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Landscaping the monitoring of interoperability and digital transformation

Streamlining the monitoring of digital policies in the European Commission

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Content

Abstract

For over 20 years, several European digital policies have measured progress in the European Member States through monitoring activities such as benchmarking or maturity assessments. However, legal and technical requirements in the EU initiatives related to the government's digital transformation and interoperability require a holistic approach that integrates knowledge and reduces the administrative burden that its reporting entails to the essential minimum.

With this in mind, the study analyses the 'ecosystem' of indicators in several well-established EU monitoring activities involving digital public services, interoperability, digital rights and multi-level governance aspects. It also uncovers gaps and inefficiencies in the various stages of the monitoring exercise lifecycle.

The study reveals several areas for improvement, such as the need to improve monitoring asset documentation and their availability in timely and adequate formats to encourage their reuse. These actions can help streamline the monitoring efforts of the EU transitioning to a data-driven approach more aligned with the European digital decade and its 2030 targets.

Keywords

Monitoring, indicator, public sector, interoperability, digital transformation of government, digital government, Digital Decade, European digital policies, EIF, NIFO, DESI, eGovernment Benchmark, Berlin Declaration.

Foreword

The European Commission (EC) has put digital transformation at the heart of its policy agenda with its *Communication on Europe's Digital Compass*[1]. Digital technologies and innovation are critical in enabling access to a wide range of services. In this context, the EC is increasingly emphasising digital sovereignty. Europe is to develop its digital capacities and infrastructures rather than depending on others.

Additionally, the COVID-19 pandemic showed - more than ever - the importance of digital technologies to sustain governance processes and the need to innovate our institutional systems. As a response, digital transformation becomes a central pillar in the *Recovery and Resilience Facility*[2] (RRF) centrepiece of NextGenerationEU[3], designed to provide financial aid to MS to make the European economy more digital and consequently more resistant to future shocks.

The ongoing digital transition, and related challenges to achieve the targets set for *Europe's Digital Decade to 2030*[4], are well recognised in the European Union policies, especially by the *Europe Fit for the Digital Age*[5] priority of the European Commission, its revised *Digital Strategy*[6], and the ambitious agenda put forward by the *Recovery Plan for Europe*[7].

EC Joint Research Centre (JRC), the science and knowledge service of the European Commission with the mission to support EU policies with independent evidence throughout the whole policy cycle, plays a significant role in achieving all those priorities. Not alone, but by supporting and partnering with many policy Directorates-General (DGs).

One of those partnerships was established with Directorate-General for Informatics (DG DIGIT). The partnership has been developed over the last years through different programmes - mainly *ISA*[8] and *ISA²* [9] and several successful actions like *ARE3NA*[10], European Union Location Framework (*EULF)*[11] and European Location Interoperability Solutions for e-Government (*ELISE)*[12]. Their main goal was to support the development of digital solutions that enable public administrations, businesses and citizens in Europe to benefit from interoperable cross-border and cross-sector public services.

With the new generation programmes, DIGIT and JRC continue making essential contributions in supporting the abovementioned policies—particularly the priorities set out in the *Digital Europe Programme*[13] (DIGITAL). The recent strategic partnership between them focuses on interoperability and digital government policies. It aims to help drive the digital transition of public administrations and public governance processes across the EU. More specifically, it helps to advance the digitalisation of European public administrations focusing on four complementary objectives:

1. Strengthen the interoperability of public administrations in Europe
2. Support the monitoring of digital transformations in digital governance
3. Understanding and promoting the use of Artificial Intelligence (AI) and emerging technologies in the public sector
4. Assist in community building for digital governance in Europe.

The package of activities supporting those objectives is named *Innovative and Interoperable Public Administration and Service*s (I²PAS) and is financed under the *European Digital Government Ecosystem* (EDGES) Chapter of DIGITAL.

The current report is one of the research results under I²PAS. In particular, it contributes to objective 2. It supports *the monitoring of digital transformations in digital governance* by analysing the monitoring situation of digital transformation and interoperability policies in the EU with a special focus on the public sector. This work serves as preparation for the proposal for a monitoring scheme of the upcoming *Interoperable Europe Act*[14].

More related materials and the latest news about our work are available from the *innovative public governance section of the JRC's Science Hub*[15]. Results from the collaboration with DIGIT are also provided in a dedicated section on the *Joinup platform* [16].

Acknowledgements

The authors would like to thank all those who contributed to the study. In particular, we would like to thank colleagues from the Directorate General for Informatics (DG DIGIT) and Directorate General for Communication Networks, Content and Technology (DG CONNECT) for their time and dedication to the activity in outlining the background and plans for their monitoring activities, as well as their interest in potential common ways forward towards improved monitoring of interoperability and the digital transformation of government in Europe. In addition, we would like to thank the comments and reflections from colleagues in the JRC's T1 Unit *Digital Transformation and Data*, whose valuable inputs helped improve the report and provide insights into a range of ongoing activities, helping to make our content as up-to-date as possible. We want to thank our colleagues Miguel Álvarez, Ruben Narzul, Maria Leek, and Claudia Oliveira for their valuable inputs throughout the study and for giving us a complete picture of the developments in monitoring for the National Interoperability Framework Observatory (NIFO) and Berlin Declaration. Lastly, we would like to thank the Member State representatives working on digital monitoring for their input to the study, including those supporting the *Interoperability of the European Public Services* Expert Group, both through our interviews and by allowing us to be involved in their workshops and meetings, with special thanks to colleagues from Italy, France, Romania and Sweden. Their openness and sincerity have ensured that the study team is well-placed to engage with the priorities that stakeholders have identified and can take ownership of collectively in the future.

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Executive summary

In recent years, the European Commission (EC) has established several monitoring and reporting activities to measure progress in policies related to interoperability and the digital transformation of government. However, digital technologies and the policy demands that they create, evolve quickly, requiring monitoring to adapt to changes. The EC priority *A Europe fit the digital age* envisions a digital transformation based on *European Values*. This digital transformation will be guided by the *Digital Decade Policy Programme, which includes the Digital Rights and Principles Declaration* and the upcoming *Interoperable Europe Act*. Both policy initiatives will set up new governance and monitoring systems to help meet essential objectives. The analysis of the monitoring landscape's complexity and assessing how current monitoring fits into the emerging overarching strategy.

For their part, Member States (MS) representatives have already indicated that the monitoring obligations and their current governance represent an increasing challenge for them. It is, therefore, necessary to identify improvement areas for reducing administrative burden related to monitoring and reporting while looking to multiply the benefits of the knowledge gathered in the EC and within MS.

The study supplies an overview of current and future needs, including gaps and limited effectiveness. It also proposes ways to align and consolidate efforts using a collaborative governance approach. The work draws recommendations and action points to encourage synergies and simplify processes to decrease the burden on the MS while increasing the benefits of monitoring for all stakeholders – to the best extent possible.

Policy context

Interoperability has been part of EC policy since the *Interchange of Data between Administrations* (IDA) Programme in 1995, followed by a series of 5-year strategies and programmes to help enable e-government across borders and sectors in Europe today. EC's proposal of a legal act in November 2022 consolidates over 25 years of collaboration between the EC and MS experts in interoperability. At the same time, EC's information society policies have evolved, with *digital* being one of the high-level priorities of the current Commission. The latter includes digital considerations contributing to the economic policies of the European Semester and, of fundamental interest to this study, the framing of current digital policy under the Digital Decade 2030. The public sector is one of the main branches of activity in this policy area, alongside establishing a set of principles related to digital citizenship in the European Union (EU), including matters of key interest to public services and public sector policy.

Nowadays, there is a range of digital strategies, frameworks and initiatives, and good practices in policymaking under *Better Regulation* by monitoring the progress and uptake of their efforts. However, there seems to be limited collaboration between them, creating potential burdens on the MS stakeholders and inefficiencies in understanding the European digital landscape. With the upcoming Digital Decade 2030 policy implementation and the proposed Interoperable Europe Act, there is a unique window of opportunity to align monitoring.

Key conclusions

Digital monitoring in the public sector is in a good state. Collaborations are mature, but there is a favourable moment to explore alternative approaches to keep relevance and foster efficiencies to improve the collective understanding of the digital landscape for the public sector across Europe.

The EU policy landscape of monitoring interoperability in public administrations and the digital transformation of government is broad and detailed but with insufficient coordination. This situation has led to added reporting burdens and inefficiencies, resulting in requests from the MS to streamline and better organise monitoring and reporting.

The maturity of individual monitoring schemes led by the Directorate-General for Informatics (DG DIGIT) and the Directorate General for Communication Networks, Content and Technology (DG CONNECT) can be recognised by their regular engagement with stakeholders in the MS, including the periodic review of indicators and validation of outputs, often pointing to areas of improvement that would aid the MS in their digital developments, as well as their standing in the monitoring schemes' metrics.

The challenges in this context are both policy-related and technical, including the increasing amount of emerging digital policy relevant to the study's context, including local and regional developments and data-sharing contexts like dataspaces. Other stakeholders are also engaged in digital topics, such as the Directorate-General for Structural Reform Support (DG REFORM), considering this from the point-of-view of public sector

modernisation. Technology's pace of development is also a notable concern, where the current approaches are not agile enough to rapidly assess potential benefits and impacts, including for any policy response.

Methodologically, the approach to assessment is questioned by the EC and the MS, where issues of triangulation of results are emerging, as well as requests for a reduction of scope or increasing the priority of certain topics. In some cases, the items monitored are becoming redundant. The latter can be seen by leading MS having maximum achievable scores leading to a form of saturation in the results and an inability to move into new topics. In addition, monitoring schemes are used to assess technical and policy solution uptake for past priorities. Results are almost wholly achieved in all MS but are still being measured.

Such issues point to a need to adopt interoperable approaches to manage monitoring schemes' assets, including their documentation, metadata on their indicators and how data is exchanged and reused. Such an approach implies improved coordination between activities, including reviewing the scope of activities and the timing of data collection and delivery.

It is timely, therefore, to consider the methodological approaches needed to establish a minimised burden on stakeholders (e.g., increased re-use of existing data flows and the potential of automated monitoring approaches) while being able to assess progress on digital across MS' public sector actors and to consider the measurement of impacts and outcomes in digital policy.

Given *issues of trust* in the activities' results, it is important to adopt collaborative multi-stakeholder approaches. Piloting and co-creation should incrementally explore alternatives agilely, which should be a focus for the next phase of this work, including ensuring such an approach is sustainable based on the draft options presented in this report and any others that stakeholders would like to consider.

Related and future JRC work

This report marks a milestone in our work supporting the monitoring of digital transformation and interoperability in the public sector, outlining the landscape of monitoring digital policies, including the indicators, stakeholders and approaches involved. It provides an evidence base for wider discussion and an opportunity to confirm what the study has uncovered to date while preparing the ground for the next phase to dive deeper into those issues uncovered and examine how solutions can be developed. Importantly, the collaborative work with DG DIGIT, DG CONNECT, MS and other stakeholders takes steps to do this by acting as an arena for stakeholder engagement, including in collaborative processes and steps for the co-creation of monitoring activities that will remain fit-for-purpose in the context of the Digital Decade 2030 and potentially beyond.

The report also forms part of a series of activities in the JRC exploring interoperability and data-sharing in the public sector. The activity includes other specific work by the study team considering regulatory aspects and legal interoperability, support to the further development of semantic interoperability in public sector data-sharing. The work takes place in collaboration with activities exploring the adoption and diffusion of specific technologies in the public sector, including blockchain and Artificial Intelligence (AI), alongside work exploring the establishment of dataspaces and sandboxing for both technical and regulatory purposes. Although the focus of the study is very much positioned in terms of public sector processes and needs of administrations, citizens and businesses, the work also engages in those areas of digital where all actors meet, including those related to GovTech, digital innovation and the broader sphere of digital governance.

Quick guide

This report summarises our work in identifying and analysing existing monitoring approaches and proposing a way ahead.

Section 1 details the rationale, scope and objectives in the larger policy context of digital transformation of the public sector in the EU. A background, including a definition of monitoring and the underlying policy context, is presented in **Section 2**.

The current and continuously emerging landscape of relevant monitoring schemes is introduced in **Section 3**. This section also includes the selection of monitoring schemes investigated in more detail, namely the European Interoperability Framework (EIF) monitoring, Berlin Declaration monitoring, the Digital Economy and Society Index (DESI) and the eGovernment Benchmark (eGov).

Subsequently, **Section 4** provides a cornerstone of the first phase of this work on monitoring interoperability and digital transformation in the public sector. This section includes a detailed explanation of the selected monitoring approaches in terms of indicator documentation, to then concentrate on the content of the different

indicators. **Section 5** provides the results of interviews with key stakeholders from the EC and the first set of issues emerging from the MS.

Section 6 summarises the main burdens, benefits, and gaps found by the work based on stakeholder inputs and desk research.

Steps towards potential solutions are outlined in **Section 7**, reporting on additional evidence and some of the consultations already taking place with stakeholders.

Section 8 concludes this report with a summary of the work.

The findings presented in this document are the basis for the subsequent report entitled "*Identifying opportunities for streamlining European monitoring of digital policies*"[17], which provides strategic analysis, baseline, and recommendations for stakeholders to take forward in the subsequent phases.

1. Introduction

Over recent years, the EC has established different monitoring and reporting activities on digital government and digital transformation. These initiatives include, on the one hand, *the Digital Economy and Society Index*[18] (DESI) and *the eGovernment Benchmark*[19] (eGov), led by Directorate-General for Communications Networks, Content and Technology (DG CONNECT)[1], and on the other hand, the *European Interoperability Framework* (EIF) monitoring[20] and the Berlin Declaration monitoring[21] (BDM), led by Directorate-General for Informatics (DG DIGIT)[2] under their *National Interoperability Framework Observatory*[22] (NIFO). These monitoring schemes were developed to examine the progress in adopting and implementing digital policies across the European Union (EU).

As the EU policies evolve to accommodate new realities, the need to measure progress is also subject to change, as foreseen in the *EC's Better Regulation guidelines*[23]. New policies, with associated monitoring activities, are also in the making, including the *Digital Decade 2030 targets*[4], the *European Digital Rights and Principles*[24] and the *Local and Regional Digital Indicators for smart cities and regions* (LORDI).

Each of the above activities defines indicators that meet particular needs and collects data using different means at various times of the year. However, they all address facets of digital transformation and, to some extent, interoperability. Member States (MS) representatives have indicated that monitoring obligations can sometimes be challenging. They confirmed that there are areas for improvement to increase benefits from using the newly gathered information while reducing administrative burden. More specifically, MS have recognised the need for close work between the existing monitoring activities as stated in the Berlin Declaration 2022 report[25]:

> *"We therefore invite the forthcoming EU Council Presidencies to pick up and improve this work, again with the support of all MS and the European Commission - and in close alliance with other EU initiatives (e.g., DESI, eGovernment Benchmark, NIFO)"*
>
> Berlin Declaration foreword – 2022

The launch of both the *Digital Decade Policy Programme*[26] and the *Interoperable Europe Act*[14] proposal offers, at this precise moment, a unique window of opportunity to address the complexity of this monitoring *landscape*. Both initiatives will set up new monitoring systems, which will be key for meeting the EU-wide targets for 2030. While doing so, there must be enough flexibility to respond to evolving EU policy needs, ensuring that relevant stakeholders carefully consider, justify, transparent and endorse any changes (e.g., on indicators). DESI and the eGov will provide much of the assessment for progress on the Digital Decade's compass but not the essential enabling role of interoperability under the EIF. In addition, the Digital Decade's assessment of the European digital rights and principles follows and extends topics currently covered by the *Berlin Declaration on Digital Society and Value-based Digital Government*[27].

Specifically, concerning the Digital Decade, the Commission is developing Key Performance Indicators (KPIs) with MS to measure progress towards the 2030 digital goals and set trajectories at national and EU levels. The indicators will soon be enshrined in an implementing act. Initial outputs will be used in the first annual report on the *State of the Digital Decade*, scheduled for June 2023. Therefore, given current opportunities to align monitoring, there is also an urgency to conduct assessments that meet strategic policy objectives in the short term.

Moreover, *Interoperable Europe* was established to help foster the coordination and adoption of common standards for public services. Data flows to reinforce the EU government's Interoperability strategy, as defined in the Communication "*Shaping Europe's digital future*"[1]. The initiative is supported by the *Digital Europe Programme*[13] (DIGITAL). It builds on the previous efforts from ISA[2] Programme and the EIF, with its form having developed cross-sector and cross-border interoperable digital solutions and the latter specific guidance on how to set up interoperable digital public services. The final evaluation of these two programs provided inputs for shaping the Interoperability policy currently under development.

[1] DG CONNECT develops and implements policies to make Europe fit for the digital age

[2] DIGIT is the Commission department responsible for digital services that support other Commission departments and EU institutions in their daily work and that help public administrations in EU member countries.

1.1 Rationale

The political context we find ourselves in while writing this report is complex and rapidly changing. Added to this is the natural challenge of working around technologies and, specifically, the topic of digital transformation that is reinventing itself at a rapid pace.

The most crucial milestone in the current political context is the 2030 agenda of the European digital strategy, which aims to boost a Europe-wide digital transformation consistent with democratic European values. Concrete targets for 2030 revolving around the four cardinal points of the "*Digital Compass*" are discussed below.

However, the emergence of the Digital Decade should not overshadow existing initiatives such as the EIF, where for years, efforts have been put into increasing Interoperability between MS to ensure the rights of Europeans when interacting with governments across borders, wherever online public services are present.

Maintaining a relevant and suitable framework in such a changing socioeconomic context requires regular review, with the most recent in 2021. Its results can be found in the impact assessment evaluation document accompanying the proposal for the legal initiative *Interoperable digital public services – European Interoperability Framework evaluation & strategy*[28], aiming at strengthening interoperability to deliver better European digital public services. A further discussion of the policy context of this work is given below.

1.2 Objectives

Given the above, the DIGIT has launched a study with the support of the Commission's Joint Research Centre (JRC) to analyse the existing monitoring approaches, practices and indicators related to interoperability and the digital transformation of government. DG CONNECT is also actively involved in the discussions. This work originated from their need to keep BDM and EIF up-to-date and adapted to current needs. However, understanding the landscape and the characteristics of monitoring related to digital policies and interoperability can be seen to have two main objectives:

- On the one hand, to help evolve the EIF and BDM schemes through a better understanding of the benefits of reusing indicators from other EC schemes or third parties, gathering best practices, identifying opportunities for collaboration between different teams, ensuring the alignment of EIF and BDM with complementary European policies, to name a few. The former is especially relevant to prepare the ground for the potential approval of the proposed European Interoperable Act since it will require changes in the form and substance of monitoring in this context.
- On the other hand, it can sketch a picture of the general situation in European digitalisation initiatives by presenting the known inefficiencies to foster collaboration, helping reduce unnecessary burdens for both the EC and the MS. More importantly, this study is more than the present report. For its realisation, a notable stakeholder engagement effort was made to establish a stable communication channel with people from both the EC and MS involved in monitoring digital transformation.

Specifically, it addresses questions such as:

- *Which monitoring schemes and specific indicators address interoperability and digital transformation of government?*
- *What is the level of coherence of the monitoring schemes? What is their rationale, and what role do they play? What are the verified usages or advantages of the different monitoring schemes? What are the challenges?*
- *What are the gaps, overlaps and emerging opportunities in the monitoring landscape? How to ensure synergies and alignment across the monitoring needs for digital policies in the EU considering the new Interoperable Europe policy? How can the overall burden be reduced?*
- *How might the monitoring schemes be re-designed to fit future policy needs, reduce the burden, and provide actionable and useful results for the EC and the MS?*

Above all, this study can help underpin an administrative Interoperability exercise within the Commission in the first place to simplify internal processes, advocating then for the fundamental Interoperability principle set out by the EIF, such as *Administrative simplification*, by which,

"where possible, [it will be sought] to streamline and simplify administrative processes by improving them or eliminating anything that does not provide public value. Administrative simplification can help businesses and citizens to reduce the administrative burden of complying with EU legislation or national obligations."

Fighting for that end is a sign of Interoperability (Interoperability Platform) governance that:

"refers to decisions on interoperability frameworks, institutional arrangements, organisational structures, roles and responsibilities, policies, agreements and other aspects of ensuring and monitoring interoperability at national and EU levels."

For the monitoring of digital strategies to be successful, it must be considered a truly European public service for national benefit; therefore, it is important to promote inter-intra-organisational Interoperability, ensuring that Interoperability principles are applied in a way that monitoring schemes are "*interoperable by default.*"

The efforts of the study are driven by a two-fold approach, as shown in **Figure 1**, increasing the benefits and reducing the burdens for all stakeholders to increase public value when monitoring digital policies.

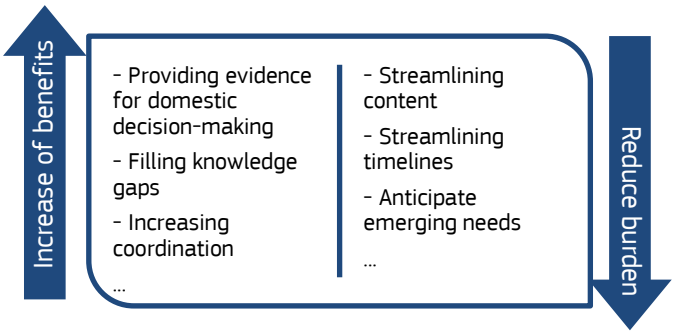


Figure 1: the two-fold way approach key features

The work did **NOT** include a cost-benefit analysis of the currently established monitoring schemes in its methodology (in the sense of any numerical estimate of the scale of the administrative burden in terms of time, money, human resources used etc.). However, a first qualitative approximation is partially available through personal interviews with representatives involved in the compilation, submission, and verification of national data. At the same time, the study continuously looks for such policy-relevant evidence from stakeholders.

