery**: desktop | **Data used:** sharing of base registries data from all Belgium<br>**Data produced:** creation of Base registries in Wallonia (2 in 2018)<br>**Location data**: address data |

**Motivation**

| Benefits pursued |
|---|
| • Reduce administrative burden and overcome dissatisfaction by enforcing the once-only principle OOP<br>• Facilitate and simplify high quality base registry data exchange between public authorities<br>• Provide quality data and adequate level of security to improve service delivery |

**SWOT**

| Strengths | Weaknesses | Opportunities | Threats |
|---|---|---|---|
| Implements the OOP, reduces administrative burden. | Relative success: operates only 18 base registries today. Hard to convince participation Lack of political support | Leverage the future open data strategy in Wallonia, the whole-of public sector approach | Resistance to change<br>Scalability and technical capacity of BCED<br>Blockchain |

**Outcomes**

| Measuring success | Take-up |
|---|---|
| Faster and more accurate information flow | **Target user base:** All public services should be delivered implementing the OOP |

| | |
|---|---|
| Number of annual queries, number of authentic sources, number of end-users, percentage of public administrations using BCED<br><br>Cost savings per year: 40 M for the citizens and the businesses, 10 M for the regional and local authorities, an additional 25 M foreseen with future registries integrated | **Take up:** Access of base registry data through BCED:<br>- 2015: 2,5 M queries/year<br>- 2016: 6 M queries/year<br>- 2017: 7 M queries/year<br>- 2018 (forecast): 15 M queries/year |

**Maturity Level**

| Case 5 | 1 e-Government | 2 Open | 3 Data-Centric | 4 Fully Transformed | 5 Smart |
|---|---|---|---|---|---|
| **Drivers** | X | | | | |
| BCED generates huge efficiency gains | | | | | |
| **Service model** | X | | | | |
| BCED provides data following queries from administrations or citizens | | | | | |
| **Digital system** | X | X | | | |
| Citizens can access online services where they can work directly with pre-filled forms | | | | | |
| **Ecosystem and users** | X | | | | |
| The government data owners | | | | | |
| **Technology focus** | X | | | | |
| Use of SOA | | | | | |
| **Leadership** | X | X | X | | |
| The business owners usually take part in the identifying usage of their data. | | | | | |
| **Key metrics** | X | | X | | |
| | | | | | |

## *Case Study 6: Sustainable Smart City Management with the urban GIS system in the city of Kielce, Poland*

### Sustainable Smart City Management with the urban GIS system in the city of Kielce, Poland

**Overview**

| Country | Sector | Scope | Cross-border | Cross-sector | Organisation | Complexity |
|---|---|---|---|---|---|---|
| PL | Smart City Utilities | Local | No | Yes (roads, participation, …) | City of Kielce | Low |

**Description**

| History and context | Services and data | |
|---|---|---|
| 2006: recommendation on sustainable digital development, only a cadastre system.<br>2007: Open call for tender, 2009: system for building permits, grants, environmental aspects…<br>2010: GIS related events organized in cooperation with universities. 2014-2016: design of Smart City Platform. 2016: launch of Geoportal 3D and Internet servers of high quality photogrammetric data | **End users:** Residents, local and entrepreneurs, investors, NGOs, city units and departments<br>**Aim:** Deliver GIS-based services for integrated city management<br>**Channels of delivery**: Portal, apps, web services, desktop | **Data used:** Reference data, land register, master map, address map<br>**Data produced:** land use, elections, waste management, flood plains, utilities infrastructure<br>**Location data**: |

**Motivation**

| Benefits pursued |
|---|
| • Better coordinated municipal policies including spatial economy, planning policy and zoning<br>• Easy access to full, up-to-date integrated information about the city<br>• Investment process improvement and monitoring<br>• Better environment management<br>• Better social participation (budget prioritization, public consultation…) |

**SWOT**

| Strengths | Weaknesses | Opportunities | Threats |
|---|---|---|---|
| Development in stages, smart city unit leadership and team of passionate people | Organizational changes to bring to a large team, IT competences lacking | The INSPIRE directive and interoperability, the ISO 3720 process | Focus training on sustainable development, smart city good practices and not only on tools |

**Outcomes**

| Measuring success | Take-up |
|---|---|

| | |
|---|---|
| The number of administrative procedures supported, number of digitized datasets. The goal is to significantly increase the reach of external services: objective is 20% of residents using data and social participation services. | **Target user base:** Internal and external users<br>**Take up:** GIS in Kielce after 10 years of development:<br>• 103 242 administrative cases<br>• 450 internal users (72% off all employees)<br>• 150 administrative procedures are supported |

**Maturity Level**

| Case 6 | 1 e-Government | 2 Open | 3 Data-Centric | 4 Fully Transformed | 5 Smart |
|---|---|---|---|---|---|
| **Drivers** | | X | X | | |
| Location data – based services, participatory budget elaboration | | | | | |
| **Service model** | X | X | | | |
| Kielce university use 3D models to analyse how investment processes influences the river valley influences flooding | | | | | |
| **Digital system** | X | X | | | |
| Data is provided through the portal, web services (WMS) and geoportal. | | | | | |
| **Ecosystem and users** | X | X | X | | |
| Understand the complexity, developing the smart city strategy with various stakeholders. | | | | | |
| **Technology focus** | X | * | | | |
| Usage of SOA and webs services. Planned to implement the API architecture, some pilot projects | | | | | |
| **Leadership** | X | | X | X | |
| It depends on the domains. In most cross sector processes in the city: level 4, others on level 1. | | | | | |
| **Key metrics** | X | X | X | | |

## *Case Study 7: The European Chemicals Agency: creating value from data*

### ECHA: creating value from data

**Overview**

| Country | Sector | Scope | Cross-border | Cross-sector | Organisation | Complexity |
|---|---|---|---|---|---|---|
| EU | Cross-sector | International | Yes (EU MS, OECD Countries) | Yes (Industries using chemicals) | Operations Directorate | High (volume, sensitivity) |

**Description**

| History and context | Services and data (3 services are described) | |
|---|---|---|
| 2004: Data collection (formats and tools) during the REACH Directive negotiations. 2007: REACH in force, start of REACH operations, leveraging OECD standardisation. 2009: Dissemination website.<br>2010: Automation for optimising data submission<br>2011: Digital Transformation Initiative with revamp of the Dissemination site in 2016. 2016-2017 Data Value discovery initiative for the next strategic planning period (2019-2023) | **End users:** Industry, academia, MS competent authorities, public, ECHA and regulatory expert<br>**Aim: 1:** Chemical data collection<br>**2:** Dissemination of data **3:** Use of analytics to improve operations.<br>**Channels of delivery**: websites, data repository, integration platform, dashboard for MS | **Data used:** registered information on chemicals from companies, MS<br>**Data produced:** Information on chemicals in standard formats, inventories, dataset on ca. 15.000 substances …<br>**Location data**: secondary role. (place of production of chemical) |

**Motivation**

| Benefits pursued |
|---|
| • Implementation of the REACH legislation lead by the agency, ensuring consistency across MS<br>• Improved operations through standardisation, automation, data mining and analytics |

**SWOT**

| Strengths | Weaknesses | Opportunities | Threats |
|---|---|---|---|
| Standardisation, efficient exchange and high data reuse<br>Chemical knowledge hub<br>Data management | Data distribution not automated (metadata, privacy challenges), data management not a corporate-level activity | Legislation is the driver, corporate awareness that data is an asset, centralized management by ECHA | IP barriers, resources uncertainty, knowledge level of contractors, standardization builds on OECD work, not EU |

**Outcomes**

| Measuring success | Take-up |
|---|---|

| | |
|---|---|
| **1** Data collection: Annual satisfaction surveys, dossier processing time<br>**2** Dissemination: Number of unique visits, annual satisfaction surveys; Number of data requests from MS<br>**3** Analytics: Number of substances pre-selected that were subsequently selected by MS for regulatory actions | **Target user base: 1.** legal obligation for all; **2:** unlimited (open access) **3.** Not relevant<br>**Take up: 1:** 145.000 users. **2:** 40 M /Year page views **3:** 300 substances, of which 70-80% subsequently selected by MS |

**Maturity Level**

| Case 7 | 1 e-Government | 2 Open | 3 Data-Centric | 4 Fully Transformed | 5 Smart |
|---|---|---|---|---|---|
| **Drivers** | X | X | X | X | |
| Use of data analytics for insight-driven operations transformation | | | | | |
| **Service model** | X | | X | | |
| The pre-screening and prioritization based on data analytics is a proactive service | | | | | |
| **Digital system** | X | | X | | |
| A common IT architecture supports data collection and dissemination. The analytics-based service is data-centric. | | | | | |
| **Ecosystem and users** | X | | X | | |
| Interoperability between ECHA, MS and EC for exchanging data. Inclusion of new ecosystem partners for new services. | | | | | |
| **Technology focus** | X | X | X | | |
| APIs pose privacy and security challenges and are being tested for an open any data approach. | | | | | |
| **Leadership** | X | | X | | |
| Data transformation is led by technology and innovation is led by business | | | | | |
| **Key metrics** | X | X | X | | |
| Dataset metrics from the dissemination site, data analytics based services for MS and ECHA | | | | | |

## 4.3 Analysis of key motivations of digital government initiatives and benefits pursued

This section analyses the motivations underlying the initiatives described in the case studies and presents them in the light of the drivers for digital government. The aim of this section is to map the key motivations onto the drivers of the Transformation Framework[39], illustrating the reasons behind each driver for transformation in the initiatives.

[39] The level 5 of maturity of the drivers is never measured in the case studies and is therefore deleted from the table

**Table 16 - Key motivations and drivers of digital government identified in case studies**

| Motivation | 1 e-Government | 2 Open | 3 Data-Centric | 4 Fully Transformed |
|---|---|---|---|---|
| **Drivers** | Compliance, efficiency | Openness and transparency | Citizen value | Insight-driven transformation |
| Case 1: FI | Secure taxation capabilities for the future, technology soon obsolete<br>Reduce IT costs spent on maintenance<br>Increase the level of automation, relocate workforce to more productive tasks<br>Enhanced tax compliance | Better overview of all relevant data on one customer | User friendliness in filing tax returns, enhanced customer service | |
| Case 2: ES | Avoid multiple health records, all information is linked to one single identification<br>Guarantee the continuity of care throughout the different services | Measuring compliance to a legislation on warrantee for waiting time | Place the patient at the centre of the healthcare system | |
| Case 3: IT | Create political endorsement and a strong and centralized governance to boost transformation. | | Accelerate the implementation of the digital agenda<br>Provide citizens with a richer service experience (e.g. for taxpayers, transportation) | |
| Case 4: UK | | There was a huge demand for reusing transport data in new travel services | | (this is led by the private sector, generating transformed services based on reuse of data) |
| Case 5: BE | Reduce administrative burden by enforcing the once-only principle<br>Facilitate and simplify high quality base registry data exchange between public authorities<br>Provide quality data and adequate level of security to improve service delivery | | Overcome citizen and business dissatisfaction by enforcing the once-only principle | |

| | | | | |
|---|---|---|---|---|
| Case 6: PL | | Easy access to full, up-to-date integrated information about the city | Better environment management<br>Investment process improvement<br>Better participation (budget prioritization, public consultation…)<br>Better coordinated municipal policies including spatial economy, planning policy and zoning | |
| Case 7: EU | Implementation of the REACH legislation lead by the agency, ensuring consistency across MS<br>Improved operations through standardization and automation | | Improved operations through data mining and analytics | |

### *Compliance and efficiency*

The motivations linked to compliance and efficiency are multiple and varied.

**Compliance** refers to the need to **implement a legislation**, (the REACH Directive (EU)) or a principle (the Once Only Principle (BE)), to **secure specific capabilities** linked to government's tasks, (taxation (FI)), and ensure high compliance to the related legislation (FI).

**Efficiency** is referred to in many ways. **Cost savings** is one of them, with replacement of legacy systems to lower maintenance costs (FI), or savings generated by administrative burden reduction (BE).

Efficiency is also linked to **improved operations though automation** (EU, FI) allowing the relocation of part of the workforce to more productive tasks (FI). Efficiency refers also to **improved public service delivery** (BE, FI) through quality data and adequate security (BE), easing of data exchange between administrations (BE) with a facilitation service.

Efficiency is also referred to as the outcome of a specific (EU) of a centralized approach for achieving compliance to legislation, ensuring **consistency** among Member States. One initiative (IT) aims to **boost transformation** by creating political endorsement and a strong and centralized governance.

Standardisation is mentioned as an **enabler** of efficiency (BE, EU) as well as the use of a single identifier – in this case a health record (ES) - to which all data is linked.

### *Openness and transparency*

Motivations linked to openness and transparency are linked to **accessing data**, such as all data on a citizen relevant for taxation purposes (FI), all transport data relevant for commuters (UK), all data on the use and composition of chemicals (EU), or all data about a city (PL). Transparency is also described as providing **insight in a government process** (ES) which allows to measure compliance to a legislation (waiting time for an appointment at the doctor)

### *Citizen value*

Citizen value is found in **user friendliness** of public services such as prefilled forms which are a manifestation of the Once-Only Principle (FI, BE), providing a richer service experience leveraging access to data and putting the citizen – for example, the patient (IT) - at the **centre of the service(s)**. The **high demand for new services** – for example around transport data (UK) - is a clear indicator of citizen value of that service.

Whereas improved city management (PL) may be seen as efficiency, it is identified as providing higher citizen value in the initiative, because it **improves the overall management** so much, not just a specific process, that we can refer to **tax-payers' value for money** rather than efficiency as in cost reduction or operational efficiency.

Improved city management includes better environment management, investment process improvement, better-coordinated municipal policies and also **better participation from citizens** (budget prioritization, public consultation…), which ensures that public governance includes the citizens' opinion and values. Improved operations thanks to **predictive analysis** are also considered as bringing citizen value for money, rather than simply improving efficiency of operations.

### *Insight-driven transformation*

The use of predictive analytics (EU) for better operations also refers to insight-driven transformation, with the exploration of data mining and intelligence techniques for supporting operations. One initiative refers to the use of data shared by the public sector (UK) by the private sector to create innovative services.

## 4.4 Analysis of strengths and weaknesses of digital government initiatives

### *Strengths of digital government initiatives*

This section provides an overview of the strengths of digital government initiatives identified in case studies.

**Table 17 - Strengths of Digital Government initiatives identified in case studies**

| | High level support | Technical aspects | Organisational aspects | Results and outcomes |
|---|---|---|---|---|
| | *High management and political support* | *Interoperability and standards, experience* | *Adaptive or staged approach* | *Strong demand and successful outcome* |
| Examples from case studies | High management and political support (multi-year funding). (FI) | Experienced implementation partner and strong project management (FI) | Coordination of stakeholders to manage programs with agile and open data approach (IT) | A large program on time, on budget.(FI) |
| | Strong political leadership and support from the Ministry. (ES) | Interoperability office, open-standards environment (ES) | Evolving architecture (IT) | Engaged community of developers and designers (IT) |

| | | | | |
|---|---|---|---|---|
| | Smart city unit leadership inside municipality (PL) | Standardisation, efficient exchange of information (EU) | New cultural framework (IT) | High demand for transport information (UK) |
| | | | Development in stages (PL) | Market for data used by apps developers (UK) |
| | | | Team of passionate people (PL) | High impact of services on travellers' commute (UK) |
| | | | | Implements the OOP, reduces administrative burden. (BE) |
| | | | | Successful data management project (EU) |
| | | | | High level of data reuse (EU) |
| | | | | Became a chemical knowledge hub (EU) |

The strengths of the initiatives in the case studies can be classified along four categories, as depicted in the table above:

### *High-level support*

Political support and high management (FI, ES) support are cited as strengths of an initiative because it enables the allocation of the right resources and provide drive to the initiative. Strong leadership at the centre of the municipality – for smart cities - (PL) is also a strength to be leveraged.