1.3 Methodology

The study's approach, to date, has been to address the landscape of monitoring schemes as case studies. They are discrete activities with their assets, artefacts, documentation, and stakeholders, both within and outside the Commission. The study has involved qualitative research techniques such as document/website review, semi-structured interviews, and attending stakeholder workshops, occasionally as active participants. The list of interviews and workshops carried out are respectively in **Annex 10** and **Annex 11.**

Although the study has not adopted an ethnographic approach, steps have been made, especially through the interviews and workshops, to take a position as a trusted, neutral advisor to build relationships with stakeholders. The approach should allow further collaboration in addressing the issues this initial part of the study is uncovering. A substantial part of the work has been examining documentation on monitoring to create an overview of the landscape.

An initial analysis of the material led us to explore the monitoring schemes in greater detail, engaging with the actual monitoring indicators to uncover overlaps and inefficiencies. This aim was extended when it became apparent that there were already a series of data-sharing activities between key initiatives, leading to a more quantitative and *ecological approach* in mapping out the relationships between the indicators, their related topics and evolving scope of each initiative.

The context of the work has also required us to consider the evolution and trajectory of monitoring Europe's digital policies concerning the public sector. While some work is presented in the report, it should be acknowledged that policymaking in this context and monitoring is likely to increase, including in specific technological spheres and as interest increases in local and regional developments in the digital transformation

of government. Regular internal meetings with key DIGIT and DG CONNECT staff have ensured that the study team could adjust investigations in line with current policy developments.

We have also had the chance to validate some of the work as it progressed with two key stakeholder meetings, firstly with the Commission Expert Group on Interoperability of European Public Services (in October 2022), and secondly with leaders through the Chief Information Officers (CIO) meeting (in November 2022). These events have allowed some of our findings to be scrutinised by stakeholders early in the study's development and to understand their willingness to engage further in the topic, both in terms of feedback on the study's scope and the chance to undertake in-depth interviews with representatives from France, Italy, Romania, and Sweden.

1.4 Challenges and limitations

The subject matter of this study is particularly challenging due to, for example, the considerable number of stakeholders involved, the fragmented competencies of the different EU policy units that have to fulfil their legal obligations and the rapid evolution of technology that requires revisions of several monitoring schemes.

One central challenge when analysing information from multiple sources is using different terminologies. For clarity and consistency in this report, we will be referring, unless necessary, to "*monitoring schemes*", and we will give preference to the word *indicator*. This terminology reflection is not trivial; a shared *conceptual model* of these fundamental aspects and how they fit together would help in the overall study's objective, something stakeholders have highlighted as missing beyond the core topic of monitoring European digital policy.

It is preferred to use the form "*indicator*" and not "*Key Performance Indicator*" or its acronym "*KPI*," as this would appear to cover other measurements that seem to be applied in different schemes. KPI is generally used in project management and business, where the name implies evaluating performance against predefined targets. Such targets are not always found in the analysed schemes or how policyholders may respond to varying performance levels. Therefore, strictly speaking, not all *indicators* are *KPIs*. It is worth noting, as well, that there are also OKR "*Objectives and Key Result"* indicators that may be more outcome-based that reflect areas to help achieve KPI targets. Such outcomes-based perspectives may be further addressed in the latter phases of the study.

Although the terms "*index,"* "*observatory,"* and "*scoreboards"* are used more or less as equivalents to refer to exercises to monitor the progress of initiatives, they have little or nothing to do with each other. Regarding the present study, for simplicity and to generalise the term so that they fit within it, it has been decided to refer to them as "*monitoring schemes*" (unless specific examples need to be otherwise named).

Also, the study does not intend to go into detail on terminology assessments. However, it advances as a recommendation that harmonising concepts between schemes would improve understanding and perhaps more intuitive reuse of existing data, where aligned or at least well-defined terminology is one component of a desirable common conceptualisation of digital monitoring in the future.

A series of additional challenges and limitations should be considered before reading ahead, including:

- With the evolving digital policy landscape and associated monitoring schemes, the primary subject of this study is a *moving target* with several dimensions. We face (fast) evolutions of policies, technologies, and indicators. The latter is a challenge because progress is made along these dimensions, and only with a little coordination. Only active monitoring schemes have been considered for study analysis. However, information emerging about policy proposals and new indicators in the creation or under review were fully considered possible. The collaborative process throughout the study has opened possibilities for further work to consider how monitoring schemes can better align.
- Parts of this work are, by their nature, subjective. On the one hand, there is a high degree of subjectivity when mapping existing indicators to, for example, Interoperability principles, targets of the Digital Decade or European digital rights and principles. Therefore, the report's findings would still benefit from confirmation or validation by engaging relevant experts/stakeholders. On the other hand, we are also faced with opinion-based findings from interviews with experts from the EC and MS. Our initial engagement with stakeholders helped us explore the problem space and identify improvements to the current monitoring approaches. Naturally, the content of each interview depends very much on the (policy and technical) profile of the interviewee. Findings were considered stronger in cases where multiple interviewees shared similar insights. Given that the indicator analysis and the interviews were performed in parallel, we also benefitted from occasional confirmation of intermediate findings or pointers to dedicated analysis activities.

— Given the explorative nature of this work, the sequence of interviews and subsequent presentations of intermediate results kept providing insights for possible additional investigations, and new questions kept emerging, raising a scoping challenge. Possible other work could always be done to broaden the consideration (and monitoring schemes to consider) or deepen the analysis (e.g., from schemes to indicators to data sources to individual survey questions, etc.). While new ideas were emerging all the time, we decided on a balanced approach, i.e., to concentrate the first phase of our work on a small, selected set of monitoring schemes that were then examined to a good level of detail – without going into the finer-grained details of data sources, etc. Extensions of this work would be possible based on future needs and interests, including research by other groups.

— Like the above, the overall balance between expectations, timing, quantitative data, and qualitative data (mostly from interviews and expert meetings) is challenging in this type of work. The co-creation process that could be established between already engaged stakeholders helped set the priorities we discussed in the report. An extended co-creation process will require further priorities to be developed for any next steps. Any additional evidence, following feedback on this report or inputs from stakeholders, needs to be considered regarding how it may influence future developments.

2. Background

2.1 What is, and why do we need *monitoring*?

The EC is responsible for planning, preparing, and proposing new EU laws and policies. As in any project, policymaking needs to regularly understand the progress of initiatives to know if they are implemented and applied correctly to obtain the desired results. This process is called ***monitoring***. The *Better Regulation toolbox*[29] describes the *monitoring* activity as follows:

> *"Monitoring is a continuous and organised process of systematic data collection (or access) throughout the life cycle of an initiative to oversee its progress. Monitoring is necessary to generate information that feeds into future evaluation and impact assessments and to provide solid evidence base for policymaking. Monitoring generally involves tracking progress with respect to previously identified targets or objectives. While monitoring most frequently uses quantitative data, using qualitative data is also possible."*

According to the *Better Regulation Guidelines*[23], monitoring is essential for different EU policymaking stages of the lifecycle (**Figure 2**).

Figure 2: The EU policymaking cycle

Source: *Better Regulation Guidelines 2021*

Indicators are the raw material of the monitoring activities**.** They provide essential information on the status and progress of given activities and allow the comparison of various aspects over time and geographies. The *Eurostat's Concepts and Definitions Database* [30] defines an *indicator* as:

> *A "summary measure related to a key issue or phenomenon and derived from a series of observed facts."*
>
> They *"can be used to reveal relative positions and/or show positive or negative change. When evaluated at regular intervals, an indicator can point out the direction of change across different units and through time. In the context of policy analysis, indicators are useful in identifying trends and drawing attention to particular issues. They can also be helpful in setting policy priorities and in benchmarking or monitoring performance."*

Monitoring activities, therefore, produce/collect the data the indicator tracks, which is then reflected in reports that interpret them. Opinion-based sources, such as testimonials or interviews, can enrich the knowledge and validate the indicator's value and direction.

As reported in the *Next generation digital Commission*[6] Communication, the EC's *Better Regulation agenda* has integrated digital thinking into the policy cycle. **Figure 3** shows how to enable digital-ready EU policymaking in the various stages. Relatedly, Tool 28 of the Better Regulation Toolbox", provides *guidelines to build digital-ready policies and "digital check" questions for policymakers"* to help *"detect digital dimensions early on*".

This approach offers a means to:

"simplify implementation, improve resource efficiency, reduce administrative burdens, reuse existing standards and solutions, prepare the ground for using data analytics and encourage the uptake of innovative technologies".

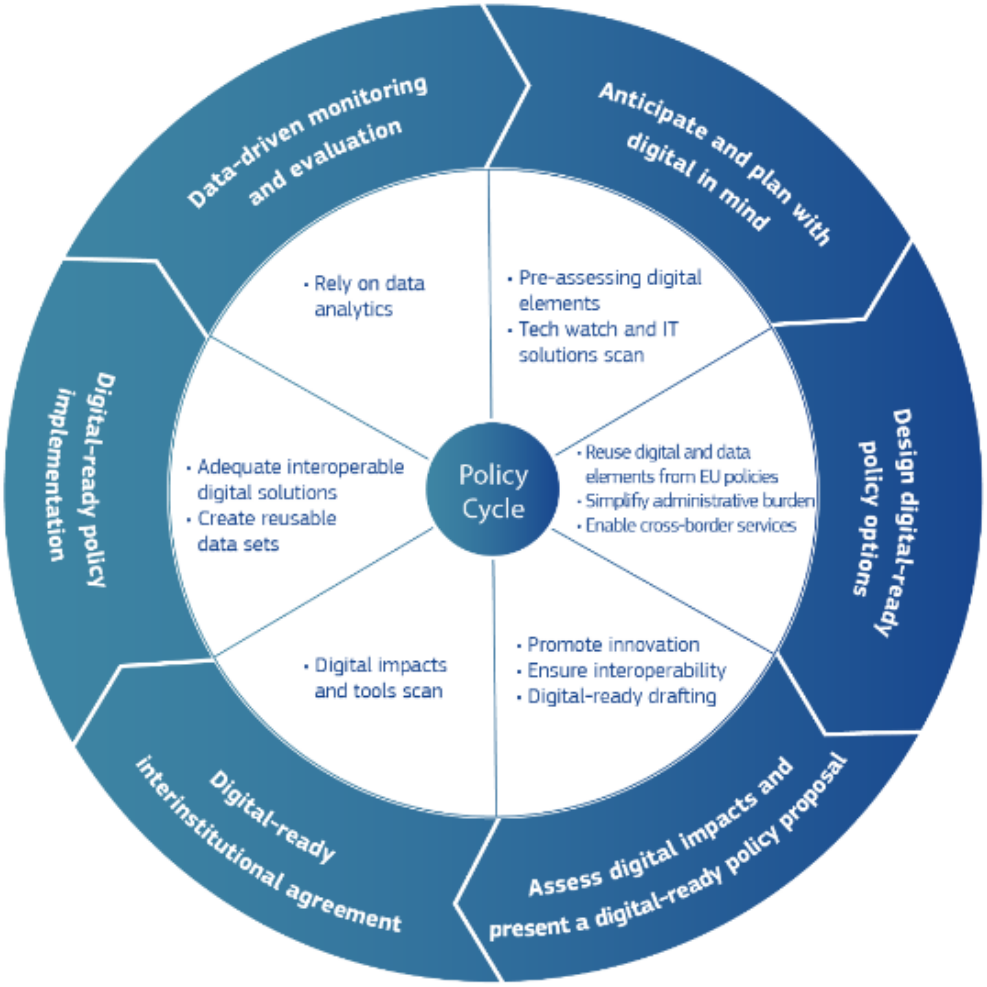


Figure 3: Policy cycle – digital-ready policymaking

Source: *Next generation digital Commission* Communication

2.2 Policy context

2.2.1 EC digital policy historical review

The development of the proposed *Interoperable Europe Act*[14] has outlined a series of policies relevant to the digital domain, where the increase in EC digital society policies in scope for the study should be noted (see **Figure 4**). It is, therefore, worth outlining some key policies, as they provide context to the evolution of monitoring the study is exploring.

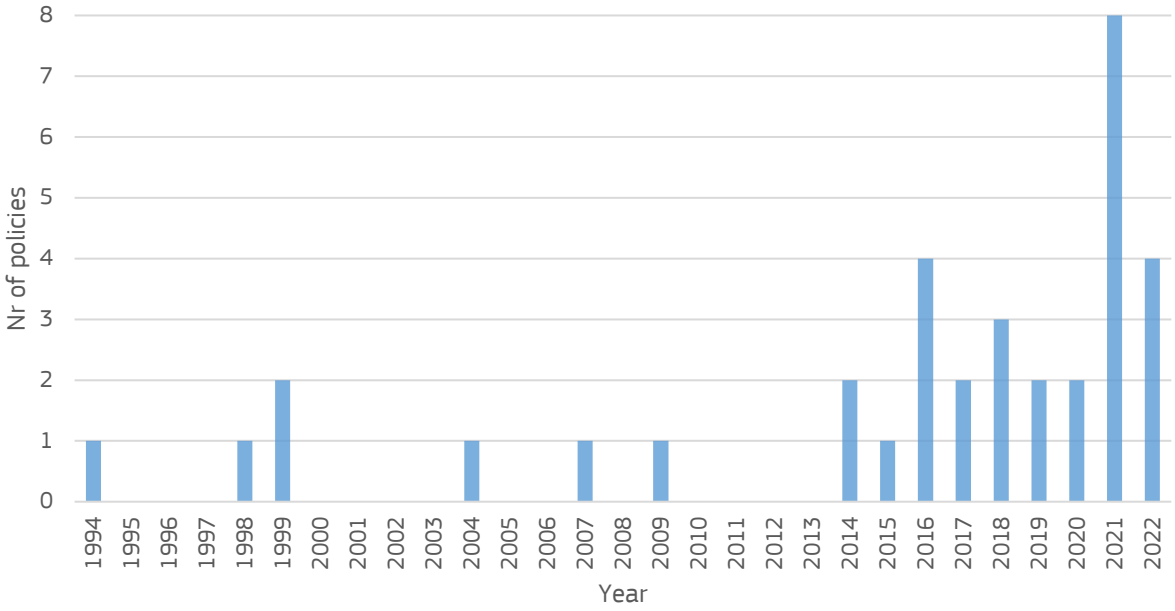


Figure 4: Increase in digital policy-making since 1994

The Treaty on the Functioning of the EU[31] is the basis for many EC digital society policies. In particular, the *Trans-European Networks* (TENs) were a landmark for political considerations of IT infrastructure (alongside transport and energy) and sharing information across borders, especially the funding instruments to support cross-border digital infrastructures and national telematic systems exchanging information between public administrations. Below are outlined interoperability policy areas followed by additional e-government and e-society initiatives details.

Interoperability in policy

In the late 1990s, a court ruling indicated that TENs would include public administration networks. In 1995, the *Interchange of Data between Administrations* (*IDA*) Programme[32] established the first EC activities on Interoperability, focusing on the employment, health, agriculture, statistics, and competition sectors.

IDA II followed in 1999 and paid particular attention to the *Economic and Monetary Union* and the consumer protection, health, and transport sectors, with activities in 2002 helping to provide much of the e-government component of the *Europe Action Plan*[33].

A Decision followed IDA in 2004 for the *Interoperable Delivery of pan-European eGovernment Services*[34] (IDABC) Programme. IDABC ran from 2005 to 2009, relevant to certain activities under the *eTen*, *eContent*, *eInclusion* and *eLearning* programmes. This programme began to tackle the *cross-border* and *cross-sector* Interoperability themes, then taken in successive programmes with consideration for the Interoperability issues related to the exchange of information between the national and European levels. It notably considered the needs of citizens and businesses in interacting with public administrations online, pointing to user-centricity principles tied to interoperability. The first version of the *European Interoperability Framework* (EIF) was established, aiding cross-sector coordination on Interoperability.

In 2010 the *Interoperability Solutions for European Administration*s (ISA) Programme started the first efforts for monitoring interoperability. The uptake The efforts of the programme included: the uptake of the EIF by the MS and the establishment of national Interoperability frameworks aligned with the EIF and recognising activities

in Interoperability in specific domains, including maritime information systems and geospatial data-sharing, including those activities associated with the INSPIRE Directive and wider concepts of *location interoperability.*

The programme on *Interoperability Solutions and Common Frameworks for European Public Administrations, Businesses and Citizens*[9, p. 2] (ISA² Programme) continued the development of public sector digital solutions for cross-border and cross-sector public services. Running from the 1st of January 2016 to the 31st of December 2020, it, amongst other activities, provided a revision of the EIF in 2017. It also created other common reference materials, including the 2017 *Rolling Plan for ICT Standardisation*[35].

To support the digital transition, the *Digital Europe Programme*[13] (DIGITAL) is the current funding programme (2021-2027) focused on bringing digital technology to businesses, citizens, and public administrations. It supports five key areas: supercomputing, Artificial Intelligence (AI), cybersecurity, advanced digital skills and interoperability. More specifically, as defined in *Shaping Europe's digital future* Communication[36], *Interoperable Europe* was established to help foster the coordination and adoption of common standards for public services. Data flows to reinforce the EU government's Interoperability strategy. The DIGITAL programme supports the initiative and builds on the initiatives mentioned above—the results of the final evaluation of ISA² [37]provided inputs for shaping the proposed Interoperable Europe Act.

Overall, the Interoperability policy has grown from initial sectoral *experiments* and expert-driven frameworks to the current proposal for legally binding commitments on interoperability, covering not only technical concerns between MS information systems but also organisational and governance aspects that can be seen to reinforce and fill gaps in other digital policies.

Ministerial Declarations and Digital Policy

In parallel, but also linked to the interoperable policy developments, the EU has also taken several policy efforts related to, broadly speaking, e-government. Ministerial declarations, EC action plans and related funding efforts can recognise this.

The Belgian Presidency in 2001 and the Italian Presidency in 2003 were recognised as taking steps to support e-government, although details are limited. In 2005, the United Kingdom Presidency[38] underlined the role of the i2010 initiative (see below). It emphasised the need for a fully inclusive e-society to ensure that, importantly, "*measurable benefits*" of ICT would be available to all, especially in e-government. In comparison, the Portuguese Presidency[39] in 2007 also supported improving Better Regulation to reduce administrative burdens and considered public sector modernisation.

A milestone in the context was the Swedish Presidency's *Malmö Ministerial Declaration on eGovernment*[40] in 2009, which set out a vision until 2015 underlining Interoperability needing support through "a common culture of collaboration" underpinned by "good administration" principles, as well as recognising a role for open-source solutions and aligning national interoperability frameworks to the EIF. This initiative was followed in 2010 by the *Granada Declaration*[41] under the Spanish Presidency, which saw a European digital economy supported by "*smart and open public services such as e-health and e-government*" and considered the role of Cloud Computing, e-authentication/eID and the role of data protection and privacy in, amongst others, e-government services. Open standards and interoperability were also seen to support cost-effective and innovative e-government, especially at legal, organisational, and technical levels relevant to the EIF. Notably, this Declaration called for progress to be benchmarked through:

> *"… harmonised methodologies and indicators, adaptable to the evolution of technology and its use by citizens, enterprises and public administrations, allowing for a robust and comparable measurements of ICT use and impact on sustainable economic growth and social welfare."*

Where the *Rome Declaration* in 2017 under the Italian Presidency[42] gave high-level support to promoting a *"… democratic, effective and transparent decision-making process and better delivery*", it was the Estonian Presidency's *Tallinn Declaration on eGovernment*[43] in 2017 that reinforced Interoperability topics, recognising the importance of the EIF and its principles, such as user-centricity.

In 2020, the *Berlin Declaration on Digital Society and Value-based Digital Government* was signed under the German Presidency, creating a broad and far-ranging set of commitments related to e-government. As shown below, this declaration continues to form the foundation of assessments in this context, where the study has explored its monitoring in detail, where Interoperability is firmly set alongside digital sovereignty and linked to the ambitions of the current policies of the Digital Decade. Digital democracy and digital rights have continued to be of interest under the *Lisbon Declaration: Digital Democracy with a Purpose*[44] of the 2021 Portuguese Presidency. Interoperability was further emphasised in the *Strasbourg Declaration on the Common Values and*

Challenges of European Public Administrations[45] under the French Presidency in 2022. The latter included strengthening knowledge sharing, pooling investments, administrative simplification, and support for data space development. However, monitoring in this context by the EC rests with the indicators developed for the Berlin Declaration.

The 2002 *eEurope Action Plan*[33] aimed to create a dynamic knowledge-based economy in Europe by 2010. Interoperability-related aspects included support for increased e-accessibility and an emphasis on generalised access to electronic access to public services by 2003, with a

> *"coordinated approach for public-sector information, the promotion of the use of open-source software in the public sector and simplified online administrative procedures for business".*

eHealth aspects were suggested to have "*an appropriate telematics infrastructure"* by 2002. National progress was to be measured through the *eEurope Benchmarking Report*[46], with the Action Plan also monitored[47].

The 2005 *eEurope* Action Plan[48] also addressed eHealth and digital skills. It underlined the need for the modernisation of online public services, including broadband connection for all public authorities by 2005,

> *"multi-platform access (telephone, television, PC, etc.)" to public services by 2004 and the creation of easy-access Public Access Points to the Internet (PAPI) for citizens, as well as support to eProcurement, where the end of 2005 would see "… most public supply contracts… awarded electronically".*

This Action Plan also noted the EC's adoption of an interoperability framework…

> *"… to facilitate the provision of pan-European e-government services for citizens and businesses".*

It defined Interoperability as

> *"… the capacity with which two programmes (a client and a server, for example) can exchange and interpret their data properly".*

The Action plan intended the continuation of the 2002 benchmarking activity. It aimed to produce by the end of 2002 *"… a list of indicators and a renewed methodology… at European Union level"*. The review of this Action plan was reported[49] regarding monitoring and sharing good practices in 2009.

The Action plans were followed in 2005 by the strategic framework of *i2010: Information Society and the Media working towards growth and jobs*[50] to create a Single European Information Space, promote research and innovation in ICT and support an inclusive information society. It would target actions on Interoperability and digital rights management. eInclusion was recognised for boosting social, economic and territorial cohesion and improved digital skills, where "*high-quality public services*" using ICT would be supported by an *"… Action Plan on eGovernment as well as strategic guidelines*" (see below). i2010 also aimed to launch online public service operational demonstrators to test technological, legal and organisational solutions that align with the EIF's key aspects. The main achievements of i2010 were reported[51, pp. 2005–2009] in line with the Lisbon Strategy review, which included, amongst others, that "*ICT policies have gradually been mainstreamed*".

The above-mentioned *i2010 eGovernment Action Plan: Accelerating eGovernment in Europe for the Benefit of All*[52] recognised an ongoing need for innovation and modernisation in the public sector and increasing demand for "*seamless public services across borders*". The plan aimed to support the creation of tangible benefits for citizens and businesses from e-government, where economic concerns such as market fragmentation and limited Interoperability were highlighted as potential barriers to the Single Market. Notably, the EC also sought to ensure the *"…cooperation of all stakeholders in the EU in designing and delivering eGovernment*", pointing to principles of user-centricity and the role of other actors that would today include business partners such as GovTech. The five main objectives of the plan to be realised by 2010 are worth noting, given current policy goals:

> — *"No citizen left behind: advancing inclusion through eGovernment so that by 2010 all citizens benefit from trusted, innovative services and easy access for all."*
>
> — *"Making efficiency and effectiveness a reality – significantly contributing, by 2010, to high user satisfaction, transparency and accountability, a lighter administrative burden and efficiency gains."*
>
> — *"Implementing high-impact key services for citizens and businesses - by 2010, 100% of public procurement will be available electronically, with 50% actual usage, with agreement on cooperation on further high-impact online citizen services."*

— *"Putting key enablers in place - enabling citizens and businesses to benefit, by 2010, from convenient, secure and interoperable authenticated access across Europe to public services."*

— *"Strengthening participation and democratic decision-making - demonstrating, by 2010, tools for effective public debate and participation in democratic decision-making."*

In terms of assessments, the Action Plan foresaw, by 2006, *"... a roadmap setting measurable objectives and milestones... by 2010,"* focussing on citizens as beneficiaries of e-government. Notably, this action was established as an "*open partnership with Member States, the private sector and civil society and in coordination with European Public Administration Network (EPAN)*", a context pertinent to this study. It also set 2007 the objective to have:

"In line with the i2010 benchmarking framework, benchmarking and case-based impact and benefit analysis based on common indicators will be performed based on Member States' inputs to monitor progress with this Action Plan."

Moreover, *jobs* and *growth* were emphasised, and "*measurements*" were seen as an added value of EC involvement, where it was specifically reported that:

"Providing relevant information, quantifying, benchmarking, measuring and comparing impact and benefit is essential for mainstreaming eGovernment. Work has been progressing on a common impact/benefit-oriented measurement framework, which includes benchmarking using common indicators (measured nationally or by European-level action) and case-based learning using measurable indicators. Economic models are emerging and need to be further developed as complementary tools to help identify ways of using the data, e.g. identifying the relationship between investment and productivity within an eGovernment project or the contribution of eGovernment policies and programmes to GDP growth, jobs or social cohesion."

This set of assessments included MODINIS benchmarking eGovernment basic services online, a project on improving eGovernment benchmarking indicator, and a MODINIS eGEP study on financing, benefits and economics of eGovernment. These were to sit alongside the sharing of good practices through *the eGovernment Good Practice Framework*[53]*, the eGovernment Observatory, Your Europe*[54] portal*, the TESTA network*[55] and *the Single Window Customs*[56].

Modernising online public services across borders and at diverse levels of government was also highlighted that would also create demand for "*key enablers*" such as eID and interoperability, where the measurable impact of these services was seen from widespread usage rather than simply making services available online, with eProcurement highlighted as a notable area for development, alongside key public services for citizens and businesses. These were recognised as:

"... citizen mobility services, such as improved job search services across Europe, social security services relating to patient records and electronic health prescriptions, benefits and pensions across Europe, and educational services relating to studying abroad. Other key services to be considered include company registration and VAT refunding for businesses."

This activity was also complemented by plans to work on eID. Such work continues to be assessed in this study's four main monitoring schemes, the efforts of the Single Digital Gateway *life events* and the overall target of key public services and eID under the Digital Decade (see below).

Moreover, Interoperability is recognised in the Action Plan as a "*generic key enabler*" with high-impact e-government "*building blocks*", including "*common specifications, interoperability guidelines and re-usable software*" recognised alongside the adoption of an updated EIF.

Lastly, the Action Plan also notes a need to strengthen participatory democracy in online contexts, where citizens were seen as

"*... becoming ever better informed and are demanding greater involvement... in all phases of democratic decision-making*", including at the European level, where the "*... interface between democracy, new technologies, new forms of social organisation and governance*" was brought into consideration.

The former would include tests to conclude in 2010 in ICT tools that would

"... facilitate transparency and public involvement in democratic decision-making (and support) ... exchanges of experience".

Monitoring of the Action Plan was also a key concern, resulting in updates and promoting reusable solutions (at the time of IDABC).

As one of seven flagship initiatives of the *Europe 2020 Strategy*, the *Digital Agenda for Europe 2010-2020*[57] continued to measure policy developments in line with its main aims to aid economic recovery from the financial crisis in terms of "*smart, sustainable and inclusive growth*". Interoperability was one of the then seven key activities of the Digital Agenda, addressing issues of standards adoption in the public sector (including for public procurement) and coordination between public authorities tied to the *European Interoperability Strategy* and the *EIF* (at the time under the ISA Programme). The latter was presented alongside developing open platforms and supporting trust and security aspects related to eID. Notably, digital skills and accessibility/eInclusion continued to be a key concern of digital policy. From the Digital Agenda, it was suggested that MS should

"Apply the European Interoperability Framework at the national level by 2013" and *"Implement commitments on interoperability and standards in the Malmö and (2010) Granada Declarations by 2013".*

The Digital Agenda also recognised environmental concerns concerning ICT, including energy efficiency and more technical areas such as cross-border sensor networks. In addition, the Digital Agenda called for MS to:

[make e-government services] "fully interoperable, overcoming organisational, technical or semantic barriers…" have in place *"Points of Single contact function as fully fledged eGovernment centres"* and by *"…2011 on a common list of key cross-border public services that correspond to well-defined needs*", that would be online by 2015.

The Digital Agenda also aimed to assess progress through regular contact with senior decision-makers in the Commission and the MS and produce an annual scoreboard with socio-economic developments based on KPIs drawn from the Benchmarking Framework 2011-2015 and endorsed by the MS in 2009. For Public Services, this involved two indicators:

"eGovernment by 2015: 50% of citizens using eGovernment, with more than half of them returning filled-in forms. (Baseline: In 2009, 38% of individuals aged 16-74 had used eGovernment services in the last 12 months, and 47% of them used eGovernment services for sending filled forms)."

"Cross-border public services: by 2015 online availability of all the key cross-border public services contained in the list to be agreed by Member States by 2011. (No baseline)".

Following the Digital Agenda and Malmö Declaration in 2010, the EC produced the *eGovernment Action Plan 2011-2015*[58]. *Service-oriented architectures* (SOAs), "*clouds of services*", and open specifications were recognised as allowing greater sharing, re-use and interoperability, supporting increased efficiency through ICT in the public sector. Alongside interoperability, the EC saw legal instruments, standards setting, common frameworks, generic tools, and technical building blocks aiding e-government developments. Social media/Web 2.0 was also noted as relevant in involving citizens in producing and designing public services and where ICT could support public participation and governance. By 2015, the MS would also provide cross-border and interoperable eDelivery services for citizens related to life events related to studying, working, living, receiving health care and retiring anywhere in the EU. In terms of business, MS and the EC would look to sustain *Pan-European Public eProcurement On-Line* (PEPPOL) and *Simple Procedures Online for Cross-border Services* (SPOCS) after assessment. The ISA Programme was also highlighted, including promoting reusable solutions for access to authentic sources by 2012 and aligning national interoperability frameworks to the EIF by 2013, alongside key enablers, including the rollout of eID solutions from 2012-2014. The Action Plan also noted that targets would be set with MS, including "exchanging best practice and information, conducting studies and benchmarking". By 2011, targets were to be agreed on *Public Sector Information* (PSI) reuse indicators and by 2013, MS were to:

"… develop personalised online services, including functions such as monitoring the progress of transactions with public administrations", as well as *"common targets for the roll-out collaborative services".*

Cross-border and efficiency aspects were also noted for EC and MS initiatives. Governance was also mentioned by establishing a High-level Expert Group that would review the Action Plan.

The *Digital Single Market Strategy for Europe*[59] (DSM) was created in 2015, emphasising European growth and competitiveness within a global digital economy. The growth potential was one of the three pillars of the DSM, with investments in Cloud and Big Data seen alongside innovation and research supporting private sector competitiveness and, of importance to this study, "*better public services, inclusiveness and skills*". These

activities sat alongside a notable emphasis on cybersecurity and personal data privacy. Interoperability and standardisation were also linked to increased competitiveness, with the DSM defining Interoperability in the digital economy as:

> *"… ensuring effective communication between digital components like devices, networks or data repositories. It also means connecting better along the supply chain or between industry and services sectors".*

Emphasis was placed on the public sector context, where interoperability:

> *"…means more efficient connections across borders, between communities and between public services and authorities. E-government services that are being developed in different Member States should be able to communicate with each other and not develop in isolation".*

MS were recognised as having a *"common understanding… (for the) basic requirements to achieve interoperability*" through the EIF that the DSM would seek to update and extend. This was complemented by recognising the role of standards in public procurement and a need to bring national catalogues together into a European frame. eGovernment services were seen to gain efficiency using the *Once Only Principle* and the proposed development of the *Single Digital Gateway*[60] (SDG). Progress in the DSM Strategy, given its cross-cutting nature, requested more coordination between European institutions, as well as aiming to:

> *"… improve the quality of the data and analysis needed to underpin the (DSM) … by pooling the relevant knowledge and making it easily accessible to the public"*, including the further development of DESI.

The DSM also proposed designing and implementing the e-Government Action Plan 2016-2020.

It is worth outlining more details about the SDG and the related *Once Only Technical System* (OOTS) of the *Directorate General for Internal Market, Industry, Entrepreneurship and SMEs* (DG GROW), as these are examples of activities as building blocks towards interoperable cross-border online public services.

The SDG has been designed to support the Single Market and the free movement of goods, services, capital and people, supported by Regulation (EU) 2018/1724, establishing a single digital gateway to provide information, procedures, assistance and problem-solving services. It aims to offer EU citizens and businesses the means to access information, administrative procedures, and assistance services in another EU country. This has been realised in practice by creating the *YourEurope* portal (originally established in 2006), which acts as a single entry point offering information about a series of life events, such as a citizen travelling, working or studying in another country, alongside their rights in topics such as healthcare, family rights and consumer rights. Further filters will eventually guide the user to national online services covering 21 procedures (including related document transfer) by the end of 2023. The life events mentioned can be readily contrasted with those within the scope of the eGovernment Benchmark's activities. The SDG also aims to gather user feedback on barriers encountered as inputs to policy-making that can be viewed as a form of monitoring. Overall, the SDG may be considered a policy-related area creating online public services across borders, where interoperability issues will likely be encountered and potential solutions developed.

Reusing existing solutions, the OOTS aims to streamline cross-border online procedures by the end of 2023 by allowing citizens and businesses to supply the same data (known as *evidence*) to public authorities only once. The OOTS helps public authorities connect so they can exchange documentation following requests from citizens or businesses following the Once Only Principle (one of the principles of the EIF). Working as an integration mechanism and technical framework for data-sharing, the OOTS has a decentralised architecture that, through a virtual secure network, allows public sector websites and other authentic sources of information to discover and exchange data at all administrative levels automatically. OOTS makes use of eDelivery and eIDAS nodes in the MS while promoting a promoting *once-only by design*, with implementation support through the Once-Only Hub. Lastly, the OOTS has set out a generic user journey that exemplifies where Interoperability issues are tackled through seven key steps: user authentication (via eIDAS), evidence located (the type and from which provider), evidence request to the provider, a user is redirected to the provider, evidence preview, evidence response to a request, submitted by completing a procedural form.

Returning to the chronology, the most recent Action Plan[61] also placed more emphasis on the digital transformation of government, seeing it as a key success to the Single Market where "*Seamless cross-border and digital public services contribute to competitiveness and make the EU a more attractive place to invest and live in*". It was also seen as a "*catalyst to coordinate public sector modernisation efforts and resources*" alongside topics such as innovation. Seven underlying principles of the range of activities in the eAction Plan are worth noting, namely *Digital by Default*, the *Once Only principle*, *Inclusiveness and accessibility*, *Openness & transparency, Cross-border by default*, *Trustworthiness & Security*, and *Interoperability by default,* many of

which can be seen as continuity from previous policy efforts, although placing them at the core of activities. Although they can also be seen as interrelated, it is worth noting that *interoperability by default* indicated that:

> *"… public services should be designed to work seamlessly across the Single Market and organisational silos, relying on the free movement of data and digital services in the European Union*".

Key enablers, including eID, were also supported alongside eProcurement, the Standards Catalogue's continued development, and the EIF revision by 2019. Other features included the proposal for the SDG by 2017 and making the European eJustice portal a one-stop-shop by 2016, supporting the *European employment services network Scope* (EURES) job mobility portal by 2017 and supporting MS in cross-border eHealth services until 2018. Activities facing citizens were also promoted, where the Action *"Accelerate the deployment and take-up of the INSPIRE[3] Directive data infrastructure*" was an example of a domain-specific interoperability framework under the EIF, as well as collaboration between DG DIGIT, DG Environment and the JRC to implement INSPIRE and reuse its Interoperability assets and experience towards *location interoperability* and the engagement of the European geospatial community in e-government interests. In terms of governance, the eGovernment Action Plan Steering Board examined progress in the Action Plan and proposals for new actions, with the plan calling for *"… joint commitment and joint ownership between the Commission and the Member States, at all levels of administratio*n" for its realisation.

At the end of 2022, the *European Court of Auditors* (ECA) examined the *e-Government Action Plan 2016-2020* activities. Their report[62] directly addressed the topic of monitoring, indicating that:

> *"… the Commission did not set up any specific monitoring framework including a set of performance indicators to assess the progress of the actions and policy priorities and the extent to which they were met",*

Although progress on individual actions was monitored and discussed in dedicated stakeholder groups, an assessment of impacts was missing. There was no "systematic feedback from the Member States to follow up the implementation of specific actions at the national level". However, the EIF and NIFO were highlighted, alongside the SDG, eID and eProcurement policies, as having specific arrangements in this mode and the eGovernment Benchmark and DESI were reused for this purpose. The ECA indicated that these indicators were not specific enough to the achievements of the Actions in the plan, so

> *"the Commission is unable to link the results of either indicator to the results and impact of the Action Plan in the Member States".*

Progress in online services for businesses was noted, but the report also highlighted an *"… uneven development in Member States*". The report also noted that although progress could be seen in the EC implementing the actions, the MS faced delays in implementing some digital public services. The continuous technical support for implementation in examined policy areas was also welcomed by those MS interviewed, including the components offered through the CEF-funded digital service infrastructures, including eID resources. Although stakeholder engagement and online resources were applauded, the audit also indicated that the "*Commission did not promote digital public services in a comprehensive and coordinated manner*", with no overarching strategy and limited awareness of how MS would promote uptake in their countries. Lastly, the report also recognises that positive steps have been taken by the EC in this context in preparations for monitoring the Digital Decade, highlighting the role of DESI in monitoring in this context.

The EC has already replied[63] to the points made by the ECA, accepting all recommendations, and has noted that monitoring through the Path to the Digital Decade 2030 and the Digital Compass will help with the implementation and promotion of e-government services in conjunction with national roadmaps. Clearer KPIs are expected to be developed in this context to help avoid diverse interpretations by the Member States. In addition, NIFO is foreseen to remain in place as part of monitoring the Digital Europe Programme (at least until 2027). DIGITAL investments, including Digital Innovation Hubs and the GovTech Incubator, may also aid solution uptake.

The Commission's most recent digital policy is *A Europe fit for the digital age*[64], as a flagship initiative aiming to achieve a range of targets under the Digital Decade[4], which presents the vision and path for Europe's digital transformation by 2030. Under three main elements, it aims to empower businesses and people in a human-centred, sustainable, prosperous future. Firstly, the Digital Compass outlines the key milestones of its digital strategy as four cardinal points: skills, infrastructure, business and, importantly for this study,

[3] INSPIRE refers to the Directive aiming at establishing and *Infrastructure for Spatial Information in Europe*

government. The related targets by 2030 are having 100% of key public services online, All citizens having access to medical records online, thus continuing eHealth initiatives and having 80% of citizens with access to digital ID, continuing work on digital identity and eID. Being the first digital policy programme to have such targets, it also promotes a digital transition shaped by European values by defining and safeguarding European Digital Rights and Principles. This declaration outlines a sustainable, human-centric vision for digital transformation. Ensuring the vision and objective towards a digital transformation are achieved and aligned with the EU's values. The *Path to the Digital Decade* is the proposed policy program that sets concrete digital targets delineated in *Digital Compass* Communication. It sets out a novel form of governance with the MS through a mechanism of annual cooperation between the Union's institutions and the MS to ensure that the Union jointly achieves its ambition. The *Path to the Digital Decade* also aims to support and coordinate deploying and operating Multi-Country Projects, where annual reporting would also aim to provide a compulsory annexe to the European Semester. The 21st of November saw the first meeting of the Digital Decade Board, an expert group with MS representatives to support the implementation of the Digital Decade Policy Programme. It is in this context that the study will undertake its future research.

2.2.2 Digital Government and Interoperability as the basis of *Digital Government Transformation*

Digital government, *electronic government*, *eGovernment*, *online government*, or *connected government* are often used interchangeably. However, the *electronic government* would have a more limited meaning than *digital government* since it mainly involves those capabilities oriented to transactional services (digital public services) in the public interface. In contrast, the *digital government* covers aspects of *rewiring* the administration, thus also changing the organisational culture, skill sets, forms of collaboration and, fundamentally, the nature of government in the digital age.

According to the *Recommendation of the Council on Digital Government Strategies*[65] outlined by the Organisation for Economic Co-operation and Development (OECD), *Digital Government* refers to

> *"the use of digital technologies, as an integrated part of governments' modernisation strategies, to create public value. It relies on a digital government ecosystem comprised of government actors, non-governmental organisations, businesses, citizens' associations and individuals, which supports the production of and access to data, services and content through interactions with the government. A fusion of advanced technologies, the integration of physical and digital systems, the predominance of innovative business models and new processes, and the creation of smart products and services".*

If there is one characteristic that every digital government must face, it is the intra-organisational complexity and heterogeneity that involves different ministries and departments. Therefore, simplifying administrative processes requires the application of Interoperability principles. Therefore, digital government and Interoperability go hand in hand. According to the NIFO glossary[66], interoperability *is:*

> *"a key factor in making a digital transformation possible. It allows administrative entities to electronically exchange meaningful information in ways that are understood by all parties. It addresses all layers that impact the delivery of digital public services in the EU, including legal, organisational, semantic and technical aspects."*

The *Digital Government Transformation*, or *digital transition* as coined by the EC in the *2030 Digital strategy*, is the process that leads towards *Digital Government*, where Interoperability principles and measures can be seen to underpin it. Even the *Communication 2030 Digital Compass: the European way for the Digital Decade* explicitly mentions Interoperability:

> *"Europe must harness digitalisation to drive a paradigm change in how citizens, public administrations and democratic institutions interact, ensuring interoperability across all levels of government and across public services".*

According to the JRC study *Exploring Digital Government Transformation in the EU*[67], it

"is the introduction of radical changes, alongside more incremental ones, in government operations, internal and external processes, and structures, to achieve greater openness and collaboration within and beyond governmental boundaries, enabled by the introduction of a combination of existing ICTs and/or new data-driven technologies and applications, as well as by a radical reframing of both organisational and cognitive practices; it may encompass different forms of public sector innovation across different phases of the service provision and policy cycle to achieve key context-specific public values and related objectives such as, among others, increasing efficiency, effectiveness, accountability and transparency, to deliver citizen-centric services and design policies that increase inclusion and trust in government".

To ensure DGT in Europe, specific targets have been defined for 2030.

"*Our digital transition will not be complete without the digitalisation of public services. Public services make a huge difference in our daily lives; think of electronic health records, for example. They are also an important driver of digitalisation for small and medium companies that can shift a large part of their administration online, like filing online VAT forms, for instance. This is why we propose to have 100% of key public services available online for all Europeans by 2030 – and 80% of us should use a digital identity*".