### *Technical aspects*

Interoperability and standards are often mentioned as strengths leading to success, the initiatives focus on these aspects – interoperability office (ES), use of standards (EU) - and leverage them.

Strong project management and experienced team members are key for large successful initiatives (FI).

### *Organisational aspects*

Adaptive or staged approaches are seen as strengths of initiatives. Examples include the coordination of stakeholders to manage programs with agile approaches (IT) or the potential for an architecture (IT) to evolve

according to future technological trends. A development in stages with “small steps” is seen as a strength, together with a team of passionate people (PL).

Establishing a new culture in public sector initiatives aims to overcome the lack of execution culture, linked to unclear goals and low accountability for progress (IT).

### *Results and outcomes*

Strong demand and successful outcomes are strengths that initiatives have leveraged. Examples are project management successes, such as a large program on time, on budget (FI), a successful data management project (EU) and an engaged community of developers and designers (IT). Other types of successful outcomes are being recognized as a reference in the business – a knowledge hub (EU).

Strong demand from the future users are strengths that new services leverage: high demand for transport information (UK) and a market for data used by apps developers (UK) and a high level of data reused (EU) pulled the initiatives to success. By implementing the once only principle, the initiative (BE) resolves strong discontent of citizens who complained about entering their data multiple times.

### *Conclusion*

Initiatives identify a variety of strengths, these relate to political support, strong project management and experience, interoperability or adaptive approaches; but strong demand from users and successful outcomes such as an engaged community or a successful data management project and are key elements to leverage as strengths of an initiative which can provide traction towards success.

## *Weaknesses of digital government initiatives*

This section provides an overview of the weaknesses of digital government initiatives identified in the case studies.

**Table 18 - Weaknesses of Digital Government Initiatives identified in case studies**

| | High level support | Technical aspects | Organisational aspects | Results and outcomes |
|---|---|---|---|---|
| | *Lack of management or political support* | *Technical challenges and issues with data* | *Lack of involvement or missing contributions* | *Negative outcomes or risks of the project.* |
| Examples from case studies | Lack of political support (BE) | Lack of bandwidth in some provinces. (ES) | Use of English as working language. (FI) | Use of a solution not tailored to taxation legislation.(FI) |
| | Data management not a corporate-level activity (EU) | Managing legacy (ES) | Managing change (ES) | Budget issues linked to the size of the initiative. (ES) |
| | | IT competences lacking (PL) | Public sector lacks execution culture (IT) | Procurement leads to lock-in and long projects with few providers (IT) |
| | | Metadata classification challenge (EU) | Most demanded data sets were in the private sector. (UK) | Relative success: operates only 18 base registries today.(BE) |
| | | Privacy challenges for sharing data via APIs (EU) | Hard to convince participation from different agencies (BE) | Data distribution not automated yet (metadata, privacy challenges) (EU) |
| | | | Organizational changes to bring to a large team (PL) | |

The weaknesses of the initiatives in the case studies can be classified along four categories, as depicted in the table above:

## *High-level support*

Just as political and high management support is a strength, lack of support is a weakness (BE). Key initiatives such as a data management project which are not a corporate-level activity (EU) can hinder overall transformation.

## *Technical aspects*

Key technical aspects such as lack of bandwidth (ES) or lack of IT competences are considered weaknesses of the initiatives.

Other challenges such as managing legacy of very large projects during transformation (ES), metadata classification (EU) or privacy issues in data sharing can weaken an initiative.

### *Organisational aspects*

Lack of involvement or missing contributions is identified as weaknesses of initiatives. Examples are the lack of execution culture, linked to unclear goals and low accountability for progress (IT), the lack of participation (BE) or resistance to sharing data (UK).

Managing change (ES) and achieving organizational changes in large teams (PL) or working in another language (FI) are issues in the project that needed to be overcome.

### *Results and outcomes*

Negative outcomes or risks weaken initiatives. Examples relating to project management and procurement are: project scoping and the choice of a potentially inappropriate solution (FI), budget issues amplified by the size of the initiative (ES), procurement methods leading to lock-in on long projects with few providers (IT). Other examples relate to low output such as a low number of base registries in operation (BE) or data distribution not automated yet (EU) because of technical aspects.

### *Conclusion*

Initiatives identify a variety of weaknesses that need to be overcome and that hinder success. These relate to low of political or management support, as well as lack of bandwidth, technical expertise and adequate procurement frameworks to avoid lock-in. Other challenges are about managing legacy, change management and buy-in for the transformation.

## 4.5 Analysis of opportunities and threats of digital government initiatives

### *Opportunities of digital government initiatives*

This section provides an overview of the opportunities for digital government identified in the case studies.

**Table 19 - Opportunities of Digital Government initiatives identified in case studies**

| | High level support | Technical aspects | Organisational aspects | Results and outcomes |
|---|---|---|---|---|
| | *Lack of management or political support* | *Technical challenges and issues with data* | *Lack of involvement or missing contributions* | *Negative outcomes or risks of the project.* |
| **Examples from case studies** | Policy founding the initiative (IT) and dedicating long term budget | Interoperability leading to reusability of location data (PL) | A common effort of the whole agency (FI) | Leverage quick wins to trigger change (ES) |
| | The future open data strategy in Wallonia (BE) | | Patients are driving change. (ES) | Corporate awareness that data is an asset, results of the successful data management project (EU) |
| | INSPIRE Directive eases he implementation (PL) | | Ecosystem partners on board (ES) | |
| | REACH Directive is the driver (EU) | | Market opportunities which created new business in the ecosystem (UK). | |
| | Political focus on openness (UK) | | The initiative leverages its scope: a whole-of public sector approach (BE) | |
| | | | Compliance to the ISO 3720 process triggered digitalization of data (PL) | |
| | | | Decision for the implementation of the REACH Directive to be managed centrally (EU) | |

The opportunities of the initiatives in the case studies can be classified along four categories, as depicted in the table above:

### Policy and budget

Initiatives leverage policy opportunities. For example, a policy can found the initiative with a decree setting it up (IT) and dedicating long term budget. A Directive can be at the root of the initiative (EU) or ease the implementation (PL). Open data policies or strategies at country or region level are also mentioned (UK, BE).

### Technical aspects

Interoperability leading to reusability of location data (PL) is referred to as an opportunity - whereas in some cases it is seen as a strength - because it was not a specific effort in the initiative (such as setting up an interoperability office) and the fact that there was data available with interoperability qualities, thanks to the INSPIRE Directive, eased the implementation of the project.

### Organisational aspects

Unplanned support and buy-in are opportunities highlighted in the cases. For example, whole-of-government (BE) and whole-of-agency (FI) efforts build momentum and are leveraged for success. Ecosystem partners and users can be on board early and “pull” change in the organisation; for example, patients see ask the doctors to use the new system and pharmacists adhere fast to the new approach (ES).

Market opportunities which created new business allowed the ecosystem to develop fast (UK).

In one case (PL), the methodology for implementing the initiative triggered indirect buy-in: compliance to the ISO 3720 process about sustainability raised awareness and triggered a focus on digitalization of data (PL), which lead to buy-in: more digitalized data was then a key opportunity for the initiative to grow.

In another case, the results of a study on security and risk for the implementation of the REACH Directive recommended that it should be managed centrally (EU), which eased the coordination of all Member States with a common approach.

### Results and outcomes

Visibility of benefits is an opportunity leveraged by some the initiatives. Examples include “quick wins” for the users (ES) – the patients who push for the usage of the electronic appointment scheduling tool because they are sure to get an appointment and stop losing time in travelling. Another case shows that thanks to a successful outcome of the project – the data management project (EU), there is corporate awareness that data is an asset.