Speech by Executive Vice-President Vestager[68]

However, the cardinal points cover much more than the Communication 2030 Digital Compass target*s: the European way for the Digital Decade*. Some of the elements that are included under the cardinal point "*Government*" of the declaration are:

- Participation in democratic life online - electronic voting
- Online public services accessible for all of all ages and with disabilities,
- The best digital environment with easy-to-use, efficient and personalised services with high security and privacy standards.
- Digital services by default, as a model to follow for the digitization of companies and SMEs
- *Government as a platform* with advanced capabilities (data processing, AI, and virtual reality)
- Enhance [Urban] smart data platforms—development of "smart villages" in rural areas.
- Use of green public procurement criteria
- Enable modern and efficient justice systems, compliance with consumer rights, and
- Increased effectiveness of public action, including investigative and enforcement capacities against digital crimes

For the study team, a *Digital Transformation of Government* would involve (fundamental) changes in terms of

- organisational structure and culture
- new competencies and skills to manage digital transitions
- relationships with the private sector, including innovation, co-creation and GovTech
- relationships with citizens, including the way how can citizens engage in democratic processes
- public services provision, including digitization
- policy-making, i.e. how policies are developed, implemented, and evaluated

From the basis of these concepts that help frame the scope of the study, there is also a need to consider the policy cycle and the role of Better Regulation concerning monitoring.

2.2.3 Evaluating the policy cycle through *Better Regulation*

The EC's attitude to policy-making was revolutionised by adopting the *Better Regulation* approach, a means to review and make better policy following decades of law-making that did not reflect the growing understanding of the inter-related nature of many of the societal challenges the European Union aims to address. In particular, Better Regulation recognises four broad focus areas, namely socio-economic concerns, geopolitical topics, and environmental policies, as well as a discrete recognition of the importance of digital policies.

Key elements of Better Regulation are that policy must reflect a sound evidence base and transparently develop impactful policies. It also aims to simplify laws and, of importance to this study, avoid unnecessary burdens. Notably, these may be perceived or actual burdens related to assessments, monitoring, indicators (throughout their lifecycle) and related evidence gathering. Better Regulation also aims to increase the involvement of citizens and businesses in decision-making processes related to regulation, an aim to some extent shared with the digital transformation of government.

Recent developments have addressed some of these aims. Of particular note to this study are improvements to how Better Regulation should not harm sustainability goals, keeping a long tradition of environmental policymaking. In addition, it also emphasises the need to consider digital transformation in the sustainability context, in a broad sense but one that would also apply to advances in the public sector. In addition, integrating strategic foresight into policymaking to ensure proposals address expected trends and challenges by, for instance, considering emerging megatrends in the green, digital, geopolitical and socio-economic contexts.

The last recent strategic development in Better Regulation relevant to the study is the integration of strategic foresight to consider emerging "*megatrends*", where digital matters are highlighted alongside green geopolitical and socio-economic issues. *Strategic foresight*[69] considers not only preparedness and anticipatory policy-making but also one based on evidence, given the role of monitoring and evaluation in the policy cycle. Strategic foresight as a discipline also sets transition pathways alongside approaches to minimise any "*shocks"* the EU may face.

This report considers the status and landscape of monitoring for Interoperability and the digital transformation of government today. Still, the Digital Decade's longer-term targets place this work in the foresight context, to some extent, helping to find gaps and barriers and consider future scenarios to ensure monitoring is fit-for-purpose. It should also be noted that the *2022 Strategic Foresight report*[70] deals with the *twin transition*[71] between the key green and digital pillars of EC policy. Of particular note, bearing in mind a long-term target of 2050 is that low to medium-income families are likely to be affected by the twin transition, including their ability to access digital public services. The report also calls for work in ten action areas, including strengthening "*green and digital diplomacy*" by making use of the EU's role in regulation and standardisation, where a separate action calls for utilising this standardisation role on a global stage and where ICT standardisation can be seen to have clear links with Interoperability . This action also calls for the promotion of EU values, which can be seen as linked to the development of Digital Citizenship in the Digital Decade, and the fostering of partnerships, which can have links to some definitions of the Digital Transformation of Government. Another action proposes changes to education and training to match the rapid technological changes and socio-economic realities the EU faces, which may also be linked to the enhancement of digital skills (including in the public sector) seen within the Digital Compass.

Similarly, a third action proposes future-proofing investment in new technologies and infrastructures, which may arguably involve a widespread adoption of Interoperability measures, including investments in open-source solutions. Aside from digital concerns but of some relevance to the study, the foresight report also calls for action in developing monitoring frameworks for measuring wellbeing beyond GDP, where any theoretical or practical steps taken in the course of the study could be of interest to modernising some monitoring techniques for digital policy in terms of assessing outcomes and impacts. Lastly, although a related matter to this study but of interest to digital policy, the 2022 report specifically calls for action in cybersecurity and a "*secure data sharing framework*" of particular interest to supporting "*critical entities*" to avoid impacts from disruptions.

2.2.4 Specific support for monitoring under *Better Regulation*

Better Regulation is supported by a series of tools, with Chapter 5, "*Monitoring the application of interventions*", setting out monitoring arrangements and details for indicators (Tool 43), alongside details for legal provisions and evaluation (Tool 44) and the use of appropriate data for evaluation and impact assessments (Tool 67). Given the focus of the study, it is helpful to outline some details from Tool 43. It should be noted, however, that indicators and data play a role across the policy cycle and that the development of new legislative acts in the context of Interoperability and the digital transformation of government should position themselves in terms of this tool and, following its conclusions, the work of this study.

Tool 43, *Monitoring arrangements and indicators*, is key in asking policymakers to consider monitoring when proposing a new policy (or revising an existing one). The tool also recognises that monitoring has various facets so that it provides not only details to take corrective measures if a policy is not working as expected but also a means to enhance accountability in terms of implementation performance against targets, something that may also be shared publicly to provide a means for stakeholders to understand the position of work underway. Moreover, the tool introduces that monitoring is not only a technical measurement exercise but can also aid

effective communication, assisting transparency, showing progress towards policy goals, and linking monitoring to socio-organisational and socio-technical concerns.

The tool also makes a clear separation between monitoring and "*evaluation*", noting that monitoring can contribute to the latter but that evaluation is

> *"...a more encompassing and in-depth retrospective assessment of whether the initiative achieved its objectives and how. ... (it)... assesses whether the objectives have been met efficiently (i.e. at least cost), as well as the reasons for its success or otherwise. The activity of evaluation also captures the causality between the effects and the evaluated initiative, which is not the case for monitoring" (p.358).*

The latter is outlined further in terms of monitoring involving the measurement of

> *"Inputs (such as actual expenditure of funds), outputs (such as numbers of individuals/firms affected), results and impacts related to the intervention logic, to the extent of available data" which provide one source for evaluation's in-depth analysis".*

Moreover, monitoring and evaluation may both use the same contextual data. Therefore, alone, monitoring is not aiming to understand policy impacts fully. Some assessment of existing monitoring activities may be needed to understand better the extent to which they perform an evaluative role, potentially going beyond their potential remit.

An important aspect of the study is that the tool also sets out details for setting up monitoring systems, including ICT-related matters directly relevant to DIGIT's role in policymaking and establishing any new IT systems. Moreover, it proposes that IT tools should be deployed to "*automate as much as possible ... to shorten data collection and processing time*", a topic that would be addressed in the following phases of the study.

The tool also outlines an intervention logic that considers indicators as inputs, outputs, and results/impacts, as shown below in **Figure 5**.

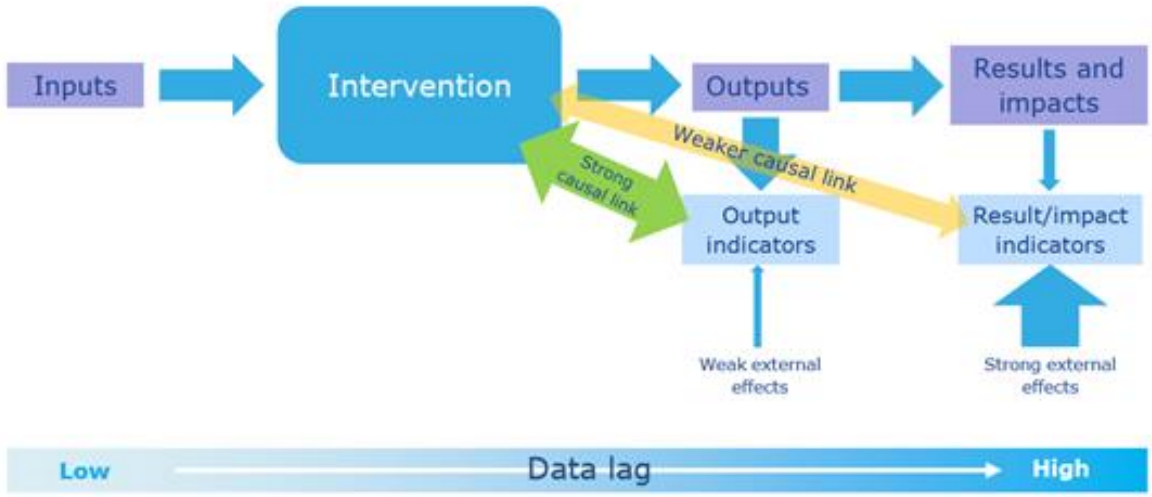


Figure 5: Intervention logic and type of indicators.

Source: *Better Regulation Toolbox 2021*

The tool, therefore, recognises a challenge for monitoring in knowing the extent to which a policy is creating an impact alongside a range of potential other factors. The tool mentions this by suggesting the following:

> *"It is important to note that monitoring data could sometimes capture changes that are both due to the EU initiative and other factors" (p.358).*

Given any thoughts on assessing impacts and outcomes in digital policy, such issues present theoretical and methodological challenges that should be addressed in this study. The tool also suggests that a:

"… limitation occurs when the initiative takes a long time before some of its effects start to materialise or when changes in the policy cannot be attributed solely to the initiative; in this case, the monitoring may not capture the intended effects of the policy" (p.359).

Importantly, the tool also defines "*indicators*" as:

"…a quantitative or qualitative indication of how close an initiative is to achieving its set goal; it is a factor or variable used to measure aspects of policy or programme progress. Indicators must be linked with the objectives of the initiative, and they must relate to different stages of the initiative (inputs, outputs, results, and impacts) … (They) … can be useful for informing the policy cycle… (while setting)… requirements on data that needs to be collected". (p. 362)

The tool also notes that the:

"limitations and possible burden for… data collection" should be considered so that those selected "provide relevant and reliable information at an affordable cost" (p. 362).

The tool suggests that burdens may be reduced by data reporting being substituted with data access to

"… sources in the MS… under proper confidentiality clauses or data reuse" (p.365).

Such considerations of evaluating burden form part of this study, with the potential for assessing costs being potential future work and data access forming part of any future option discussion. It also notes the importance of describing what an indicator is precisely measuring, metadata and potentially qualitative analysis. More specifically, the tool provides some examples of metadata elements such as the "*General/Specific/Operational objective*" being measured alongside the indicator, its definition, the type of indicator involved, the unit of measurement used, the data source, frequency of measurement, baseline data, target and a data quality rating. Describing digital indicators in a common frame and issues of metadata are discussed in the analysis below. Another important aspect is how all indicators should be *SMART (Specific, Measurable, Achievable, Relevant, and Time-Bound)* and *RACER*, namely:

(1) **Relevant**, i.e. closely linked to the objectives to be reached;

(2) **Accepted** (e.g. by staff, stakeholders). The role and responsibilities of the indicator need to be well defined. For example, if the indicator is the handling time for a grant application and the administrative process is partly controlled by the Member States and partly by the EU, then both sides would assume only partial responsibility.

(3) **Credible** for non-experts, unambiguous and easy to interpret;

(4) **Easy to monitor** (e.g. at low cost and with acceptable administrative burden);

(5) **Robust** against manipulation (e.g. if the target is to reduce administrative burdens to businesses, the burdens might not be reduced but just shifted from businesses to public administration).

Moreover, the tool sets out a further six criteria that this study has taken into consideration, namely indicators which are:

(6) **Attributable**: changes in the indicator should be attributable to the initiative. There should be a clear causal link, unless the indicator is to be used for contextual information only;

(7) Data should be **easily/readily available** and of a good quality, ideally at national/regional level if appropriate;

(8) **Timeliness**: Indicators should capture the effects due to the initiative within a reasonable length of time, taking into account also the frequency of capturing or measuring the indicators;

(9) **Baseline and target**: for monitoring progress, it is important to clarify the link to the relevant policy objective, have baseline (starting point) and explained target values to put the indicator value into context, for example which assumptions are used to derive the target from the baseline;

(10) **Metadata**: Indicators definition should come with the unit of measurement, the source of the data, frequency of data collection and any other relevant information to facilitate data sharing, use and reuse, and aggregation.

(11) **Data protection legal framework**.

The tool also suggests a need to

"… clarify and assign responsibilities for data management, collection, processing, and quality assessment (data governance)" (p.367).

Such elements are also examined regarding the current set of indicators in the digital policy landscape the study addresses. This includes the tool's proposal to consider international classifications for data, including those related to the *European Data Portal*[72].

The tool goes further in this direction by also considering data reuse and transparency by suggesting a need to

"… be transparent towards stakeholders and make data publicly available where possible and according to the data protection framework, preferably as open data (according to the principles of the EIF)",

The tool suggests that monitoring activities should look to existing monitoring and evaluation systems before designing specific approaches for a given policy. This includes data already being collected, where the tool asks:

"Is some relevant data already being collected in the context of monitoring other initiatives?".

As shown below, this can be considered a good practice and something that digital policies across DGs have already adopted. The tool also asks policymakers to consider the extent to which existing "*monitoring structures*" exist and, importantly for this study, if they are "*interoperable*". That related data:

"… needs to be collected reliably and smoothly and regularly reported in a standardised and interoperable manner (regulatory reporting requirements) to the extent possible. Ensure that the data collected are reusable".

It also suggests that:

"Reporting requirements should only cover what is relevant and not available via other channels and once-only principle should be respected… (and)… Use reporting standards and formats to increase interoperability and ease sharing of data in the context of different policy areas, to the extent possible" (p.366).

As such, the work undertaken in this phase of the study will aim at not only uncovering the indicators and observatories providing potential evidence for Interoperability (and the digital transformation of government) but also the Interoperability issues encountered in the reuse of such content, including where it could be possible to enable the *Once Only Principle* (OOP) for sharing content between the MS and the EC.

The tool also makes mention of missing data and, to some extent, data gaps, highlighting a need to consider the *EU Standard Cost Model* (Tool #58) and that costs should be proportionate to the identified data and policy needs. It also suggests the:

"…cost of setting up and maintaining a monitoring system should also be considered among the cost impacts of options" (p.365).

3. The landscape of digital government transformation and interoperability monitoring

The study team conducted dedicated desk research to analyse Europe's digital transformation monitoring landscape. It benefitted from the series of interviews to uncover related activities that may contribute to its general state of play. **Figure 6** represents the rich but not exhaustive overview of monitoring schemes and associated initiatives, classified into four types concerning this phase of the study:

1- **Primary established activities**, i.e. approaches to monitoring digital transformation and/or Interoperability in the public sector for existing EU-level initiatives that are already in place and deliver regular monitoring data. Those approaches became the focus/priority for the more detailed analysis in the first phase of this work.

2- **Primary planned activities**, i.e. approach to monitoring digital transformation and/or Interoperability in the public sector for recently established or upcoming EU-level initiatives. Those approaches helped to identify future needs and possibilities for alignment in the first phase of this work.

3- **Secondary activities**, i.e., approach to monitoring that includes sides of digital transformation and/or Interoperability in the public sector that are either already in place or still to be researched. Those approaches are candidates for consideration in the next phase of this work.

4- **Additional relevant activities**, i.e. an extended ecosystem of any other European or international initiatives that may have evidence to contribute to later stages of this work.

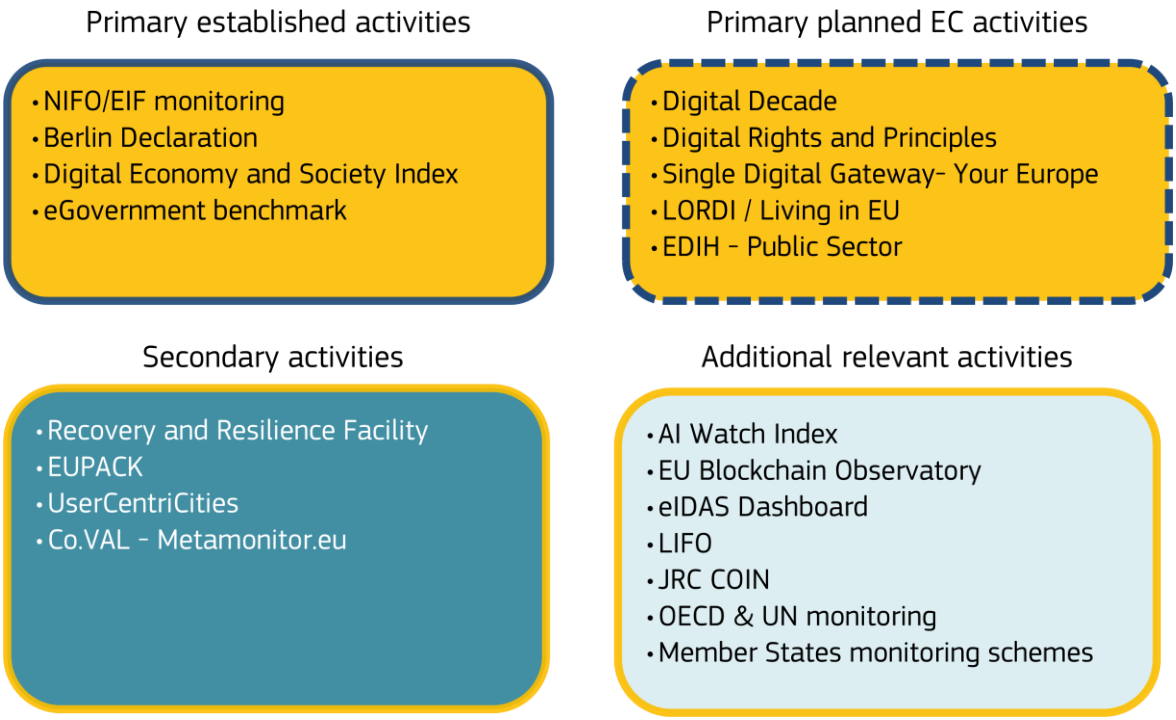


Figure 6: Landscape of monitoring schemes and initiatives that relate to digital transformation and interoperability

Having those approaches mapped out allows us to follow them carefully and find potential complementarities that could be useful to the purpose of the study in the short or medium term. The following sections describe in more detail the composition of each category.

3.1 Primary established activities

The initiatives within the *primary established activities* are of the highest relevance for the study since they have monitoring schemes already up and running; the EC owns them, ensuring EU-wide coverage and, maybe more importantly, in terms of synergies because there are already existing relationships among them. These *"established activities"* are:

Figure 7: Primary established and in-depth analysed EC activities

All the schemes in this category handle aspects of digital transformation from different angles.

The *National Interoperability Framework Observatory* (NIFO) / EIF monitoring focuses on public administrations' Interoperability and digital services. The Berlin Declaration monitoring (BDM) analyses the degree of application of democratic values and principles in the digital transformation process. The eGovernment Benchmark (eGov) evaluates the usability and user-centricity of digital services and portals. Lastly, the Digital Economy and Society Index (DESI) covers key digitisation components across society.

Detailed information on each of them follows below, and a comparative table of their characteristics is provided in **Annex 2.**

NIFO/EIF monitoring

The *National Interoperability Framework Observatory* (NIFO), widely speaking, is an online community of practice for sharing experiences and best practices on policies, systems, challenges and successes related to interoperability. It includes regular engagement with national experts through the *Interoperability of European Public Services Expert Group*[73]. NIFO's primary mission is to monitor the implementation of the revised version of the EIF by the MS, as mandated by *DECISION (EU) 2015/2240*[9], *and monitor National Interoperability Frameworks*, help foster capacity-building and the modernisation of public administrations. Since 2012, it has examined how the EIF's principles have been embedded as guiding principles in national strategies/frameworks dealing with interoperability.

NIFO contains a remarkable wealth of knowledge compiled in part through its monitoring scheme, EIF monitoring[20], which tracks the evolution of the adoption of the EIF for several years. The results of the monitoring exercise enrich the Digital Public Administration factsheets produced annually.

The *Digital Public Administration factsheets*[74] provide a country-level yearly overview of the latest developments and advances in digital public administration and Interoperability matters in 35 European countries. They include an Interoperability and eGovernment State of Play, annual highlights followed by sections gathering political communications and aspects such as legislation, governance, infrastructure and cross-border services for citizens and businesses. Additionally, each year a factsheet dedicated to the EU is also published. Since their inception in 2014, the factsheets have supplied the state-of-play of the digital transformation of public administrations across Europe, thus tracing its evolution over time. For this reason, the factsheets' name has changed with time to reflect such evolution from "*eGovernment*" to *"Digital Government*" and finally to "*Digital Public Administration*".

The *EIF monitoring* and *Digital Public Administration factsheets* are different products issued within the NIFO framework that complement each other. However, the study has considered them a single monitoring scheme for simplicity. For this reason, we will refer to them as *NIFO/EIF* unless referred to differently. In addition, it should be noted that the stakeholder survey for NIFO/EIF is implemented in tandem with the one for the BDM.

Berlin Declaration

This initiative originates in the European leaders' commitment to fundamental rights and European values reaffirmed in the *Berlin Declaration on Digital Society and Value-based Digital Government*[27] signed in December 2020, by which countries must implement 2024 22 Policy Actions around seven key Policy Areas:

- 1. Promote fundamental rights and democratic values in the digital sphere
- 2. Enhance social participation and digital inclusion to shape the digital world
- 3. Foster digital empowerment and digital literacy to allow all citizens to participate in the digital sphere
- 4. Strengthen trust through security in the digital sphere to allow everyone to navigate the digital world safely, authenticate and be digitally recognised within the EU conveniently
- 5. Strengthen Europe's digital sovereignty and interoperability as a key in ensuring the ability of citizens and public administrations to make decisions and act self-determined in the digital world
- 6. Create value-based, human-centred AI (Artificial Intelligence) systems for use in the public sector, strengthening its pioneering role in the research on secure and trustworthy technology design
- 7. Foster resilience and sustainability in the digital society, preserving our natural foundations of life in line with the Green Deal and using digital technologies to enhance the sustainability of our health systems

The initiative is unusual in the study as the MS started it. In contrast, the Commission is responsible for monitoring its progress and the overall principles of the Declaration, which are recognised as relatively ambitious. The Commission has also faced the challenge of formulating the monitoring indicators from relatively high-level concepts and principles, partly proving in practice that such topics can be monitored, even with some difficulties and imperfections. Although the initiative is young, with only one progress report[25] published, its focus on democratic values is crucial to Europe's digital strategy.

As noted above, BDM is also led by NIFO in parallel to the monitoring of the EIF, ensuring coherence between the two monitoring schemes as both relate to digital public services. In addition, interviewees noted its political value as an activity whose evidence may help shape future digital policy, including topics such as digital rights and principles. It should also be noted that each Presidency usually has a declaration related to digital policy (e.g., the Lisbon Declaration and the Strasbourg Declaration). Still, MS are asked to maintain the BDM as the current key initiative, making other Declarations focus on certain aspects and have its monitoring as the key mechanism across activities to avoid creating more burdens.

Digital Economy and Society Index (DESI)

The *Digital Economy and Society Index* (DESI), run by EC, has monitored MS's digital progress since 2014. DESI produces indicators and annual reports, including country profiles and thematic chapters offering a European-level analysis across key digital areas. Unlike the other established monitoring schemes focusing only on Government and Public Administration, DESI covers the entire spectrum of society, capturing digital transformation progress in government and businesses and on infrastructures such as the degree of connectivity and skills.

Besides, DESI also provides auxiliary related products, such as the *Women in Digital Scoreboard*[75], that assesses women's inclusion in digital jobs, careers and entrepreneurship.

eGovernment Benchmark (eGov)

The *eGovernment Benchmark* (eGov) first came out in 2016 to support the *2016-2020 eGovernment Action Plan*[61, pp. 2016–2020]. Its mission is to assess and compare how governments across Europe deliver digital public services from the point of view of the end user. It focuses on four aspects:

- **User Centricity** – To what extent are services provided online? How mobile-friendly are they? And what online support and feedback mechanisms are in place?
- **Transparency** – Are public administrations providing clear, openly communicated information about how their services are delivered? Are they transparent about policy-making, digital service design processes, and how people's personal data is processed?
- **Key Enablers** – What technological enablers are in place to deliver eGovernment services?
- **Cross-border Services** – How easily are citizens from abroad able to access and use online services? And what online support and feedback mechanisms are in place for cross-border users?

For the 2022 edition, users from participating countries assessed digital government services, visiting and evaluating over 14,000 websites, giving a good account of the depth and breadth of the monitoring exercise.

The specific websites were confirmed as suitable by the MS before assessments took place based on a set related to specific services related to *life events*. The eGovernment benchmark methodology[65] defines *life events* as:

> *"Packages of government services which are usually provided by multiple government agencies around a subject that occur in relation each other, from the perspective of the citizen or entrepreneur concerned. The eGovernment Benchmark covers nine life events (government domains)".*

The latter recently included online public health services to link with policy needs, including the *Single Digital Gateway*[76] and in discussion with *Directorate-General for Health and Food Safety* (DG SANTE). It is also possible that a specific central service may take a user to a local or regional level. The method sets criteria for the number of local services evaluated in a country and limits this to organisations with larger populations. A specific technique of mystery shoppers is then used to evaluate the resources independently. The users are, therefore, nationals of the country assigned by a contractor to do the analysis. The eGov framework also has automated techniques for gathering indicator results related to *Mobile Friendliness* and *Security*.

A key element of the work is also the engagement with the MS in the assessment, including workshops with an *e-government benchmark expert group* made up of representatives from relevant ministries in the MS who review the methodology. However, they try to keep it stable for longer-term comparisons and test novel approaches before launching, such as a recent pilot activity looking at usability that could lead to a related KPI in the future. There is also a bench-learning exercise in its benchmark report with individual MS. Consultancy and guidance are provided on how they can improve their online services and benchmark performance, discussed in bilateral meetings.

3.2 Primary planned activities

While the established activities described above are the focus of the landscaping exercise, several activities foreseen by the EC need to be considered, too. These activities, listed in **Figure 8** below, will be crucial both for tailoring the future EIF and for understanding how the EC monitoring schemes could be streamlined to reduce any administrative burden while having a holistic understanding of the state of digital transformation in Europe. For this reason, it is essential to establish communication channels already in the design phase with each of them to establish synergies and adapt incrementally with a common logic in mind.

Figure 8: Primary planned EC activities

Digital Decade 2030 targets

The Digital Decade is the consecration of the European priority *Europe fit for the Digital Decade*. As far as monitoring is concerned, the proposed policy programme in the *Path to the Digital Decade* will establish a monitoring and cooperation mechanism to achieve the common objectives and targets for the digital transformation of Europe. Although the indicator definition that will take the pulse of national progress towards the 2030 targets is still ongoing, it is known to be based largely on the DESI and will use quantitative indicators.

However, not only the 2030 targets will be measured, Digital COMPASS foresees a Governance structure with annual reporting and follow-up, as shown in **Figure 9**. The publication by the Commission of the first annual report on *the state of the Digital Decade*, scheduled for June 2023, will reflect the results of the first year of monitoring while providing recommendations.

Digital Decade and Digital Citizenship: rights and principles for Europeans

Under the umbrella of the Digital Decade, the *Declaration on European Digital Rights and Principles*[77] has been proposed, promoting the *European way of the digital transition*. It will complement existing rights, such as those rooted in the EU Charter of Fundamental Rights and data protection and privacy legislation.

The Commission will assess the implementation of the digital principles in the annual *State of the Digital Decade* report, supported by an annual Eurobarometer survey that will collect qualitative data based on citizens' perceptions of how the digital principles are implemented in various MS.

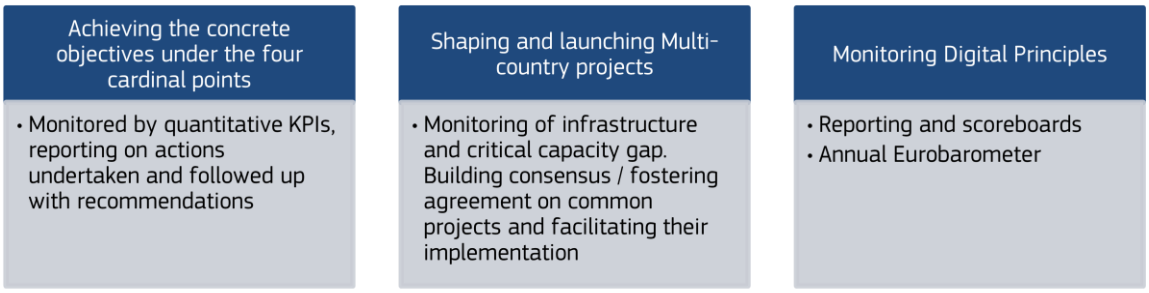


Figure 9: Digital COMPASS - Governance structure with annual reporting and follow up

Source: *2030 Digital Compass: the European way for the Digital Decade*

For the Digital Decade 2030, a new questionnaire will be set up to gather input from MS on their progress towards the targets and objectives defined in the Digital Decade Policy Programme.

Single Digital Gateway - Your Europe

Following the adoption of the gateway regulation in 2018, the European Commission and national administrations are developing a network of national portals to provide information to citizens and businesses on how EU rules apply in each EU country for cross-border users, as well as the support services available.

The Single Digital Gateway portal called *Your Europe*[54] makes this vision a reality by facilitating online access to information, administrative procedures and support services that EU citizens and businesses may need in another EU country.

By the end of 2023, Your Europe will offer access to 21 online procedures in all EU countries. Some of these procedures will be the registration of a car or the application for a pension completely digitized and eliminating paperwork, as well as any key administrative procedures for cross-border users.

This initiative is of great interest for monitoring the development of digitization of the public sector and, in particular, for the future Interoperable Europe Act, since it can be a source of information to be reused considering that the system in the back office of the portal involves interoperability measures and the use from Once Only Technical System.

Local and Regional Digital Indicators

An important recent development in EU digital policy involves a range of approaches involving sub-national government, with relevant activities in terms of monitoring. This emerging area of EC activity is important for the study as many frontline (and online) services, related Interoperability issues, and digital transformation should involve local and regional public administrations.

The EU socio-political movement, *Living-in.EU*[78] aims to join forces to boost sustainable digital transformation in cities and communities in the EU. The initiative was started by cities looking to scale up the outcomes of technology-related projects, something also relevant to the *sharing and reuse* approaches linked to Interoperability actions. A proposal for adopting the *EIF for smart cities and communities* (EIF4SCC)[79] has been made as part of the Interoperable Europe Policy Package.

Furthermore, efforts have been made to create a monitoring scheme to measure digital transformation at a regional and local level. The *Local and Regional Digital Indicators (LORDI)* monitoring framework is under development by the *Measurement and Monitoring Subgroup of the Living-in.EU* initiative. It does not currently have any other policy or legal base. The EC supports it, the *Committee of the Regions* and the *European Observation Network for Territorial Development and Cohesion* (ESPON) and the three initiatives at the heart of Living-in.EU, i.e. the *European Network of Living Labs* (ENoLL), *Eurocities*, and the *Open and Agile Smart Cities* (OASC) network. LORDI recognises the challenges of digital transformation at sub-national levels, especially where national government developments may not reflect local-level activities and smaller European

municipalities' scale, resource and capacity issues. LORDI aims to complement DESI but without the ambition of replicating it at the regional and local levels in its current form. However, future versions may provide evidence that DESI is a robust enough source. LORDI will help cities and regions develop and direct relevant policies, fulfil commitments and support access to financing opportunities while potentially providing evidence simultaneously as DESI towards the *Digital Assembly* and the European Semester in 2024.

LORDI's indicators will build on the experience of the *DIGISER* project[80], covering the aspects such as local digital infrastructure; development of local digital capacities and skills; local digital economy and services; governance and single digital market; and socioeconomic context. It will also reuse reference data from Eurostat and other authentic sources.

A specific feature of LORDI's monitoring approach worth mentioning is that it will not have a monitoring and reporting cycle, as current plans involve a continuous process of gathering evidence from cities and regions that will, in turn, be shared between stakeholders and contrasted with geostatistical information through an online platform (currently being designed). Users of the platform will be able to do a digital *health check* (or digital maturity assessment tool) and compare themselves with others who have submitted information, helping to direct their policies in a more targeted manner. There is also an aim to take a snapshot of content to contribute to the evidence base for the European Semester. It is planned that once sent, data would be reviewed by stakeholders every two years and removed if not updated. However, users may also update their data at any time. This approach relies on building a critical mass of users and creating the right communication package to ensure engagement.

Related to LORDI and Living-in.EU, and of interest to this study, is the EIF4SCC, which aims to raise awareness about the benefits of interoperability, including at the city level, where local governments across Europe may not have an established or discrete Interoperability policy. EIF4SCC also includes a new element, "*cultural interoperability*[4]", which touches on subjects such as inclusion.

EIF4SCC was recognised as important for digital transformation by DG CONNECT staff, as well as organisational Interoperability and multi-level governance issues. Interoperability is also promoted through the *Minimal Interoperability Mechanisms*[81] (MIMs) of OASC, which involves the difficulties of a broad range of actors not effectively addressing the same structures, processes and technical standards practically. In addition, DG CONNECT's work on dataspaces at a local level addresses topics such as organisational interoperability. There is also support from DG CONNECT for a digital twin toolbox and a DIGITAL-funded procurement process for data platforms to help stakeholders go into more detail and point them to useful resources. From the point of view of the study, any measurement of the uptake of these resources may offer data related to local-level digital transformation and related elements of interoperability.

European Digital Innovation Hubs

The *European Digital Innovation Hubs*[82] (EDIHs) are key to scaling up digital transformation. EDIH can be defined as one-stop shops that help companies respond to digital challenges and become more competitive. EDIHs combine the benefits of a regional presence with the opportunities available to a pan-European network.

The *Digital Transformation Accelerator* supports the network in different areas, such as the promotion and transfer of knowledge, and importantly for the study's objective, the measurement of EDIH's impact on organisations. To this end, EDIH clients from the private[67] and public sectors will complete a Digital Maturity Assessment survey.

The need to directly or indirectly measure interoperability has emerged in the discussions with stakeholders of these initiatives.

3.3 Secondary activities

Whereas the established and planned activities present the main focus area for the first phase of our work, there are a rich set of monitoring approaches that address different facets of digital transformation and/or

[4] "*Cultural interoperability refers to the approach taken by individuals and organisations to take into consideration their social and cultural differences and, if applicable, organisational cultural differences. Interoperability can be impacted by cultural differences, as individuals and organisations can respond differently to the same interoperability challenge. These cultural differences can, for example, be reflected in political challenges and leadership styles.*"

Interoperability in the public sector. These approaches are either already in place or still being researched, benefiting from EU-funded research and innovation programmes. Although these activities have not been examined in detail, they could be candidates for examination in the next phase of our work, with some examples given below as context.

Figure 10: Secondary activities – within the scope of this work

Recovery and Resilience Facility

Although the study has not examined the funding mechanisms used to support investments in public sector digitisation, the package of activities related to the *Recovery and Resilience Facility*[2] (RRF) is worth noting. As part of *NextGeneration* EU73's €800 billion (approx.) recovery plan from the COVID pandemic, investments will be made in areas relevant to the Digital Decade, including digital skills, eID to access public services and, more broadly, investments in smarter cities using AI to support public sectors policy areas such as health, transport and education. The RRF, in particular, is seen as one of the main means to achieve both a green and digital transformation in Europe, partly through Member States' recovery plans. Having been in place for two years, Communication[74] has highlighted some relevant aspects for this study, including that around €131 billion contributes to the digital transformation of Europe's economies and societies through grants and loans. The RRF also has a scoreboard[75] transparently showing such investments at the national level (as well as European summaries noted below) that are also performance-based and tied to the cycle of the European Semester. The communication notes that the investments help reforms to take place where public funding can be limited, giving examples such as digitalising public administration in Slovakia and Portugal, where the latter's efforts focus on "*simple, inclusive and secure public services for citizens and businesses*".

Six pillars are mentioned in the scoreboard, with digital transformation being one of them, where 874 measures and 2,219 milestones or targets are foreseen. By far, the largest policy area for investment is *e-government, digital public services (including digitalisation of transport) and local digital ecosystems*, covering 37% of investments. *A delegated regulation[76] has also set out some indicators for the RRF performance, where Common indicator 7* involves 116 million users of "*new and upgraded public digital services, products and processes*". Moreover, at the end of 2021, reports provided some evidence of where countries were investing in digital public services, with Italy €17.6 billion, Germany €7.1 billion, Spain €6.1 billion and France €3.2 billion covering almost three-quarters of the investment budget in the EU. Because of this type of monitoring and data, the RRF is worth reporting in this study.

The mid-term evaluation of the RRF is expected for 2024, where progress in policy and the specifics of digital transformation and other recovery-related policies could be examined further.

European public administration country reports

The *Directorate General for Structural Reform Support* (DG REFORM) provides a set of country reports[73] to present an overview of the characteristics and recent developments in the public administrations in the MS from a qualitative and quantitative perspective. They are based on analytical work under the *European Public Administration Country Knowledge* (EUPACK) project[83]. The EUPACK is a multi-annual initiative of the Commission to develop the country and thematic knowledge on the EU Member State public administrations' functioning and reforms. Such knowledge enables country analysis, helps identify reform priorities and eases the effective delivery of technical and other EU support for improving capacity in the MS. A full chapter on service delivery and digitalisation is particularly interesting to the study - *Quality of Public Administration A Toolbox for Practitioners - Theme 5: Service delivery and digitalisation*[84].

UserCentriCities

Co-financed by the European Union's Horizon 2020 research and innovation programme, the *UserCentriCities*[85] project developed a platform for local authorities at city and regional levels to compare their performance with their peers and exchange mutual learning about delivering user-centric services. Based on a list of curated indicators, the *Benchmarking Dashboard*[86] ranks the performance of European cities and

regions in designing and delivering digital services that focus on citizens and their needs. Underling resources are offered as open data[87] in different formats.

Beyond the contribution to monitoring, it is also worth noting that the *User-Centric Services Repository*[88] and *Service Design Toolkit*[89] provide handbooks and tools that support adopting a user-centric approach. Such material might be highly relevant in related work on human-centric and (public) value-based digital public services.

Understanding value co-creation in public services for transforming European public administrations (Co-VAL)

Co-VAL is another EU-funded research project that aims to find new ways of examining the value co-creation and its integration to transform public administration services and processes. It promotes the principle that local and national institutions must collaborate closely to deliver a digital government that serves the users' needs. Following the e-Government Renewal Co-VAL policy brief[90], which presents six recommendations for achieving the required collaborations, the project developed a dashboard to understand how local and national governments perform against these recommendations. These dashboards and Co-creation DASHBOARDS[91] (country and municipality level) are relevant to the study.

The data availability is summarised in a *MetaIndex*[92], which considers the completeness, update frequency and machine readability of uptake data on five key digital service topics: eID, ePayment, Messaging, Transparency and General Digital Services by different stakeholder groups. The indicator model and definitions are available online.

3.4 Additional relevant activities

Throughout the work, we came across many initiatives and related monitoring approaches, all relevant but not included in the initial scope that focussed on a first selection for its deeper analysis. These approaches are highlighted in the figure below and could be explored further should stakeholders see them as relevant.

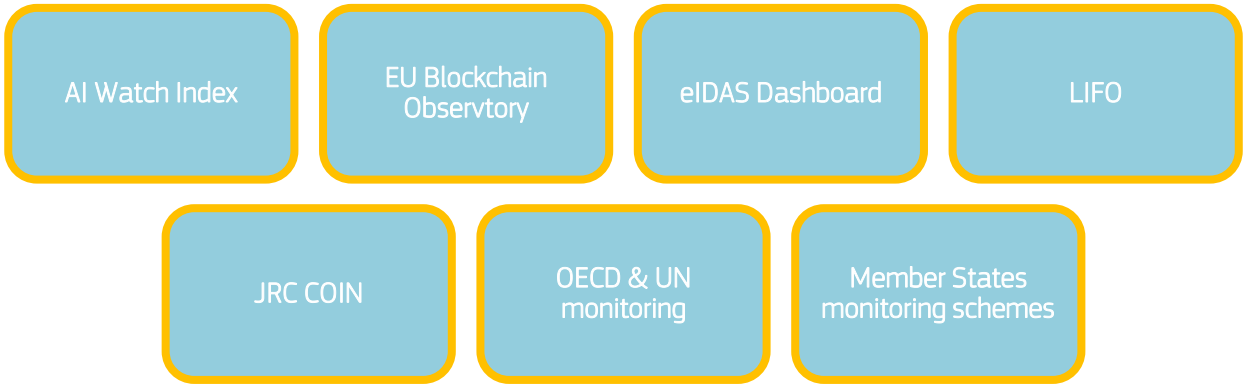


Figure 11: Extended ecosystem of additional relevant activities - within the scope of this work

AI Watch Index

In the fast-paced AI revolution, reliable data on AI-related investments by the private and public sectors are unavailable. This unclear view of AI diffusion constraints informed decision-making. AI Watch has developed a comprehensive methodology to estimate AI investments and applied it to the European economy.

The full report on the methodology and a feedback form are available on the *AI Watch* platform[93], alongside other aspects of developments presented in the *AI Watch Dashboard*[94].

EU Blockchain Observatory (& Forum)

The *European Union Blockchain Observatory and Forum*[95] aim to accelerate blockchain innovation and the development of the blockchain ecosystem within the EU and so help cement Europe's position as a global leader in this transformative, innovative technology. Its objectives include monitoring blockchain initiatives in Europe and producing a comprehensive source of blockchain knowledge.

eIDAS Dashboard and eID

eIDAS Regulation on Electronic Identification, Authentication and Trust Services[96] established the framework to ensure that electronic interactions between businesses are safer, faster and more efficient, no matter in which European country they occur. It is a European Regulation that created one single framework for electronic identification (eID) and trust services, making it more straightforward to deliver services across the European Union. The Regulation states that by 2018 all online public services requiring specific electronic identification assurance must be able to accept notified eID schemes from other countries.

The *eID CEF Building Block* comprises a set of services (including software, documentation, training and support) for identification in line with the eIDAS Regulation. *Connecting Europe Facility*[97] (CEF) supports countries in the roll-out of the *eIDAS Network,* the technical infrastructure which connects national eID schemes through the so-called eIDAS Nodes. As stated on the website:

> *Service Providers, usually public administrations and private sector organisations, may then connect their services to this network, making these services accessible across borders and allowing them to enjoy the legal recognition brought by eIDAS. In order to support them through the implementation of their eIDAS-Nodes, node implementers can benefit from the interoperability readiness test performed by the European Commission.*

A dashboard on the CEF website[98] provides highlights, and a dashboard on eID with indicators including aspects of uptake, service availability or reuse data was available every year until Q4 2021.

Relatedly, DG CONNECT has also foreseen a study[99] to gather evidence on eID about the targets of the Digital Decade.

Location Interoperability Framework Observatory (LIFO)

The *Location Interoperability Framework Observatory* (*LIFO*)[100] monitors the implementation of location interoperability good practices in European public administrations based on the level of adoption of recommendations in the EULF Blueprint.