### Conclusion

Initiatives leverage a series of opportunities. Policies are often referred to, relating to open data and interoperability. Unplanned support and buy-in such as ecosystem partners on board early and market opportunities can “pull” change in the organisation. High visibility of benefits to users or decision makers and “quick wins” are advocates for change.

## 4.6 Threats to digital government initiatives

This section provides an overview of the threats to digital government identified in the case studies.

**Table 20 - Threats to Digital Government Initiatives identified in case studies**

| Table 1. | High level support | Technical aspects | Organisational aspects | Results and outcomes |
|---|---|---|---|---|
| | *Lack of management or political support* | *Technical challenges and issues with data* | *Lack of involvement or missing contributions* | *Negative outcomes or risks of the project.* |
| Examples from case studies | Adaptation of legislation, leading to potential change of scope. (FI) | Technical capacity which does not scale (BE) | New system and new processes, minimal tailoring possible (FI). | Uneven adoption rates of the new system (ES). |
| | Possible lack of continuity of the project, due to political change (IT) | Disruptive technologies such as Blockchain (BE) | Actual resistance to change<br>Lack of scalability of the organisation (BE) | People had to go to different sites to find the different data (UK) |
| | IP barriers to sharing data (EU) | Knowledge level of contractors (EU) | Need for training on sustainable development, smart city good practices and not only on tools (PL) | Standardization builds on OECD work, which may impact the uptake of the standard by other EU agencies (EU) |
| | Uncertainty of resources (EU) | | | |
| | Financial risk linked to large programs. (FI) | | | |

The threats to the initiatives in the case studies can be classified along four categories, as depicted in the table above:

### *Policy and budget*

Changes at policy and political levels, budget changes and uncertainties are strong threats to the initiatives. Examples relating to the requirements of the services include potential change of legislation, leading to change of scope (FI), or IP barriers to sharing data (EU). Political change threatens the continuity of the project (IT) and creates uncertainty about the resources (EU). Budget uncertainties are linked to financial risks of large programmes (FI)

### Technical aspects

Disruption, low scalability and capacity are the main technical threats mentioned. Disruptive technologies may render the initiative irrelevant, such as Blockchain for the data registries (BE). Lack of technical knowledge (EU) and technical capacity to scale (BE) are also direct threats to the implementation of the initiatives.

### Organisational aspects

Threats to the uptake and lack of business knowledge may strongly hinder the success of the initiative. For example, while change management was seen as a weakness is some cases (see above), actual resistance to change - due to factors like lack of scalability of the organisation or very different business processes of the new system (FI) - is a threat to the uptake which becomes a risk to the project and needs to be managed as such. The lack of scalability of the organisation (BE) or the lack of business knowledge (PL) is also threats to the good implementation of the projects.

### Results and outcomes

Outcomes of the project impacting the uptake, generating uneven adoption rates of the new system (ES) slow down the roll-out of the new system. The lack of a user-centred approach due to the diversity of ecosystem partners was seen as a threat in the case of the multiple open data sites (UK) the users had to go to find data. Having a lead organisation outside of the ecosystem targeted is a potential threat to the uptake; the example of standardization efforts led by the OECD and leveraged by ECHA may impact the uptake of the standard by other EU agencies (EU).

### Conclusion

Initiatives are at risk due to various types of threats. These are changes at policy and political levels, budget changes, as well as lack of scalability of systems or teams, lack of knowledge and disruptive technologies. Ecosystems need to be managed to ensure buy-in and coordinate user-centred services. This may require notable effort from lead organisations.

# 5. Digital Government Maturity (DGM) insight based on the case studies

This section analyses the maturity levels of the case studies and presents the findings for each theme: the drivers, the service model, the digital system, the ecosystem and users, technology focus, leadership and key metrics.

The tables below present the level of maturity for each theme, based on the feedback from the case studies through self-assessment which is then validated. The level of maturity is represented with an "**X**" in the tables. In the case where the private sector provides services based on open data shared by government, the maturity level is defined with the following symbol: (X).

## 5.1 Drivers

The table below outlines some of the drivers found in the case studies.

**Table 21 - DGM of drivers in case studies**

| Drivers | 1 e-Government | 2 Open | 3 Data-Centric | 4 Fully Transformed | 5 Smart |
|---|---|---|---|---|---|
| Case 1: FI | X | X | X | | |
| Case 2: ES | X | X | X | | |
| Case 3: IT | | X | X | | |
| Case 4: UK | | X | X | (X) | |
| Case 5: BE | X | | | | |
| Case 6: PL | | X | X | | |
| Case 7: EU | X | X | X | X | |

***Description:***

- Openness and citizen value are almost always cited as drivers for transformation (all except BE).
- One case (BE) focuses on efficiency only, because this is the chosen model of the cross-roads bank for data exchange, to enable the once only principle, enhancing efficiency of information exchange within and with government.
- Compliance and efficiency are not always drivers for digital government, citizen value and openness are strong enough drivers for transformation (IT, UK, PL).
- Some cases are driven by insight-driven transformation, level 4 of maturity; these cases focus on leveraging data for transformation of their services (UK, EU), and building on the drivers of openness and citizen value.

## 5.2 Service model

**Table 22 - DGM of service models in case studies**

| Drivers | 1 e-Government | 2 Open | 3 Data-Centric | 4 Fully Transformed | 5 Smart |
|---|---|---|---|---|---|
| **Service model** | **Reactive** | **Intermediated** | **Proactive** | **Embedded** | **Predictive** |
| Case 1: FI | | | X | | |
| Case 2: ES | X | X | * | | |
| Case 3: IT | | X | * | | |
| Case 4: UK | | X (X) | X | | |
| Case 5: BE | X | | | | |
| Case 6: PL | X | X | | | |
| Case 7: EU | X | | X | | |

* Pilots only

### *Description:*

- Digital transformation initiatives focus as much on reactive service models (ES, BE, PL, EU) as on intermediated ones (ES, IT, UK, PL), or to a lesser extent, on proactive ones (FI, UK, EU).
- Initiatives combine multiple service models. Reactive service models are associated with intermediated or proactive ones. The exception is the case of a simple reactive model, where the scope of the initiative is to provide the data infrastructure for other initiatives to transform, by leveraging on it (BE).
- Proactive service models are diverse: automation as in pre-filling (FI), use of analytics to support operations (EU) and proactive provision of transport information (UK)
- Intermediated service models are sometimes designed in the initiative: the goal is to provide the building blocks (IT) or the open data (UK) to be reused by third parties to deliver services. In another case, a third party creates the intermediated service because the initiative shares its data (PL). Another case highlights the use of third-party apps for user-friendly presentation of health data (ES).
- There are no cases with embedded or predictive service models, but we cannot conclude anything about that at a larger scale.

## 5.3 Digital system

**Table 23 - DGM of digital systems in case studies**

| Drivers | 1 e-Government | 2 Open | 3 Data-Centric | 4 Fully Transformed | 5 Smart |
|---|---|---|---|---|---|
| **Digital system** | **IT-centric** | **Citizen-centric** | **Data-centric** | **Thing-Centric** | **Ecosystem-centric** |
| Case 1: FI | | | X | | |
| Case 2: ES | X | X | X | | |
| Case 3: IT | | X | X | X | |
| Case 4: UK | | | X | | (X) |
| Case 5: BE | X | X | | | |
| Case 6: PL | X | X | | | |
| Case 7: EU | X | | X | | |

### *Description:*

- Initiatives usually combine different digital systems, with the only exception (FI) of a data centric system, which is a COTS[40] into which all data is entered following diverse procedures.
- All types of digital systems are used, data-centric systems dominate the system landscape, followed closely by IT-centric and citizen-centric systems.
- One case study (IT) refers to a thing-centric system, which is work in progress: the aim is to leverage a data and analytics framework to enable public services to reuse data from things.
- One case study (UK) refers to an ecosystem-centric system. While the Department for Transport initiative on open data is focused on the data-centric system with a metadata repository, private partners reuse this data to create services which are developed around an ecosystem-centric platform, focusing on leveraging ecosystem relationships. The level of maturity related to achievements by the private sector is represented with the following symbol in the table: “(X)”.
- Private sector in service co-creation, as they take the lead in providing the services building on the data from the public sector.

[40] Customized off-the-shelf

## 5.4 Ecosystems and users

**Table 24 - DGM of ecosystems in case studies**

| | 1 e-Government | 2 Open | 3 Data-Centric | 4 Fully Transformed | 5 Smart |
|---|---|---|---|---|---|
| **Ecosystem and users** | **Government-centric** | **Service co-creation** | **Aware** | **Engaged** | **Evolving** |
| Case 1: FI | | | X | | |
| Case 2: ES | X | * | | | |
| Case 3: IT | | X | | | |
| Case 4: UK | | X (X) | | (X) | |
| Case 5: BE | X | | | | |
| Case 6: PL | X | X | X | | |
| Case 7: EU | X | | X | | |

* Pilots only

### *Description:*

- Initiatives involve their ecosystem with different levels of maturity, except for the highest level which refers to the evolving ecosystem.
- Initiatives do not always combine different ecosystems levels; 4 initiatives (FI, ES, IT, BE) focus only on one ecosystem level.
- Government-centric, service-co-creation and aware ecosystem approaches dominate the case study landscape, with a slight preference for the government-centric ecosystem.
- Government-centric ecosystems usually (ES, PL, BE, EU) use interoperability activities and the development or use of common standards as a way to develop or liaise with the ecosystem.
- Service co-creation is done in various ways; some reach out to the open source community for service co-creation (IT), with higher levels of success than initially estimated. Another case (UK) illustrates the strong role of the private sector in service co-creation, as they also providing services building on the data from the public sector. This is illustrated by the following symbol in the table "(X)". The public sector provides the open data services.
- "Aware", level 3 of the ecosystem maturity, is illustrated through different approaches in the case studies. For example, one approach (PL) involves the wider ecosystem when defining the smart city strategy.
- One case study (UK) refers to an engaged ecosystem. While the Department for Transport initiative on open data is focused on the service co-creation ecosystem, private partners ensure an engaged ecosystem around their co-created services.

## 5.5 Technology focus

**Table 25 - DGM of technology focus in case studies**

| | 1 e-Government | 2 Open | 3 Data-Centric | 4 Fully Transformed | 5 Smart |
|---|---|---|---|---|---|
| **Technology focus** | **SOA** | **API enabled architecture** | **Open any data** | **Things as data** | **Intelligence** |
| Case 1: FI | | | X | | |
| Case 2: ES | X | X | | | |
| Case 3: IT | | X | X | X | |
| Case 4: UK | | X | X (X) | | |
| Case 5: BE | X | | | | |
| Case 6: PL | X | | | | |
| Case 7: EU | X | X | X | | |

### *Description:*

- Initiatives place their focus technology at all levels of maturity except for the level 5 “Intelligence”.
- SOA, API architecture and Open Any Data approaches dominate equally the case study landscape.
- SOA approaches leverage interoperability initiatives (BE, ES, EC).
- Some API architecture approaches are carried out under the same initiatives and the SOA ones (ES, EU). API architectures are envisioned by all (ES, IT, UK, PL - pilot ; EU) except for one case (FI) which used a COTS system in which all data is transferred and one case (BE) which focuses on its mandate of a cross-roads bank of data exchange from base registries.
- An “open any data” approach (UK) had a dedicated governance board to manage the opening of data from the private sector. The opening of data coming from the private sector is represented with the following symbol in the table: (X).
- There is one “things as data” approach (IT) which is work in progress; it is part of the data and analytics framework which aims to supporting agencies in sharing data and co-create joint analysis using big-data and machine learning models.

## 5.6 Leadership

**Table 26 - DGM of leadership in case studies**

| | 1 e-Government | 2 Open | 3 Data-Centric | 4 Fully Transformed | 5 Smart |
|---|---|---|---|---|---|
| **Leadership** | **Technology** | **Data** | **Business** | **Information** | **Innovation** |
| Case 1: FI | | | X | X | |
| Case 2: ES | X | | X | | |
| Case 3: IT | X | X | | | |
| Case 4: UK | | | X | (X) | (X) |
| Case 5: BE | X | X | X | | |
| Case 6: PL | X | | X | X | |
| Case 7: EU | X | | X | | |

### *Description:*

- Initiatives show all types and very varied types of leadership. Business is seen most often as leader in the case study landscape, followed by technology and information. Data and innovation are seen respectively twice and once.
- All case studies show combined leadership, with 2 or 3 leaders.
- Business leadership is often supported by political leadership.
- In the case (IT) where business is not leading, both technology and data are leading because technology is a gap to be filled due to lack of CIOs in the various agencies impacted by the initiative, and data drives the innovation.
- Information leadership (level 4 of the maturity model) is approached in various ways. One case (FI) describes that a merge of IT and business teams lead the transformation programme. Another case (UK) describes even reaching innovation leadership by involving the public sector and the private sector to share the roles of leadership: government opens the data leveraging business knowledge and the private sector (referenced by the symbol (X) in the table) innovates on information derived from data.
- Innovation leadership is reached in one case (UK), where we observe that business/policy drives the open data initiative of the government in transport, and the private sector focuses on information and innovation in the provision of services.

*Note*: Due to the diversity in leadership in all the cases, and the lack of conclusions thereof, we have analysed further if there was a link between the maturity level of leadership and the overall maturity of the initiative and the answer was that there is no link in general.

## 5.7 Key metrics

**Table 27 - DGM of Key metrics in case studies**

| | 1 e-Government | 2 Open | 3 Data-Centric | 4 Fully Transformed | 5 Smart |
|---|---|---|---|---|---|
| **Key metrics** | **% Services online** | **No. open datasets** | **No. data-driven services** | **% new/retired services** | **No. new models** |
| Case 1: FI | | | X | | |
| Case 2: ES | | | X | | |
| Case 3: IT | | | | | |
| Case 4: UK | | X | | | |
| Case 5: BE | X | | X | | |
| Case 6: PL | X | X | X | | |
| Case 7: EU | X | X | X | | |

### *Description:*

- Initiatives can measure the metrics of the first three levels of maturity. No case illustrates the measurement of key metrics relating to new and retired services, or to new models.

## 5.8 Mapping of maturity trends to the service model maturity

This section explores the link between the level of maturity of the service model and the level of maturity of the following other themes: Digital System, Ecosystem and Technology Focus. The aim is to understand if there are hindering factors to the implementation of new service models, whether technology or digital systems are key enablers of maturity of service models.

The table below presents the mapping of these four themes for all the case studies, with the level of maturity reached referenced (e.g.: “proactive”).