The European Union Location Framework Blueprint (*EULF) Blueprint*[101] guides the implementation of the *European Interoperability Framework* (EIF) in the geospatial domain. Consequently, the LIFO complements the EIF monitoring scheme operated by NIFO with one indicator (as shown later in section *4.2.2 Indicator descriptive analysis*). LIFO data collection was carried out first in 2019. It involved ten participating countries, with a second data collection in 2020 that involved 23.

The information collected allows national and overall European status to be compared. That helps to identify strengths and areas needing improvement, uncover best practice solutions and plan appropriate measures, including potential partnerships and reuse of solutions.

Composite Indicators & Scoreboards Explorer (JRC COIN)

Many activities measure complex and multidimensional issues, but all this information is dispersed across different publications and websites. Finding what matters in a world awash in data stays challenging for scientists and policymakers. In response, the JRC has created the *Composite Indicators and Scoreboards Explorer*[102]. More than just another data tool, Explorer aims to create a home to all well-known multidimensional measures that can help us take the pulse of our societies.

The Explorer builds on 20 years of expertise and over 100 collaborations on indicator frameworks at the JRC. It draws on various data sources from organisations developing composite indicators and scoreboards worldwide.

By exploring the country profiles, it is possible to understand how a particular country performs in each policy area, from the 17 Sustainable Development Goals to the six EC political priorities, supplying an overall picture of the different indices within each policy area.

OECD *Going Digital Toolkit* and *Digital Government Index*

The OECD's website *Going Digital Toolkit*[103] helps countries assess their state of digital development and formulate policies in response. Given that digital transformation crosses many aspects of the economy and society, the OECD application allows for exploring cross-cutting issues and finding relevant indicators. Among the different topics is that of *Digital government*[5], including indicators from the OECD Digital Government

[5] Digital government bookmark from the OECD's Going Digital toolkit https://goingdigital.oecd.org/theme/1

Index101 and other OECD statistics, including the "*Share of individuals using the Internet to interact with public authorities*".

UN e-Government Surveys and UN-eKnowledgebase

The United Nations *E-Government Development Index* presents the progress of its members on eGovernment matters. Along with an assessment of the website development patterns in a country, this Index incorporates the access characteristics, such as the infrastructure and educational levels, to reflect how a country uses information technologies to promote access and inclusion of its people. The EGDI is a composite measure of three important dimensions of e-government: the provision of online services, telecommunication connectivity and human capacity.

The United Nations E-Government Survey 2022[104] is the 12th edition of the United Nations' assessment of the digital government landscape across all 193 MS. The E-Government Survey is informed by over two decades of longitudinal research, with a ranking of countries based on the United Nations *E-Government Development Index (EGDI)*, a combination of primary data (collected and owned by the United Nations Department of Economic and Social Affairs) and secondary data from other UN agencies.

The 12th edition of the survey included data analysis in global and regional contexts, a study of local e-government development based on the *United Nations Local Online Service Index* (LOSI), consideration of inclusion in the hybrid digital society, and a concluding chapter that outlines the trends and developments related to the future of digital government. It features extensive annexes on its data, methodology and related pilot study initiatives as wish all editions.

The *Online Service Index* (OSI) provides a composite normalised score based on an *Online Service Questionnaire* as part of the knowledge base. Furthermore, the Local Online Service Index (LOSI) serves as a multi-criteria index that captures e-government development at the local level by assessing information and services provided by municipalities to citizens through their official websites.

This wealth of information can also be accessed through the *United Nations e-government development database*[105] (UNeGovDD). According to the website, UNeGovDD "*is a benchmarking tool that provides a comparative assessment of the e-government development of UN Member States. It offers an interactive snapshot of each country's e-government development from a regional and global perspective*."

Member States monitoring schemes

MS also have their own (often national) digital policies, with related monitoring activities, offering interesting practices, including dashboards that *take the pulse* of the implementation and use of digital public services (see also **Table 7**).

From this broader view of the EU policy landscape relating to digital transformation and Interoperability monitoring, it is possible to explore the four key monitoring schemes in more detail.

4. In-depth analysis of the EC's established monitoring schemes

4.1 Schemes overview

The in-depth scheme analysis presented in the following sections gives the first answers to the study question:

Which monitoring schemes and specific indicators address interoperability and digital transformation of government?

Which is essential to understand eventual issues and possibilities for improvement in the scope of the study?

The analysis is based on the latest methodological sources available at the time of the research[6]., listed in **Table 1**

Table 1: Monitoring scheme methodologies used

Scheme	Version used	Note
DESI	2022 Methodological note[106]	Referring to the 2021 Data collection
eGov	2020-2023 Method paper[107]	
EIF	2020 Analytical model [Excel file][108]	Comprises MS results gathered in 2020 and published in 2021
BDM	2022 [First] progress report [Appendix I][25]	Referring to the 2021 Data collection

4.1.1 Schemes' structure and components

The structure behind the analysed schemes varies significantly, including in naming their components, as shown in **Figure 12**. Although the study focuses primarily on the indicator level, the terminological differences among components add complexity to the mapping. Harmonisation efforts in using common structural concepts and terminology would make the reuse of indicators and the comparability for analysis more straightforward.

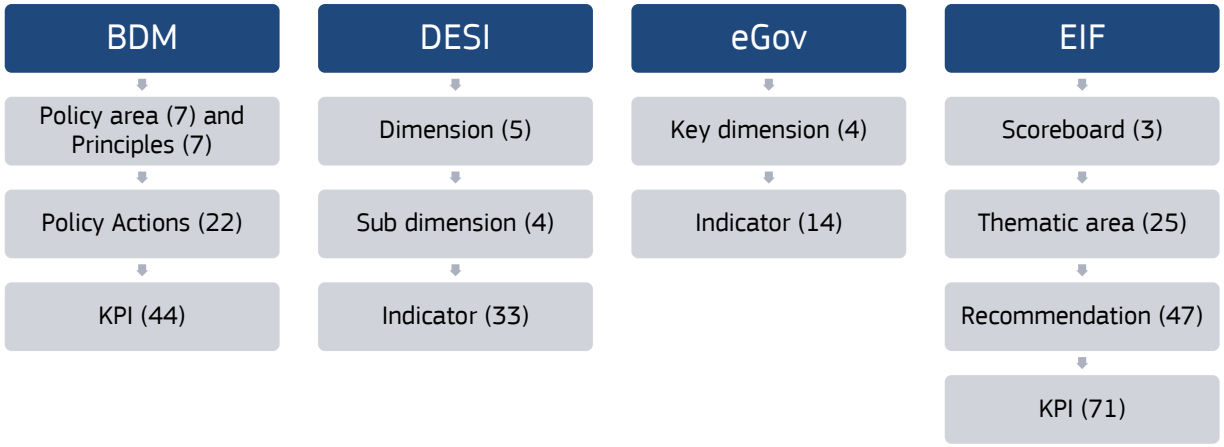


Figure 12: Components of the analysed monitoring schemes

Still, on terminological/conceptual differences, the study team has observed that the same concept of *indicator* or *KPI* differs among schemes. eGov Benchmark indicators (**Figure 13**), for example, act as *composite indicators* with different granularity than other schemes. Their 14 indicators are subdivided into other facets offering more detailed information, such as portals/web services, business/citizens, life events, and national/cross-border

[6] The table lists the latest mtholodological notes available at the time of the analysis.

aspects. This is confirmed by the reuse analysis between schemes where, in some cases, the indicator reuse of the eGov Benchmark information relates to disaggregated aspects. The BDM indicators 7 and 8 reuse only a part of the eGov's indicator *2.3 Transparency of service design*[7].

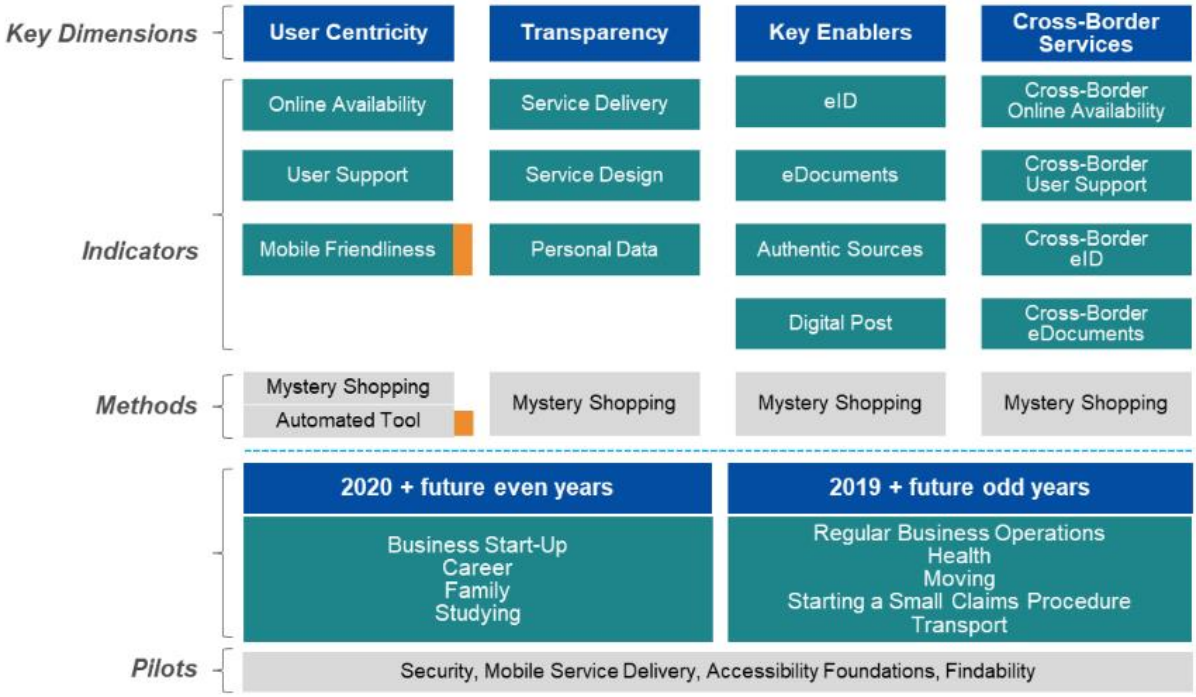


Figure 13: eGovernment Benchmark framework.

Source: *eGovernment Benchmark 2020-2023 Method Paper*

Another important aspect, in this case, is the way that topics are split over two-time horizons, with some measurements taking place in odd years (e.g., 2019 ongoing) and others in even years (e.g. 2020 ongoing). Arguably, this split also can reduce the burden of monitoring to focus on certain topics in these years, which will be addressed below in the analysis.

4.1.2 Spatiotemporal coverage

All four schemes focus on the national administrative level covering the European Union's 27 MS (EU 27). However, on many occasions, the coverage goes far beyond the EU27 boundaries, including the EFTA countries, neighbours and/or EU candidates. This spatial completeness means that analyses are well-placed to compare the condition of indicators across the EU and beyond.

As for temporal comparability, schemes were updated annually. However, their time series varied depending on when the monitoring scheme was born. Some have a journey of almost a decade, while others, such as BDM, are just taking their first steps with a single monitoring cycle. In addition, several time breaks related to significant changes in the scheme's conceptual models have been noticed, implying a comparability limitation over time and between schemes. **Table 2** summarises the schemes' geographical and temporal coverage.

[7] Namely *E2 Does the website provide information on the user's ability to participate in policy making process?*; and *E4 Does the website provide information on how users can enrol in any activity to improve the design and delivery of services?*

Table 2: Geographical and time coverage of analysed monitoring schemes

	DESI	eGov	EIF/NIFO	BDM
Geographical coverage	EU27 +8	EU27 + Albania; Iceland; Montenegro; North Macedonia; Norway; Serbia; Switzerland; Turkey; United Kingdom	EU-27 + Iceland; Liechtenstein; Montenegro; Switzerland; Turkey; Ukraine	EU 27
Spatial coverage	2014 - 2021	2016 | 2017 | 2018 | 2019 | 2020 | 2021[9]	2015 | 2016 | [10]2019 | 2020 | 2021	2021

4.1.3 Inter-schemes data/information flows

An element that came to light in the initial stages of the study was the relatively informal collaboration between the schemes analysed, later confirmed through interviews and data analysis.

The interactions between schemes are of at least two types: "*indicator reuse*" and "*contextual information reuse*". **Figure 13** summarises the sequence and number of indicators reuse between schemes. At the same time, **Figure 15** shows the data flow broken down by data sources.

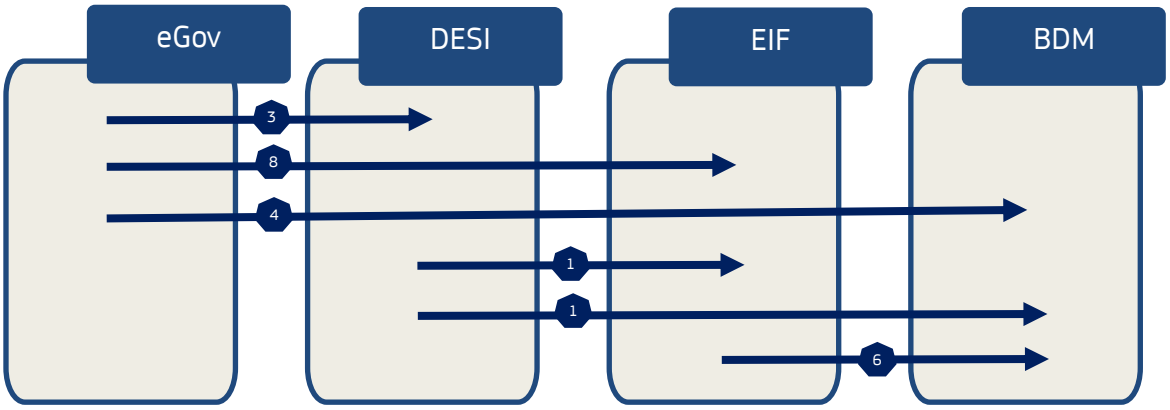


Figure 14: Indicator reuse across schemes

[8] For some dimensions, DESI has data for countries beyond EU 27
[9] There is a comparison break between e-Government Benchmark 2013-2019 and 2020 onwards
[10] Gap between 2017 and 2019. Non-comparable monitoring assessments.

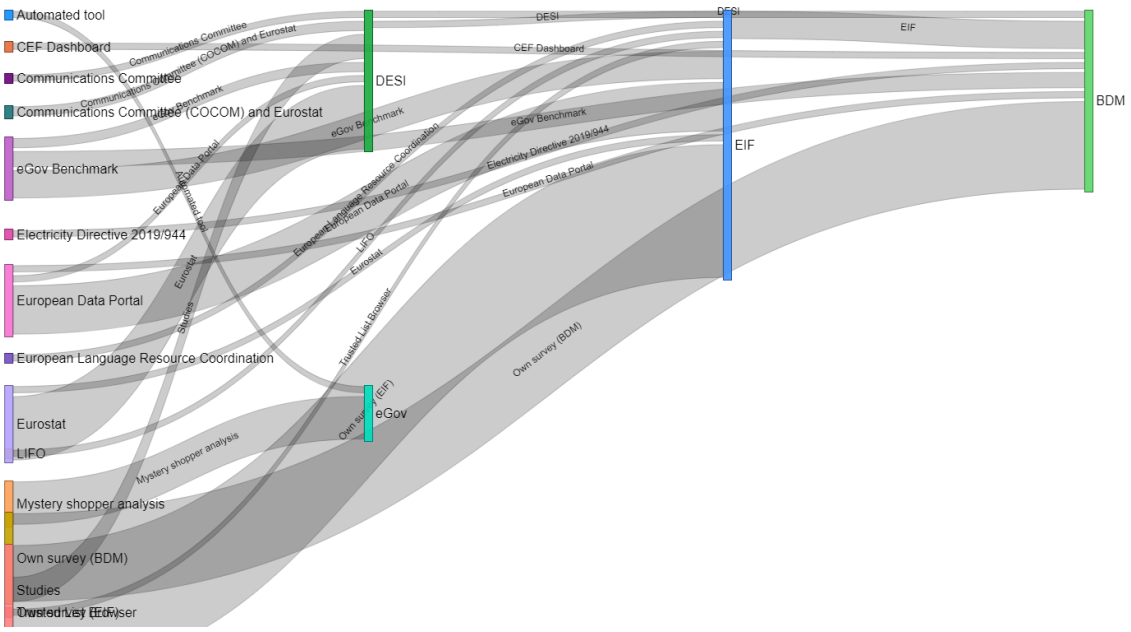


Figure 15: Indicator reuse by scheme broken down by data source

The data exchange between schemes is only a part of the information exchanged, as qualitative and contextual information in key output documentation, such as the Country/European state of play reports, are also reused. For example, the eGov Benchmark has acknowledged the role of *NIFO's Digital Public Administration factsheets* to keep its policy context sections updated.

Moreover, schemes from the same departments naturally tend to coordinate. For example, DIGIT D2 on Interoperability Unit ensures consistency between the NIFO/EIF and BDM monitoring schemes, ensuring resource optimisation through joint data collection and information reuse.

Inter-scheme data flows emphasise *input* and *output* relationships and dependencies that are key when considering the schemes' varying timelines.

4.1.4 Schemes timelines

Understanding the approximate timeframes each scheme needs to produce a monitoring cycle is key to planning and minimising dependency risks. **Figure 16** shows the approximate timelines subdivided into four key stages that all four schemes follow. The four phases considered in a monitoring cycle are:

- **Preparation**: includes the review of indicators and agreements with key stakeholders and confirmation of their participation, as well as data verification through which the data correction conditions are verified.
- **Data collection**: includes the data collection, both of primary and secondary origin. The periods can be extended for survey-based data collection by requiring periodic reminder activities to ensure that the population sample adds their contributions.
- **Data processing:** includes activities to obtain information from data collected during data collection. It also consists of the data validation phase involving the Member State representatives.
- **Publication:** involves completing and publishing reporting artefacts that may result from publishing raw data and file-based reports and/or charts to dashboards and data platforms.

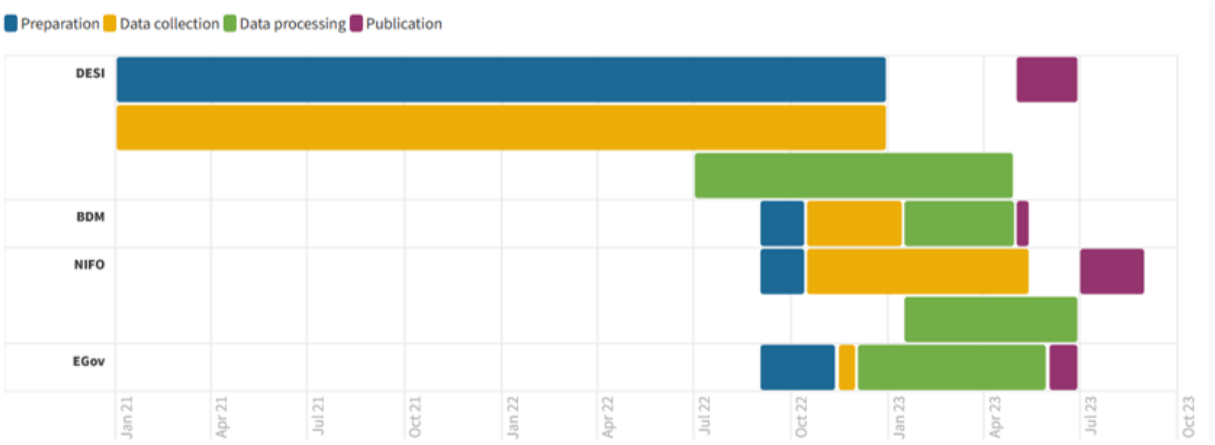


Figure 16: Approximate timelines with key stages of analysed monitoring schemes

The timeline diagram shows significant variability in the duration of the *Preparation* and *Data Collection* phases between the four main monitoring schemes.

DESI emphasises in its 2022 methodology the duration of preparatory phase efforts performed over the year.

> *"It is important to note that the Commission organises two technical workshops annually under the Digital Single Market Strategic Group to discuss the future evolution of data collections and the index. Changes made in DESI 2022 have been agreed with MS in the Strategic Group."*

The *Data Collection* duration ranges from two weeks in the case of the eGov to up to two years in the case of DESI. Schemes with longer data collection durations generally depend on external sources. This is the case of DESI requiring data from Eurostat and eGov and of NIFO awaiting data from the eGov and DESI. In these cases, the monitoring schemes work in parallel in processing the data available. Consultants in charge of NIFO/EIF use the waiting time to obtain secondary sources to, in parallel, update *Digital Public Administration Factsheets'* contextual changes so that they can be reviewed early by MS. Key sections of the report that are updated are, for example, *Digital Public Administration Highlights, Political Communications* or *Legislation.*

If secondary sources bring advantages such as cost reduction and decreased administrative burden, it is not risk-free, as it does not guarantee timely information. Schemes relying on secondary sources lose some control over the data collection process.

Regarding the publication phase, the timelines point to a general preference to have the monitoring finalised with the publication of the end product (generally as reports) before the summer break, potentially to obtain a greater impact. This brings to light tensions between the publication needs and data dependencies between schemas. That is the case for BDM, whose annual publication is scheduled for mid-May, coinciding with the final phase of the first European Semester in June. This rigidity in the publication date obliges BDM to use DESI and the eGov Benchmark data of the precedent year and/or use the EIF unpublished data. **Figure 17** shows how the data flow and dependencies sequence differs from the temporal publication needs. It is also worth noting how the close relationship between the eGov and DESI causes them to be published as a joint package.