**Table 28 - Mapping of maturity trends to the service model maturity**

| | 1 e-Government | 2 Open | 3 Data-Centric | 4 Fully Transformed | 5 Smart |
|---|---|---|---|---|---|
| Case 1: FI | | | | | |
| **Service model** | | | Proactive | | |
| **System** | | | Data-centric | | |
| **Ecosystem** | | | Aware | | |
| **Technology** | | | Open any data | | |
| Case 2: ES | | | | | |
| **Service model** | Reactive | Intermediated | Proactive* | | |
| **System** | IT-centric | Citizen-centric | Data-centric | | |
| **Ecosystem** | Government-centric | Service co-creation* | | | |
| **Technology** | SOA | API architecture | | | |
| Case 3: IT | | | | | |
| **Service model** | | Intermediated | Proactive* | | |
| **System** | | Citizen-centric | Data-centric | Thing-Centric | |
| **Ecosystem** | | Service co-creation | | | |
| **Technology** | | API architecture | Open any data | Things as data | |
| Case 4: UK | | | | | |
| **Service model** | | Intermediated | Proactive | | |
| **System** | | | Data-centric | | Ecosystem-centric |
| **Ecosystem** | | Service co-creation | | Engaged | |
| **Technology** | | API architecture | Open any data | | |
| Case 5: BE | | | | | |
| **Service model** | Reactive | | | | |
| **System** | IT-centric | Citizen-centric | | | |
| **Ecosystem** | Government-centric | | | | |

| | | | | | |
|---|---|---|---|---|---|
| **Technology** | SOA | | | | |
| Case 6:PL | | | | | |
| **Service model** | Reactive | Intermediated | | | |
| **System** | IT-centric | Citizen-centric | | | |
| **Ecosystem** | Government-centric | Service co-creation | Aware | | |
| **Technology** | SOA | API architecture* | | | |
| Case 7: EU | | | | | |
| **Service model** | Reactive | | Proactive | | |
| **System** | IT-centric | | Data-centric | | |
| **Ecosystem** | Government-centric | | Aware | | |
| **Technology** | SOA | API architecture | Open any data | | |

* Pilots only

The analysis of the mapping shows that, as expected, the level of maturity of the service model is never higher than the level of maturity of the digital systems, the ecosystems or the technology focus.

We can observe that the level of maturity of the Digital System is often higher (ES, IT, UK, BE) than the service model. This is not the case for the ecosystem or the technology focus. One case (PL) explains that we can have an intermediated service model, a co-creation ecosystem, without technology focusing on APIs, but it is not scalable. Technology is an enabler which needs to be invested in.

Another observation is that the cases do not show very different levels of maturity for each of their themes. There are exceptions for three cases, these are highlighted in green in the table.

The example of the UK case, with a service model at level 3, shows a very high maturity for the ecosystem (level 4) and for the digital system (level 5). The investment in the ecosystem and the digital system are made by the private sector, which also delivers along the proactive service model. The Government initiative focuses on opening any data and on providing the data-centric system. The example of the IT case, with a service model at level 2 (piloting at level 3), sees its digital system and its technology focus reaching level 4. This is linked to the data and analytics framework which aims to support the agencies in developing public services which make use of data and analytics. The example of the PL case shows that the ecosystem maturity level is above the others, at “aware” stage. This is because the city involves the wider ecosystem in defining the smart city strategy, prior to the implementation of the services.

# 6. Overall conclusions

Although the case studies were limited in number and the selection criteria were specific, their analysis provided strong insight in trends in Digital Government.

We illustrated Digital Transformation of Government with the case studies and we learned from them:

- The importance of the context of a Digital Transformation Initiative: the outcomes of an initiative are influenced by the political, organisational, technical opportunities and threats
- The drivers and the link with the key motivations of Digital Transformation
- The relation between the different themes – and their levels of maturity - used in the proposed Framework to qualify this transformation

This section:

- Provides references in the report to the answers to the research questions presented in the introduction and answered throughout the document
- Highlights the conclusions and lessons learned from the study

## 6.1 References to the research questions

This section maps where each research question of the study is addressed and answered.

- How is Digital Government defined? Reference: section **Error! Reference source not found.**
- What is the difference between Digital Government and e-Government? Reference: section **Error! Reference source not found.**
- What are the different levels of Maturity of Digital Government for an organisation? What are the key themes used to qualify them? Reference: section **Error! Reference source not found.**
- What are the existing Digital Government frameworks and how do they compare? Reference: section **Error! Reference source not found.**
- Can we illustrate Digital Transformation of Government with case studies and what can we learn from them? Reference: section 4.1
- What are the key contextual elements which influence or impact a Digital Government Transformation initiative? Reference: section 4.1

### *Conclusions and lessons learned*

This section presents conclusions and proposed areas for further research, based on the findings of the case studies.

### *The challenges of change*

Transformation means change and has its challenges. The case studies highlighted the weaknesses and threats of the initiatives, many are related to managing change and/or lack of buy-in for the new model.

### *Conclusion 1*

Transformation comes with its technical challenges and adequate skills need to be leveraged. To secure **appropriate technology** and related **skill sets**, adequate **procurement models** should be applied.

Traditional contracting with a limited set of contractors over a long period of time does not allow for flexibility in technology, adjustment to change is very challenging in these conditions of set requirements and waterfall models.

Agile approaches should be favoured when needed. This would also allow **piloting new technologies** with a potential of disruption and cater in advance for **managing obsolescence** of technologies in use.

### *Conclusion 2*

**Managing legacy** is also part of the technical challenges of change. This should not be overlooked when transformation happens.

### *Conclusion 3*

**Managing change** itself should not be underestimated, and should be a rather large part of an implementation project. It should include the future potential ecosystem.

The initiative should **leverage quick wins and visible benefits** to create traction.

The **complete ecosystem** should be on board; there are many ways to ensure that, such as including the future potential partners in the definition of the strategy of transformation, or defining a common standard for data exchange with the complete ecosystem.

### *Conclusion 4*

**Change management** is seen as a weakness in several case studies and in some cases as a threat when change is not happening, hindering the potential for transformation.

Factors could be linked to mistakes in the **definition of requirements** of the new system, such as lack of scalability. Transformation is linked to exploration of untrodden paths. This means overcoming the challenge of securing adequate skillsets, but also solving new issues such as privacy and data-sharing.

The culture for change in the public sector is lacking, and the current hierarchical organisation of governments may impede the potential for transformation.

*Note:* As an outcome of the analysis of the OECD framework in this study (see section 3.2), we proposed to add in the definition of digital government the notion of capacity building to accompany the digital transformation, which would include efficient project management and procurement of technologies.

## *The reasons and means of transformation: Drivers, key motivations and leadership of digital transformation initiatives*

### *Conclusion 1*

Motivations for digital government are multiple and varied. Efficiency is enacted in many ways, from cost savings including administrative burden reduction to improved operations through automation.

Efficiency is transformed into citizens' value when service improvements answer needs and are citizen-centred, and when public governance includes citizen opinions.

Transparency is mentioned in the case studies, relating to reporting on legal compliance of processes, or - relating also to openness - having access to data, either to build the citizen-centric services or to have an overview of all relevant data in various circumstances (access to all transport data, to all information about a city in an integrated manner, etc.). Accessing this data implies the need for interaction between data provider and data user, and elements of negotiation of the supply and demand of data, as for example when the data is owned by the private sector.

Insight-driven transformation leverages data and analytics to explore innovative ways of reaching high citizen value and highly efficient operations.

### *Conclusion 2*

Digital transformation of government is led by combined teams which usually include business, involving high management and political support.

Governments which aim to reach high levels of transformation maturity need to build leadership through tightly coupled teams including business, IT and data owners, creating a joint team leading innovation.

## *Service model, digital systems and technology focus*

### *Conclusion 1*

There is potential for maturity development of the service model, based on the investments in the digital systems that the public administrations have made. However, maturity is possible only if there is also investment in technology such as APIs and in the ecosystem.

### *Conclusion 2*

Digital government is delivered through multiple service models, which are the following: reactive, intermediates and proactive, reaching the level 3 "data centric" of maturity. There is a potential for reaching further maturity by developing embedded and predictive models, leveraging the existing service models.

### *Conclusion 3*

Digital government is supported by multiple types of digital systems, mostly focusing on IT, citizen- and data-centricity. There is a potential for reaching higher levels of maturity by leveraging thing- and ecosystem-centric types of platforms.

### *Conclusion 4*

Digital government is enabled by engaging various ecosystems in different ways, leading to various levels of maturity. Government-centric ecosystems leverage interoperability standards or frameworks. Open source communities and the private sector are engaged in service and solution co-creation models.

### *Conclusion 5*

Digital government is enabled by engaging various technology foci, leading to various levels of maturity. While SOA and API architectures are well understood and leverage interoperability initiatives, some API efforts still need to overcome privacy and security needs. The case studies have not illustrated “Things as data” and “Intelligence” approaches. Governments, which aim to reach high levels of transformation maturity, pilot early-on initiatives which leverage technology focusing on “things as data” and “intelligence”.

## *The roles of policy and interoperability in transformation initiatives*

### *Conclusion 1*

Initiatives leverage policy opportunities, whether they are at the root of the initiative or when they ease its implementation, such as the INSPIRE Directive for spatial data-sharing and its interoperability requirements. Open data policies or strategies at country or region level are also mentioned. Interoperability and standards are often mentioned as strengths and related policies as opportunities leading to success.

### *Conclusion 2*

The OECD and EC initiatives relating to Digital Government, such as the EIF or the Vision for public services, are coherent with the Transformation Framework until level 3. Some initiatives focus on monitoring and can be used to monitor uptake of some themes of the Transformation Framework up to level 5.

## *Citizen participation insight*

This section highlights findings of this study related to citizen participation. Whereas it does not relate to a research question of the study, citizen participation is relevant in the light of understanding how to engage the ecosystem in digital transformation of government.

A specific measurement of e-participation is made by the United Nations. The e-participation index (EPI) is derived as a supplementary index to the UN E-Government Survey. It extends the dimension of the Survey by focusing on the use of online services to facilitate provision of information by governments to citizens (“e-information sharing”), interaction with stakeholders (“e-consultation”) and engagement in decision-making processes (“e-decision-making”).

Citizen value is a key motivation for transformation, as found in one case study – the city of Kielce - which reflects the need for **better participation from the citizens**. The new smart city platform (http://idea.kielce.eu/konsultacje/) offers functionality for citizens to comment on budget prioritization, there is a space for public consultation. The platform presents all relevant information related to the public consultation and provides details on the means for collecting feedback. As an example, the explanations from the website are the following: “*those interested may submit comments to the draft of the above-mentioned plan as well*

*as comments and conclusions to the forecast of the impact on the environment. Comments and applications should be submitted to the Mayor of Kielce in writing, verbally for or by means of electronic communication to the following address: zofia.biel@um.kielce.pl and using the geoportal www.gis.kielce.eu*".

### *Conclusion 1*

Participatory activities with citizens are relevant to the digital transformation as government, especially where citizen groups should be recognised as actors in ecosystems. Further work could explore the specific models and modes of participatory democracy in theory and practice that would engage with the data and service-related aspects reported above, in line with key principles such as user-centricity and the once-only principle.

# 7. Overall conclusion

This study has analysed existing frameworks and definitions of digital government and digital transformation of government in the light of a proposed Framework for Transformation and a related definition for Digital Government. This Framework consists in five levels of transformation, from e-government to a fully transformed and smart government. Each level is qualified by characteristics of seven themes, which include for example the drivers for transformation and the types of ecosystems.

The mapping of the different analysed frameworks against the Transformation Framework shows that they mostly relate to the levels one (e-government) and two (open-government), with some elements of level three (data-centric) of the Transformation Framework. The gaps identified relate to the notion of capacity building (in project management and procurement) to accompany the digital transformation, which we propose to add to the definition of Digital Government. A second finding in the gaps relates to the enablers of transformation measured by the different frameworks: human capital, technical infrastructure or digital skills and uptake of technologies. Enablers relating to technology and skills are also referred to in the EU definition of e-government, together with organisational change to “strengthen support to public policies”.

The study illustrated Digital Transformation of Government with a series of case studies and we learned from them in several domains: (1) the importance of the context of a Digital Transformation Initiative: the outcomes of an initiative are influenced by the political, organisational and technical opportunities and threats; (2) the drivers and the link with the key motivations of Digital Transformation; (3) the relation between the different themes – and their levels of maturity - used in the proposed Framework to qualify this transformation.

Leveraging the lessons learned, the study drew three sets of conclusions.

The first one, the challenges of change, relate to managing change and setting the right path for transformation. This included, capacity building for change and adequate access to skills are key.

The second one, the reasons and means of transformation, considers drivers, where key motivations and leadership of digital transformation initiatives and the service model are related to digital systems and a technology focus. Key research points relate to researching the benefits of digital transformation and what is the role of the ecosystem, also from a social or policy perspective.

The third one, the roles of policy and interoperability in transformation initiatives, highlights the driving force of policies in transformation, and research points address how policy opportunities can support the higher levels of transformation.

# Glossary

**Table 29 - Glossary Table Digital Government**

| Term (Acronym) | Definition/Description |
|---|---|
| Application Programming Interface (API) | A set of functions and procedures that allow the creation of applications which access the features or data of an operating system, application, or other service. |
| Data analytics system | This technology capability contains information management, analytical and artificial intelligence (AI) capabilities. Data management programs and analytical applications fuel data-driven decision making, and algorithms automate discovery and action in the context of Digital Platforms. |
| Digital government | Leverages advances in technologies and relies on the use and reuse of data and analytics to simplify (digital as well as offline) transactions for end users (citizens, businesses and government agencies). It creates information from data to support and enhance decision making of government, businesses and citizens, and it fosters the creation of new, collaborative and more efficient service delivery models. In the process, underlying service models are redesigned and re-engineered to improve mission effectiveness and efficiency, to achieve optimised outcomes, such as transparency and openness, long-range cost savings, better governance and better quality of life for citizens. |
| Digital transformation | The change process associated with the application of digital technology in all aspects of human society. |
| Digital System | A digital system is a set of cross-cutting, integrated, horizontal technology capabilities that enable platform business models (see Report on Digital Platform Benchmark). Those capabilities, described through the lens of applications and business capability components, coordinate business services across multiple domains such as user experience, ecosystem, Internet of Things, IT systems and data analytics<br><br>A digital system is composed of five distinct systems: IT-centric systems, citizen-centric systems, data-centric systems, things-centric systems and ecosystems-centric systems and data use/intelligence. While all five can be embedded at different levels of transformation depending on an agency's mission, each transformation level tends to emphasize a different area. |

| | |
|---|---|
| Drivers | At different levels of maturity, government organisations pursue a range of priorities based on short- and long-range political priorities or regional business drivers.<br><br>E-government drivers mostly focus on compliance with existing objectives as well as showing improvements in operational efficiency through online channels. This is complemented by drivers of openness, transparency, constituent value delivery in later stages of maturity. In the final stages of maturity, governments pursue an insight-driven transformation in support of sustainable policy development as well as sustainable service delivery. |
| Ecosystem and users | An ecosystem is an interdependent group of stakeholders (people, business and things) sharing a networked marketplace where multiple forms of value are exchanged to achieve a mutually beneficial purpose. It enables various parties to expose their capabilities to others in order to achieve higher-level business value and outcomes.<br><br>Due to their nature, governments have been operating internal government-sector ecosystems for delivering better public services to their users (citizens, business, other governments) for the last decade. In the advent of digital government transformation, more emphasis will be put on engaging with suppliers, partners and intermediaries to co-create new public-private services and engage users in the design and implementation to further evolve services. An example of an ecosystem is the engaged developers from the open source community which create new services delivered on their apps reusing open data from the government. |
| Ecosystem systems | Ecosystem systems are one of the digital systems. They support the creation of, and connection to, external ecosystems, marketplaces and communities. API management, control and security are main supporting capabilities. |