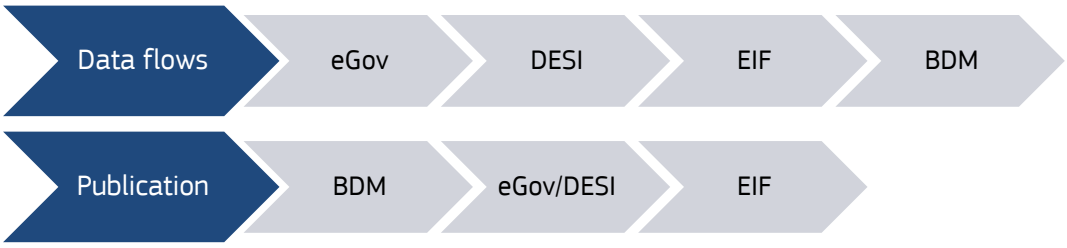


Figure 17: Differences in data flows dependencies and publication needs across the analysed schemes

The mismatching also shows a fragile situation that can easily lead to bottlenecks and cascading delays, as experimented in 2022, whereby DESI had to delay its publication to autumn, producing subsequent delays in dependent schemes.

4.1.5 Stakeholders involvement

Figure 18 summarises the different stakeholder groups involved in the analysed monitoring schemes. The close cooperation with the MS is a notable feature of the monitoring, making requests for information more feasible and accurate. The composition varies significantly across schemes, with DESI being the scheme dealing with a greater number of formalised stakeholder groups.

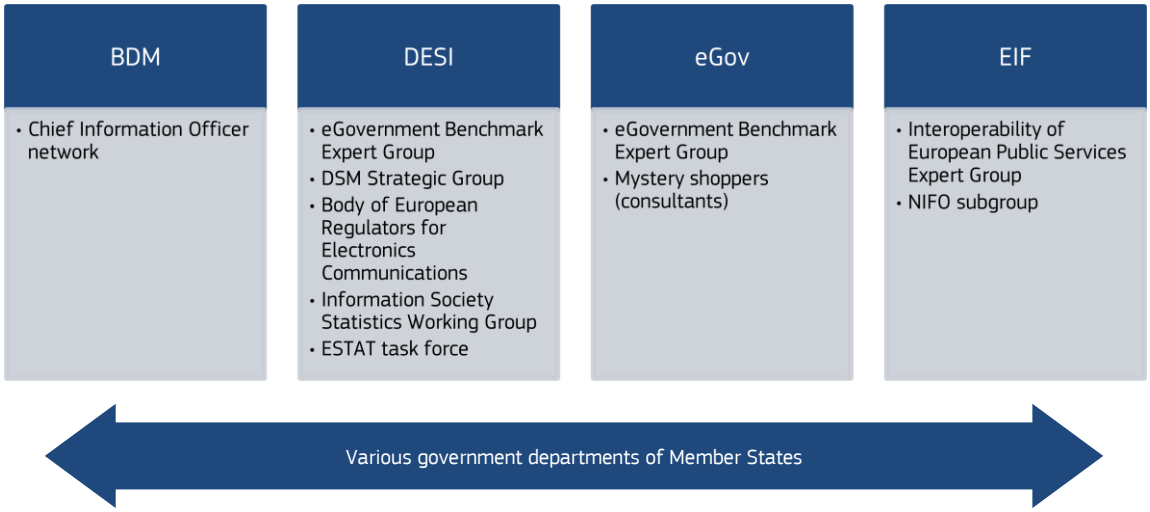


Figure 18: Group of stakeholders involved in the analysed monitoring schemes

All initiatives analysed involve MS representatives with greater or lesser involvement. Requests for MS interaction are also numerous across the different monitoring cycle phases. Generally, MS are involved in the review/design of indicators and in validating data and subsequent reports. As shown in **Figure 19**, DESI's methodology lists the key role of national authorities and appointed national representatives in its data collection and validation phases.

Data source	Data collection process
Eurostat	Data collected and verified by the national statistical offices or by Eurostat.
Communications Committee (COCOM)	Data collected and verified by the national regulatory authorities (by data experts appointed by the members of the Communications Committee in every Member State).
Broadband coverage studies	Data collected by IHS Markit, Omdia and Point Topic and verified by the national regulatory authorities (by data experts appointed by the members of the Communications Committee in every Member State).
Retail broadband prices studies	Data collected by Empirica and verified by the national regulatory authorities (by data experts appointed by the members of the Communications Committee in every Member State).
e-Government benchmark	Data collected by Capgemini and verified by relevant ministries in every Member State.
Survey of businesses on the use of digital technologies	Data collected by Ipsos and iCite, survey results have been reviewed by the Digital Single Market Strategic Group.
European data portal	Data collected by Capgemini from representatives appointed by the relevant ministries in every Member State.

Figure 19: Involvement of national authorities in DESI's data sources

Source: *DESI 2022 Methodological note*

Other examples of involvement include EIF and BDM requests for primary data to the appointed MS representatives and the eGov requesting validation of digital public services preselection to ensure these would be appropriate services to assess.

Other requests for EC monitoring exercises, such as the *European Open Data Portal*[72], and other organisations, including national and international initiatives such as the *Organisation for Economic Co-operation and Development* (OECD), the *United Nations* (UN) and the *World Bank*, "*compete*" for MS input. Several interviewees have mentioned that given the volume of work needed throughout the year, some MS have appointed a coordinator or have even created a *specific* coordination department to deal with and refer requests to the most appropriate colleagues in their public administrations.

Representative groups are sometimes formalised and registered as EC Expert Groups in the *Register of Commission Expert Groups and Other Similar Entities*[109]. It remains unclear who each expert group addresses as organisations or individuals in the MS and if there is any coordination across groups within an MS.

Although the nomination is a national decision, the same MS representative is sometimes involved in similar EC requests. Risks of policy interest overlapping can appear when engaging with different individuals with varying perspectives, as this could bring inefficiencies or less cohesive perspectives at a national level. One interviewee noted a challenge on BDM:

> "*…the way the Declaration was written is quite challenging because it also requires the MS to coordinate to make several ministries work together and a lot of coordination within the MS (and)… they don't have a lot of time to compile all the all the data*".

It is also interesting to see how groups evolve with policy. For example, the *Digital Single Market* stakeholders will be taken over by the new *Digital Decade Board* for certain aspects. In the interviews, DG CONNECT indicated a desire to have "*one single point for each Member State in an Expert Group*". Activities are also taking place with Boards such as Artificial Intelligence, European data Spaces and public sector modernisation.

Having such groups is also a strength, as it creates a series of stakeholder relationships to help a defined community for consultation around the policy cycle. However, the proliferation of boards with no coordination can become an issue.

> *"Would it be legitimate to suggest bi-annual meetings of these boards and groups to share work plans and communications/timing of activities beyond interservice consultation? I think this because they may also have their own legitimate role and areas of expertise. Still, when there is overlap, there is the condition for a proliferation of groups and evidence gathering that could become genuinely overwhelming*."

4.1.6 Monitoring schemes' feature comparison

Understanding how the schemes work and their features requires approaching them from the (re)user perspective. To this end, a set of elements have been assessed for all four cases. The list of checked elements and the results appear below in **Table 3**. Good practices were found, but some areas could be further improved to help data/information access and reuse.

Table 3: Data management features of the analysed monitoring schemes

Checked elements for each scheme.	BDM	DESI	eGov	NIFO/EIF
Provides structured scheme metadata	☒	☑	☑	☒
Provides structured indicator metadata	☒	☑	☑	☒
Provides methodology	☑	☑	☑	☑
Provides raw data	☒	☑	☑	☑
Serves API	☒	☑	☑	☒
Provides interactive data visualisation	☑	☑	☑	☑
Indexed in European Data Platform	☒	☒	☒	☑
Indexed in JRC COIN (Composite Indicators) Explorer	☒	☑	☑	☒

Provides monitoring scheme metadata

Although BDM and NIFO/EIF websites provide information on their monitoring schemes, no structured metadata description has been found compared to eGov[11] and DESI (See **Figure 20**).

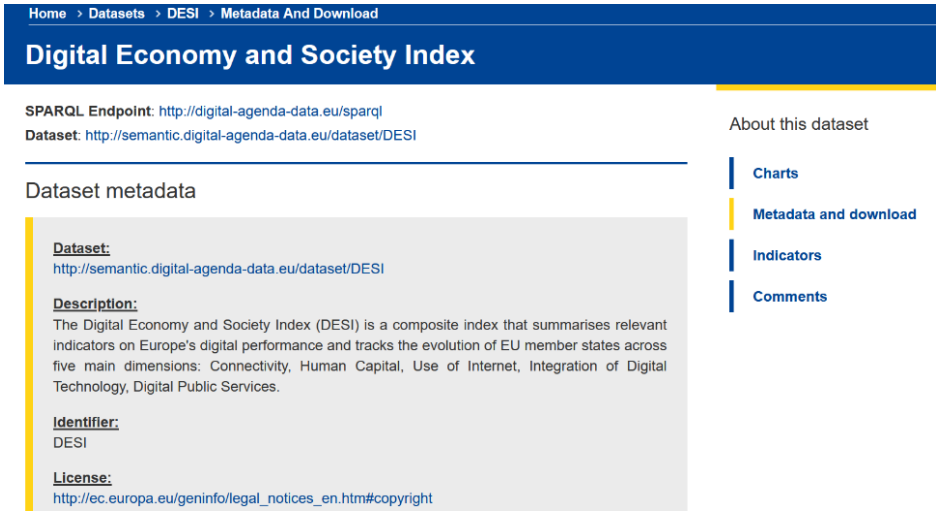


Figure 20: Metadata of DESI monitoring scheme

Source: *https://digital-agenda-data.eu/datasets/desi*

Featured metadata elements in eGov and DESI include the scheme's Uniform Resource Identifier (URI), description, identifier, license, and title. In addition, they list available dimensions, codes used and attributes.

[11] Structured scheme metadata for eGov and DESI are available respectively at: https://digital-agenda-data.eu/datasets/e-gov and https://digital-agenda-data.eu/datasets/desi

The resource also offers downloadable data suitable for human consumption and machine-to-machine communication.

Provides indicator metadata

Again, only structured indicator metadata has been found for DESI and the eGov (See **Figure 21**). Indicator details can also be obtained by browsing the indicators webpage[12]. Details include source, indicator scope and definition, and temporal coverage.

Figure 21: Example of structured metadata for eGov indicator "*User centricity*"

Source: *https://virtuoso.digital-agenda-data.eu*

Provides methodology

The four schemes make available their methodologies, although their form and content are highly variable. While BDM includes it in an appendix of its annual report[25], EIF includes it in a separate Excel file (**Figure 22**) that is annually updated alongside the scores obtained by the participating countries.

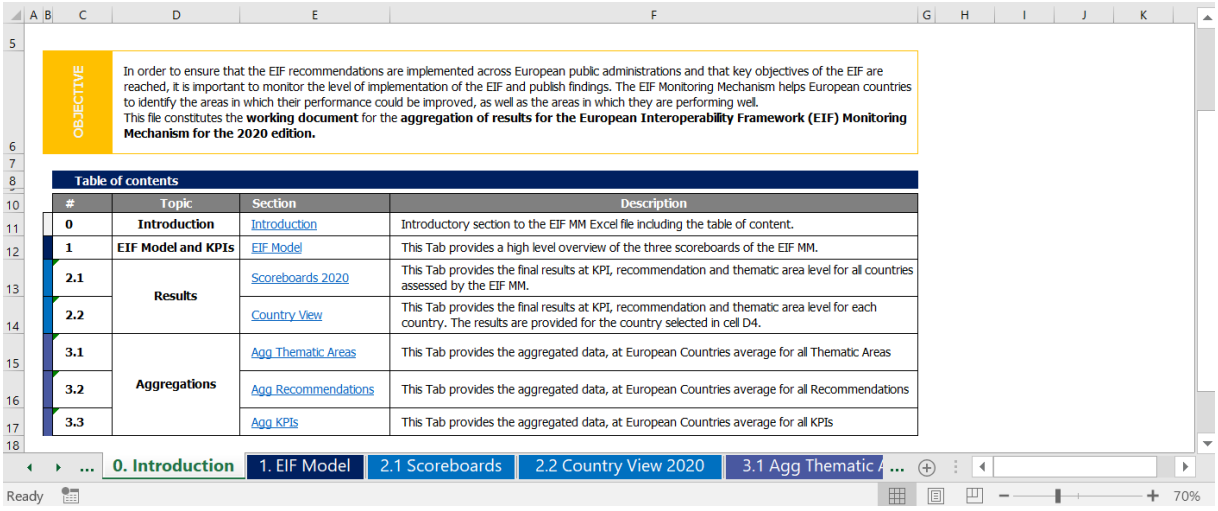


Figure 22: Screenshot with a tab of the EIF file, including the analytical model and results for 2020 data collection

Source: *EIF 2020 data collection results*

[12] https://digital-agenda-data.eu/datasets/desi/indicators

DESI and the eGov, for their part, provide the methodologies as PDF documents, respectively, *Methodological note*[106] and *Method paper*[107]. All the methodologies are reviewed annually, except for eGov's, whose work is valid for a more extended period. The last one covers 2020-2023 due to their need to evaluate life events in different years.

Arguably, DESI's methodology seems the most complete, including methodological considerations such as data flags, normalisation, imputation of missing observations, weights, and aggregation method. In addition, it includes specific methodologies used for specific indicators, such as the *Broadband Price index* indicator included as an annex.

Concerning *Methodological soundness*[13], some schemes have followed international guidelines and good practices or obtained specialised teams' support to strengthen their methodological approaches' robustness.

BDM, for example, has relied on the *Joint Research Centre - Composite Indicators and Markers Competence Centre (JRC COIN) team* to define the scoring mechanism to ensure a statistically sound evaluation[14].

JRC's Competence Centre on Composite Indicators[110] brings together scientific and analytical expertise that can be applied across policy areas. The competence centre examines available methodology within its remit. It provides Commission services with quality-controlled tools that support European Union policies' conception, implementation and evaluation. COIN includes supporting and assisting policy Directorate-Generals and technical training, as indicated in the Better Regulation Toolbox 43.

DESI declares in its methodological note to follow the *Handbook on Constructing Composite Indicators*[111], jointly produced by the OECD (the Statistics Directorate and the Directorate for Science, Technology and Industry) and the JRC Applied Statistics and Econometrics Unit.

The *Handbook on Constructing Composite Indicators* is a guide for constructing and using composite indicators for policymakers, academics, the media and other interested parties.
While there are several types of composite indicators, this Handbook is concerned with those that compare and rank the performance of countries in areas such as industrial competitiveness, sustainable development, globalisation, and innovation.
The Handbook aims to contribute to a better understanding of the complexity of composite indicators and improve the techniques currently used to build them. In particular, it contains a set of technical guidelines that can help improve the quality of composite indicator results.

[13] Defined in the SDMX Metadata Common Vocabulary 2009 as "*Extent to which the methodology used to compile statistics complies with the relevant international standards, including the professional standards enshrined in the United Nations Fundamental Principles for Official Statistics.*"

[14] As indicated in the 2022 report of the Berlin Declaration Appendix I - Methodology 1.1 Approach to design the monitoring scheme,

Provides raw data

All schemes except BDM provided raw data when authoring this report. EIF supplies separated annual Excel files that can be downloaded from the EIF monitoring webpage. eGov and DESI include historical data and allow for more flexible download options, including different open formats suitable for different usage types (human consumption, machine-to-machine consumption), as shown in **Figure 23**.

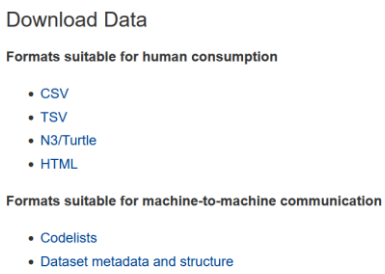


Figure 23: Download options for eGov and DESI

Source: *https://digital-agenda-data.eu/datasets/desi*

Serves API

Only DESI and eGov served streamed data through an API, specifically through a shared SPARQL[15] endpoint at https://digital-agenda-data.eu/data/sparql. (**Figure 24**).

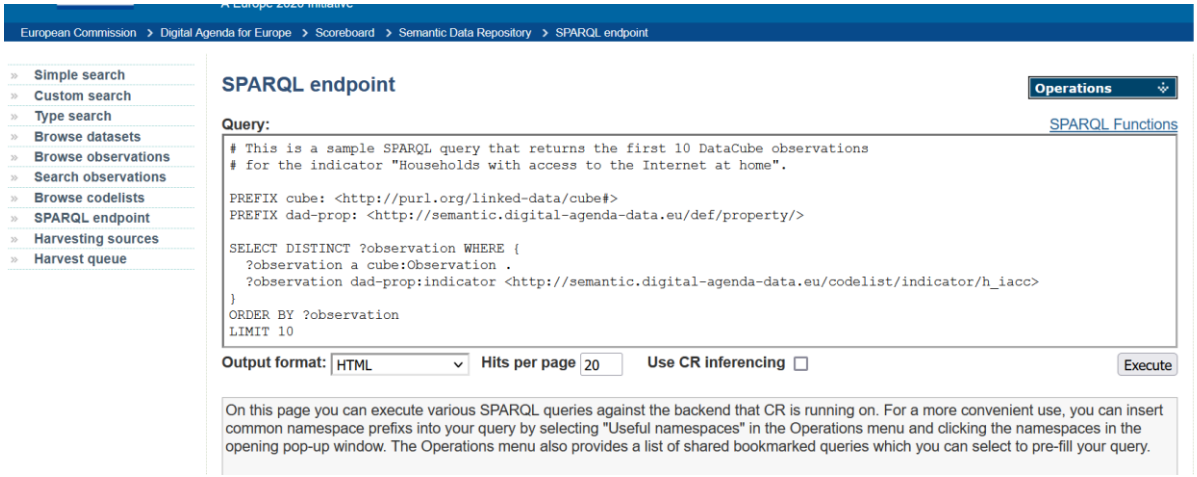


Figure 24: DESI ad eGov SPARQL query interface

Source: *https://digital-agenda-data.eu/data/sparql*

Provides interactive data visualisation

All schemes analysed included capabilities to view the results as interactive graphics; some screenshots are illustrated in **Figure 25**.

While EIF and BDM have done this through dashboards powered by the proprietary *Microsoft Power BI* tool, eGov and DESI are based on the DAD tool[16] developed by the Commission that allows data and metadata to be

[15] SPARQL is a standard query language and protocol for Linked Open Data and RDF databases.

[16] The tool named "digital-agenda-data", or by its acronym DAD tool, is an open-source tool whose source code is available on GitHub at: https://github.com/digital-agenda-data.
It is well documented in the tool documentation section at https://digital-agenda-data.eu/documentation . The tool originated in a project supported by contract SMART 2015/1086 (in continuation of SMART 2012/0103) executed by Eau de Web in partnership with Triple Dev.

served and displayed with different preconfigured graphics. Once a chart is selected, the user can drill down and change some settings.

DESI preconfigured graphics are:

1) DESI composite index,

2) DESI by components,

3) Compare the evolution of DESI components,

4) DESI compare country progress and

5) DESI – Compare two indicators.

The eGov (from 2020 onwards) proposes different and more preconfigured charts than DESI. These include:

1) Analyse one indicator and compare countries;

2) Analyse one indicator (by life events);

3) See the evolution of an indicator and compare countries;

4) See the evolution of an indicator (by life events),

5) Maps by country,

6) Compare two indicators,

7) Compare two indicators, using "country bubbles" sized on a third one

8) Compare the evolution of two indicators.

EIF and BDM structure their multi-page dashboards using diverse types of diagrams. They include filters that allow users to explore the indicators and components. They also let the user explore the various indicators and model components, such as EIF Pillars, EIF recommendations and indicators for EIF, policy areas and policy actions implementation level. BDM also shares a tab of Best Practices[17] across the MS that can be filtered out by policy area.

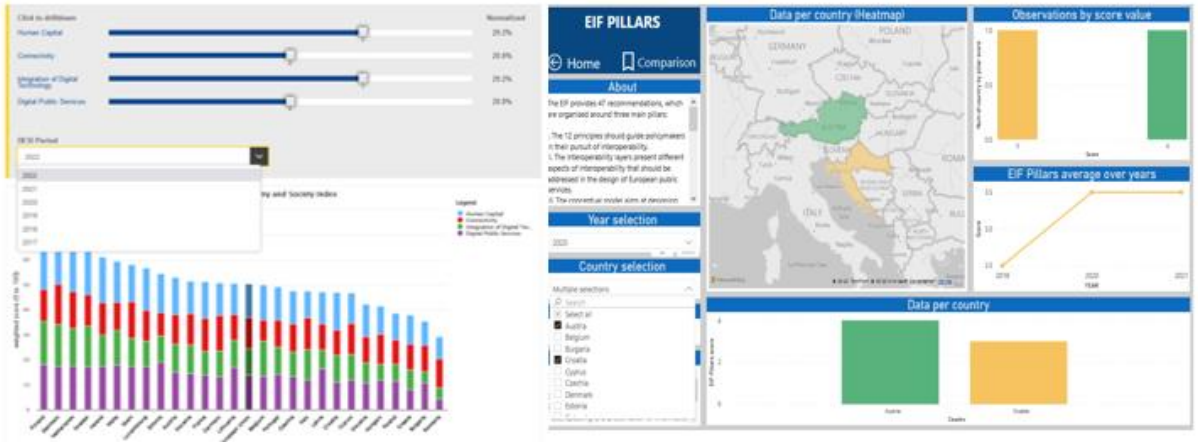


Figure 25: DESI and EIF Dashboard data visualisation

Source: *DESI Composite index chart* & *EIF monitoring dashboard*

[17] BDM's Best practices tab available at: https://app.powerbi.com/view?r=eyJrIjoiYjljODI5ZmItZWI0MC00NDRkLTg1OTItZWJiZWJmYmQ3M2MzIiwidCI6ImIyNGM4YjA2LTUyMmMtNDZmZS05MDgwLTcwOTI2ZjhkZGRiMSIsImMiOjh9

Indexed in *European Data Platform*

None of the schemes is making their data available on the *European Data Portal*. However, the NIFO Digital Administration Factsheets datasets are available until the 2020 edition (**Figure 26**). Although linking to the PDF factsheets is a great initiative, publishing the raw EIF results would ease the reuse.