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# 9. Appendix I – Digital Government Transformation Framework

| Drivers / Level | At different levels of maturity, government organisations pursue a range of priorities based on short- and long-range political priorities and business drivers. | | | | |
|---|---|---|---|---|---|
| | e-Government | Open | Data-Centric | Fully Transformed | Smart |
| | **01** | **02** | **03** | **04** | **05** |
| **Drivers** | Compliance, efficiency | Transparency and openness | Citizen value | Insight-driven transformation | Self-defining |
| Please select: | | | | | |
| Assessment guidance | The organisation delivers services through online channels to meet basic efficiency objectives. | The organisation evolves objectives to focus on opening data sources for third parties to leverage. | The organisation and third parties deliver data-based services to users. | The organisation's business and IT leaders decisively pursue a 'transformation' of services systematically and at a larger scale based on lessons learned (success) of level 3. | Transformation gives way to the new normal, i.e. sustained continuous improvement of digital services. |
| Please explain choice | | | | | |

| Service Model | Government services can be delivered through a combination of government and nongovernment channels as well as with varying balances between reactive services (that is, responding to an explicit request by the constituent) and proactive services (that is, triggered automatically when an event occurs or a certain pattern is recognized). | | | | |
|---|---|---|---|---|---|
| Level | e-Government | Open | Data-Centric | Fully Transformed | Smart |
| | **01** | **02** | **03** | **04** | **05** |
| **Service** | Reactive | Intermediated | Proactive | Embedded | Predictive |
| Please select: | | | | | |
| Assessment guidance | Services are delivered at the user's request. Access is through a portal and government apps. There remains a significant reliance on maintaining physical offices and human service agents to provide assistance for citizens trying to navigate government programs and forms.- | Services can be accessed through aggregators and intermediaries, such as citizen-developed dashboards or third-party apps fuelled by open data and initiated by start-ups or developers through hackathons. The focus turns external, towards academics, reports and citizen data scientists. | A more intense use of data allows government agencies to become more proactive.<br>Examples include:<br>- tax advice coming from tax agencies that have a real-time view of a taxpayer's situation<br>- preventative healthcare using data from environmental monitoring<br>- better management of emergency situations based on data coming from multiple | Services are available through a variety of channels, including non-government ones. Government services will be embedded into personal services that constituents receive from a commercial service provider and into a variety of devices, vehicles and infrastructure around citizens. Example include: - triggering a social worker intervention to assist a person | Services and interactions will take place through a variety of touch points. The pace of interaction is driven by the ability of government to anticipate a need or prevent an incident. |
| Please explain choice | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| **Digital System** | Digital systems are typically composed of up to five technology systems:<br>• Information systems — Supports the back office and operations, such as ERP and core systems.<br>• Customer experience systems — Contains the main customer-facing elements, such as customer and citizen portals, multichannel commerce and customer apps.<br>• Intelligence (data and analytics) systems — Contains information management and analytical capabilities. Data management programs and analytical applications fuel data-driven decision making, and algorithms automate discovery and action.<br>• IoT systems — Connects physical assets for monitoring, optimization, control and monetization. Capabilities include connectivity, analytics and integration with core and OT systems.<br>• Ecosystems systems — Supports the creation of, and connection to, external ecosystems, marketplaces and communities. API management, control and security are its main elements. | | | | |
| **Level** | e-Government | Open | Data-Centric | Fully Transformed | Smart |
| | **01** | **02** | **03** | **04** | **05** |
| **Digital** | IT-centric | Citizen-centric | Data-centric | Thing-Centric | Ecosystem-centric |
| Please select: | | | | | |
| Assessment guidance | The system is IT centric, comprising for example employee collaboration, back-office systems, core mission-critical applications, citizen portals and apps, and — in selected domains, such as defence, public safety or | Customer portals become more mature, with an interest in social networks. The use of open data is mostly restricted to external consumption. | Reuse of data becomes predominant. Focus moves to data analytics. Web APIs built around open data support access rights and identity management. | Consumption of data from things increases. Digital systems focus on connectivity to things (such as body cams for police officers, GPS on taxis or remote locks on shared bikes) and on IoT analytics. | Services and operations are dynamically reconfigured to adapt to a shift in conditions and priorities. API management software deals with a huge variety of APIs (facing constituents, suppliers and partners) and with both |
| Please explain choice | | | | | |

| Ecosystem and users | Service delivery implies different degrees of reliance on suppliers, partners and intermediaries. The nature, role and engagement with these parties varies across the levels of maturity. | | | | |
|---|---|---|---|---|---|
| Level | e-Government | Open | Data-Centric | Fully Transformed | Smart |
| | **01** | **02** | **03** | **04** | **05** |
| **Ecosystem** | Government-centric | Service co-creation | Aware | Engaged | Evolving |
| Please select: | | | | | |
| Assessment guidance | The ecosystem is mainly composed of other agencies in the same government sector or across sectors, with which service and data integration is required to better achieve program objectives or improve delivery. Agencies have established and enforced effective interoperability frameworks and/or used cross-agency enterprise architecture | At this stage, the ecosystem is geared toward external communities that can help leverage or benefit from standardized and well-formed open public data. User and supplier of data are clearly identified | At this level, the agencies start to understand the complexity of the ecosystems in which it operates, the agencies' objectives and the roles of the various participants. | At this stage, the ecosystem is geared toward external communities that can help leverage or benefit from standardized and well-formed open public data. User and supplier of data are clearly identified. | At this level, the agencies start to understand the complexity of the ecosystems in which it operates, the agencies' objectives and the roles of the various participants. |
| Please explain choice | | | | | |

| **Technology focus** | Several technologies contribute to digital transformation, but at each stage of maturity some require greater focus and adequate skills to succeed. | | | | |
|---|---|---|---|---|---|
| **Maturity Level** | e-Government | Open | Data-Centric | Fully Transformed | Smart |
| | **01** | **02** | **03** | **04** | **05** |
| **Technology** | Service Oriented Architecture | API enabled architecture | Open any data | Things as data | Intelligence |
| Please select: | | | | | |
| Assessment guidance | The most important architectural focus is to build an SOA that facilitates the integration of services across agencies and makes the government portal richer in functionality. | Mastering open data principles and technologies is essential at this stage. The main focus is on developing and managing APIs that support access to open data. | The organization is starting to apply the same principles from the previous level to business data which is not meant for public consumption. The use of open data powers the development of innovative business apps and more effective analytics to support decision making. | The ability to assemble data and service elements from multiple source to support transformation will require the use of mesh app and service architecture (MASA). This encapsulates services and exposes APIs at multiple levels and across organizational boundaries, balancing the demand for agility and scalability of services with composition and | AI and advanced machine learning become essential to deal with high volumes of data to understand, learn, predict and adapt, using them to act in ways that weren't explicitly programmed. This enables machines to start acting autonomously. Data science is evolving, moving into predictive analytics and these new learning systems. |
| Please explain choice | | | | | |

| Leadership | While collaboration between the technology (typically the IT department) and the business owners (typically, the service owner) remains at the core of successful transformation, the key roles in accomplishing progress in digital transformation vary at different levels. | | | | |
|---|---|---|---|---|---|
| Level | e-Government | Open | Data-Centric | Fully Transformed | Smart |
| | **01** | **02** | **03** | **04** | **05** |
| **Leadership** | Technology | Data | Business | Information | Innovation |
| Please select: | | | X | | |
| Assessment guidance | The strategy implementation is driven by technology. | As business owners do not yet buy into the transformative role of technology, the responsibility of open government programs is assigned to special roles like chief data officer | It is up to business owners take leadership for identifying innovative use of data. | The value of data and information is broadly recognized across the organisation. The CIO (or the new incarnation of this role) takes the lead on innovation | The CIO will be the organisation's chief transformation officer/chief innovation officer. They will make digital transformation business as usual and sustainable. |
| Please explain choice | | | | | |

| **Key Metrics** | The types of data measured changes according to the evolving objectives related to each level. | | | | |
|---|---|---|---|---|---|
| **Level** | e-Government | Open | Data-Centric | Fully Transformed | Smart |
| | **01** | **02** | **03** | **04** | **05** |
| **Key metrics** | % Services online | Number of open datasets | Number of data-driven services | % of new and retired services | Number of new delivery models |
| Please select: | | | | | |
| Assessment guidance | The percentage of services online, percentage of services accessible through mobile devices, percentage of integrated services, and electronic channel | The number of open public data per agency and the number of apps based on / reusing open data. | The number of new or transformed services based on shared business data, and the number of external players that build services on the open data. | The percentage of services eliminated, and the percentage of new services and their take up ratio. | The number of services replaced (or introduced) by improved data utilization. |
| Please explain choice | | | | | |