Figure 26: Description of the 2020 Digital Public Administration factsheets in the European Data Portal

Source: *European Data Portal*

Indexed in JRC COIN Explorer

Being indexed on the JRC COIN website[18] is a way not only to increase visibility but also to be able to perform cross-scheme and correlation analysis. DESI and the eGov Benchmark were referenced among the many schemes (indices) included in its catalogue.

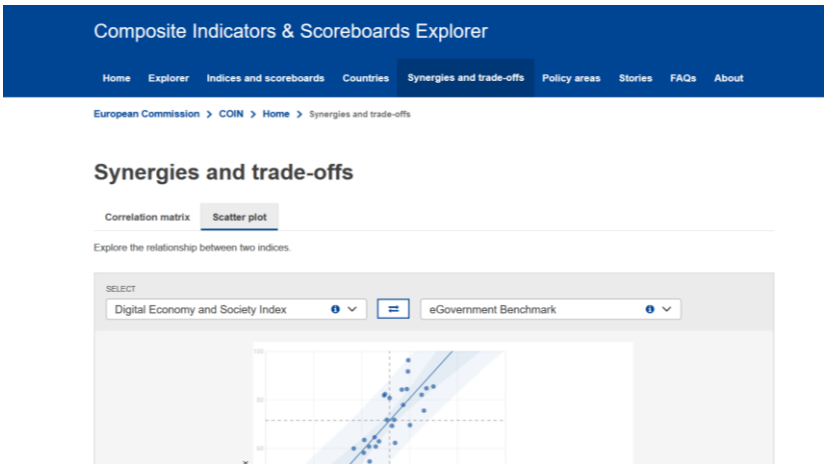


Figure 27: Relationships between DESI and eGov using the JRC COIN explorer correlation functionality

Source: *JRC COIN explorer*

[18] The JRC's Competence Centre on Composite Indicators and Scoreboards (JRC-COIN), as stated on its website, is renowned for its expertise in statistical methodologies and technical guidelines for developing sound composite indicators.
Among the different tools available is the *Composite Indicators & Scoreboards Explorer*, an interactive tool to explore and visualise data from over 100 indices and scoreboards aiming at creating a home to all well-known multidimensional measures. The Explorer builds on 20 years of expertise and over 100 collaborations on indicator frameworks at the JRC, drawing on various data sources from organisations developing composite indicators and scoreboards worldwide.

4.2 Indicator analysis

Indicators must be stable over time to compare progress against a baseline; however, they often need to be reviewed to keep their relevance. Revisions could involve adding new indicators, removing those that are no longer relevant or adapting existing ones to strategic or operational changes.

Given possible changes, the analysis has taken place on a frozen snapshot of indicators involving the ones collected and coming from the specific methodological versions available at the time of the analysis[19] in June 2022. The former implies that the number and content of indicators may differ from those available at the time of publication. For example, proposals to change EIF and BDM models were negotiated between October and November 2022 and, therefore, **not** included in the following analysis.

The complete list of indicators used can be found in **Annex 1.**

4.2.1 Indicator documentation review

Indicators are the backbone of monitoring; therefore, appropriate management is indispensable. The lifecycle management of indicators is a continuous controlled process involving many aspects, from the definition, documentation, data collection, calculation and interpretation.

As already seen, the Better Regulation Toolbox nr 43 recommends following the RACER *(Relevant, Accepted, Credible, Easy to monitor and Robust)* criteria (*Relevant, Accepted, Credible, Easy to Monitor, Robust*) when selecting indicators. This can be contrasted with DESI requirements for selecting indicators, as stated in its methodology, where they:

- *Must be collected on a regular basis. In order to fulfil the monitoring function, the indicators used in the index must be collected ideally on a yearly basis (or at least with a pre-defined regularity).*
- *Must be relevant for a policy area of interest. All indicators in the index must be accepted as relevant metrics in their specific policy areas.*
- *Must not be redundant. The index should not contain redundant indicators, either statistically or in terms of interpretation.*

Moreover, Better Regulation Guidelines recommend summarising the system of indicators, as shown in

Figure 44, to relate them to the scheme's original objectives and to have them documented.

General/Specific/ Operational objective	Indicator	Definition	Type of indicator	Unit of measurement	Data source	Frequency of measurement	Baseline	Target	Data quality rating

Figure 28: Proposed table in *Better Regulation Toolbox* nr 43 to document indicators

Source: *Better Regulation Toolbox*

Well-documented indicators can be seen as critical in an EC streamlined monitoring scenario as they facilitate understanding and reuse.

Indicator descriptions are composed of different types of information, which are usually referred to as indicator *metadata*. Commonly, a given indicator is accompanied by a definition, unit of measurement (*analytical unit*),

[19] It is worth noting as well that "summary" and "duplicated" indicators that contribute to different dimensions have been removed from the analysis.

the data source, the frequency of data collection and any other relevant information to ease data-sharing, use and reuse, and aggregation. There are several mature standards and specifications, as listed in **Annex 8**.

Exploring the indicators soon became apparent a range of important limitations. For example, the descriptions are very heterogeneous between schemes. Sometimes, key information, such as definitions and traceability of deprecated/modified indicators, is missing. Since the indicator is the essential unit of analysis for this overall study, verifying the information provided and how it is handled was necessary.

This was supported using the *Indicator Standards & Tools*[112] guidelines checklist developed by the *Monitoring and Evaluation Reference Group (MERG) of the UNAIDS programme*. The checklist contains control questions to confirm that indicators' essential components are included.

- Does the indicator have a clearly stated title and definition?
- Does the indicator have a clearly stated purpose and rationale? Is the method of measurement for the indicator clearly defined, including the description of the numerator, denominator and calculation, where applicable?
- Are the data collection methodology and data collection tools for the indicator data clearly stated?
- Is the data collection frequency clearly defined?
- Is any relevant data disaggregation clearly defined?
- Are there guidelines to interpret and use data from this indicator?
- What are the strengths and weaknesses of the indicator and the challenges in its use?
- Are relevant sources of additional information on the indicator cited?

The results of this exercise, shown in **Table 4**, indicate that, on the one hand, detailed information at the indicator level is rare among the schemes. Moreover, substantial improvements could be incorporated to aid their understanding and reuse.

Table 4: Results of indicator-checked elements

Checked elements for each scheme	BDM	DESI	eGov	EIF
Does the indicator have a clearly stated title and definition?	☒	☑	☑	☒
Does the indicator have a clearly stated purpose and rationale?	☒	☒	☒	☒
Is the method of measurement for the indicator clearly defined, including the description of the numerator, denominator and calculation, where applicable?	☑	☑	☑	☑
Are the data collection methodology and data collection tools for the indicator data clearly stated?	☑	☑	☑	☑
Is the data collection frequency clearly defined?	☒	☒	**N/A**	☒
Is any relevant data disaggregation clearly defined?	☑	☑	☑	☑
Are there guidelines to interpret and use data from this indicator?	☒	☒	☒	☒
What are the strengths and weaknesses of the indicator and the challenges in its use?	☒	☒	☒	☒
Are relevant sources of additional information on the indicator cited?	☑	☑	**N/A**	☑
Legend ☒ Not present ☑ Some presence ☑ Good practice **N/A** Not applicable				

From this evaluation, particular attention should be paid to those missing elements that impact reusability. Namely, indicators not having a clearly said purpose and rationale associated with them, even if this may appear in other documentation; guidelines that would aid the interpretation of the data also appear to be missing, and the limitations/challenges in using the indicators are not noted.

Does the indicator have a clearly stated title and definition?

From the outset, all monitoring schemes have titles. As for definitions, DESI and eGov, provide concise indicator titles. If decontextualised, BDM and EIF do not provide any, making indicators hard to grasp. Moreover, BDM and EIF indicator labels are sometimes unclear, as they generally do not include the analytical unit used (i.e., the percentage). Indicator labels are typically formulated as long sentences, retaking BDM policy actions or EIF recommendations. For example, long titles/labels have limitations in their dashboard tools that use their unintuitive numerical identifier, making it difficult to explore the content without a strong working knowledge of the indicators. The following examples can illustrate this:

- indicator 6 of BDM, "*Existence of initiatives promoting the set up of ethical and technological expert councils to provide advice to and foster debate among citizens", which could be "Technical councils for citizen debate*", or
- indicator 52 of EIF ", *Existence of agreements on reference data in the form of taxonomies, controlled vocabularies, thesauri, code lists and reusable data structure/models to achieve semantic interoperability*", which could be "*Semantic assets and reference data*."

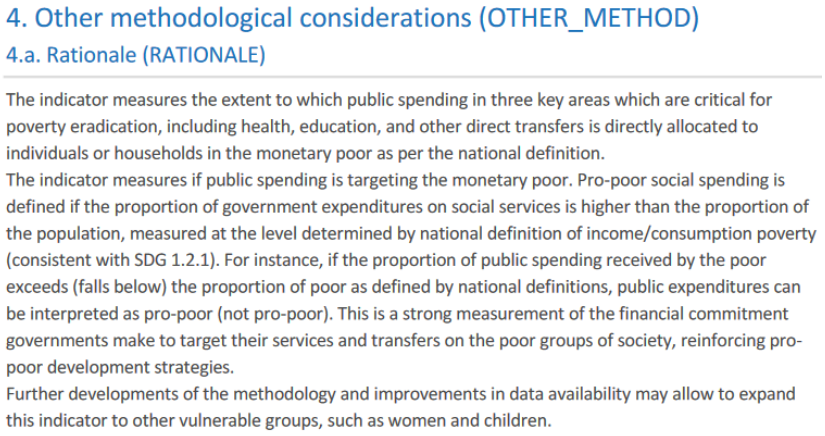
Does the indicator have a clearly stated purpose and rationale?

Scheme documentation, such as the conceptual model and technical notes, helps understand the purpose, rationale and how each indicator contributes to the monitored general objective. However, none of the analysed schemes specify the indicator level's rationale and purpose.

Indicators, especially if reused by third parties, risk appearing out of context or being used in non-foreseen use cases. Therefore, their original purpose or *raison d être* should also appear alongside their definition and source.

Supplying examples and guidance can help in understanding the reuse that can be done of existing indicators. The latter is especially true for *proxy indicators* which indirectly respond to the sought-after aspect. For example, the EIF reuses eGov indicator 23, "*Mobile friendliness*", to report on the recommendations under the "*User centricity*" interoperability principle.

The UN (United Nations), for example, foresees in its *Sustainable Digital Goals (SDG) Metadata Authoring Tool Template* [113] (**Figure 29**) a *Rationale* description as part of the section "*Other methodological considerations*" where examples and guidance on its correct interpretation and meaning are also advised.



4. Other methodological considerations (OTHER_METHOD)

4.a. Rationale (RATIONALE)

The indicator measures the extent to which public spending in three key areas which are critical for poverty eradication, including health, education, and other direct transfers is directly allocated to individuals or households in the monetary poor as per the national definition.
The indicator measures if public spending is targeting the monetary poor. Pro-poor social spending is defined if the proportion of government expenditures on social services is higher than the proportion of the population, measured at the level determined by national definition of income/consumption poverty (consistent with SDG 1.2.1). For instance, if the proportion of public spending received by the poor exceeds (falls below) the proportion of poor as defined by national definitions, public expenditures can be interpreted as pro-poor (not pro-poor). This is a strong measurement of the financial commitment governments make to target their services and transfers on the poor groups of society, reinforcing pro-poor development strategies.
Further developments of the methodology and improvements in data availability may allow to expand this indicator to other vulnerable groups, such as women and children.

Figure 29: *Rationale* description in the metadata of *SDG Indicator 1.b.1: Pro-poor public social spending*

Source: UNSTAT https://unstats.un.org/sdgs/metadata/files/Metadata-01-0b-01.pdf

Is the method of measurement for the indicator clearly defined, including the description of the numerator, denominator and calculation, where applicable?

The measurement or calculation methods are available, especially regarding the form of aggregation of the composite indicators (i.e., normalisation, rounding, weights etc.) However, each scheme handles these details differently, sometimes placing it as an annex, such as the eGov's *Annex B. Scoring rules*. DESI places this within the body of the methodology *Section 1.2 Methodological considerations*.

EIF includes the calculation formulas in the results Excel files (**Figure 30**). However, those might not be accessible or easily understood by all users. A standard metadata structure elaborating on this attribute would facilitate access to such methodological considerations.

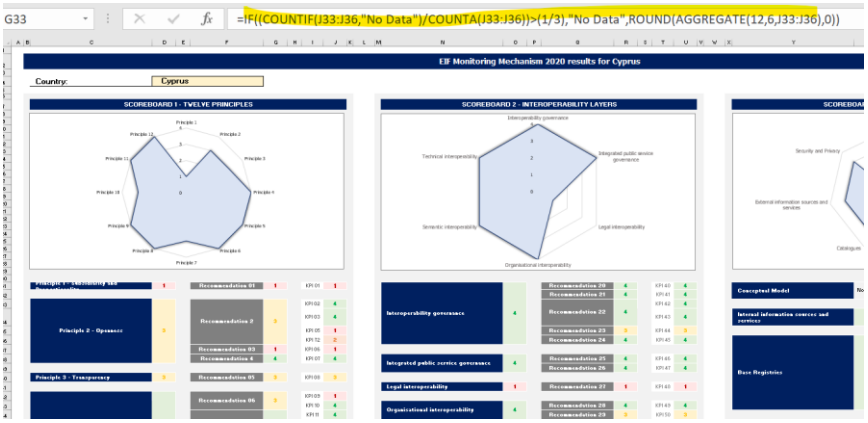


Figure 30: Calculation formula example in the *EIF monitoring results for 2020*

Source: *EIF 2020 data collection results*

Are the data collection methodology and tools for the indicator data clearly stated?

In general, methodologies and tools used are indicated. eGov, for example, explains the *Mystery Shopping*[20] technique in detail and all tasks performed by the trained *mystery shoppers,* including its questionnaire with precise indications of each element to be analysed. DESI also provides a table with notes on each external source's data collection and review process (see **Figure 19**).

EIF and BDM could improve transparency by attaching, for example, the joint questionnaire to the methodology and the completed questionnaires to the reports.

Is the data collection frequency clearly defined?

It should be underlined that data collection frequency here refers to the indicator frequency, not the monitoring exercise frequency as a whole. Little reference is made to indicator frequency, despite its high relevance when, for example, indicators are reused/being reused as secondary sources.

In general, the annual periodicity is taken for granted. However, although indicator and monitoring frequency often match (with a yearly periodicity), we observed some exceptions. EIF sometimes refers to the year of the source from which they extract the data but not systematically (**Figure 31**).

Another example is BDM, where a note in *Appendix II – BDM databases of the 2022 progress report* states:

> *"The KPI value is from 2020 and will be updated when the 2021 value is available. Please note that also the scores of related policy areas and policy actions may be affected".*

KPI 18	Existence of references of the reuse of Open Data in your National Open Data portal	European Open Data portal
KPI 19	Extent to which citizens and businesses are free to adopt technologies or IT products that are most appropriate for their needs when accessing or reusing public services	Survey
KPI 20	Extent to which data is easily transferable between systems and applications	Survey
KPI 21	Internet use - Interaction with public authorities	Eurostat - Table E-government activities of individuals via websites
KPI 22	Digital Public Services Dimension comprising of eGovernment (DESI_5_DPS)	DESI Indicators
KPI 23	Mobile Friendliness	EU eGovernment Benchmark Report 2020

Figure 31: Excerpt of EIF monitoring 2020 results shoring details on data sources.

Source: *EIF 2020 data collection results*

[20] Annex A. Mystery Shopping Questionnaire

Is any relevant data disaggregation clearly defined?

This component aims to document the indicator's possible data breakdowns (i.e., Geographic location/periods or classes such as sex, age group, etc.). DESI and eGov usually do this in a very structured way in the metadata documentation displayed on their website (**Figure 32**). The linked data tool powering their data includes a *breakdown code list*[21] documenting concepts. EIF and BDM do not provide this information explicitly. However, their dashboard tools give an idea of the available breakdowns (e.g., by country, recommendation, etc.).

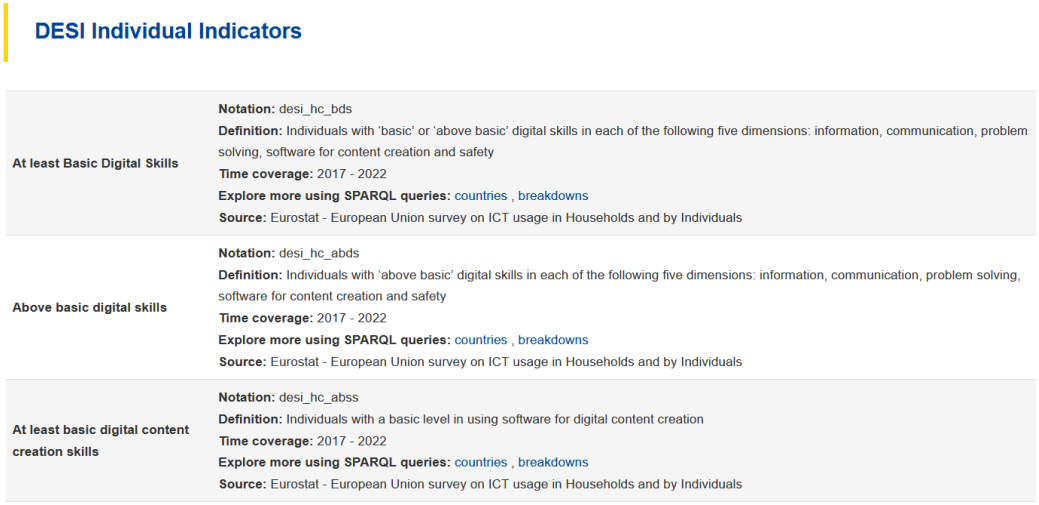


Figure 32: Indicator description in DESI indicates disaggregation options offered.

Source: *https://digital-agenda-data.eu/datasets/desi/indicators*

Are there guidelines to interpret and use data from this indicator?

The only guidelines available are the scheme's methodological notes, where further information on how to (re)use the defined indicators has yet to be found. Some of the material involves relatively standard graphics to represent comparisons between the status of a given indicator (e.g., radar diagrams for progress on key aspects in a Member State or bar charts comparing rankings between Member States). However, the interpretation of results for the intended purpose and details on the indicators for wider reuse should be considered.

What are the strengths and weaknesses of the indicator and the challenges in its use?

No references to strengths/limitations have been found either at the indicator level or the scheme itself. For example, the UN's metadata template foresees a section outlining the indicator's suitability, relevance and limitations. This component could help highlight data comparability issues and wide confidence intervals and provide further details on other (non-official) indicators commonly used with the indicator.

Are relevant sources of additional information on the indicator cited?

All the schemes provide details of the information sources used, although not all do so with the same level of detail. When data sources such as Eurostat provide many datasets, the specific table used with its identifier is indicated. At times, even the indication of the lineage and operations carried out are documented. For example, DESI's indicator source for *1b1 - ICT specialists* is:

> *"Eurostat (table educ_uoe_grad03, using selection ISCED11=ED5-8) and ISCEDF_13 [F06] Information and Communication Technologies."*

This is a robust and transparent approach, allowing any interested party to explore the source and, potentially, have greater confidence in the results, given this lineage.

[21] *Breakdown code list* available at https://virtuoso.digital-agenda-data.eu/describe/?url=http://semantic.digital-agenda-data.eu/codelist/breakdown

4.2.2 Indicator descriptive analysis

4.2.2.1 Number of indicators

The four schemes comprise 162 unique indicators with the following distribution (see **Figure 33**).

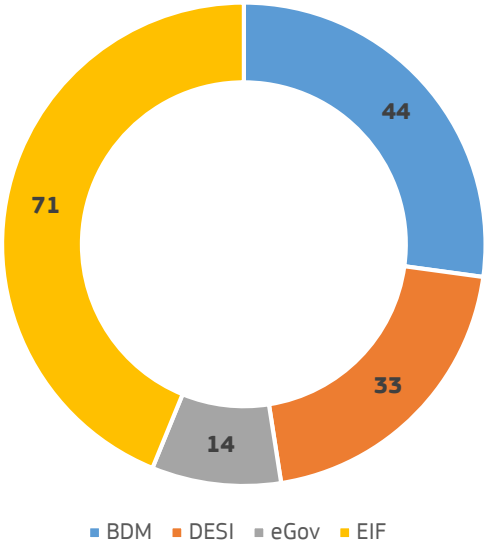


Figure 33: Number of indicators by the analysed scheme

The EIF counts 71 indicators, representing 44% of the total indicators. BDM follows this with 44 indicators (27%), DESI with 33 (20%), and eGov with 14 (9%).

The high number of EIF and, to a lesser extent, BDM indicators compared to DESI and the eGov is primarily due to the design of their monitoring model. Their monitoring design reflects the EIF and BDM conceptual models, foreseeing evidence for every recommendation and policy action. A challenge in the analysis and comparability of the indicators is that, to a certain degree, eGov indicators are presented at a high level, underpinned by a range of questions and other evidence. This aggregation also raises issues about the term "*indicator*" within and between the key schemes and the extent to which the landscape analysis could be extended to consider the scope of the underlying data and even questionnaires in a more harmonised evidence base.

Data sources

The data source analysis of the four monitoring schemes has identified 15 different data sources[22], all produced by the EC. The analysed schemes are also accounted as data sources, as shown in **Figure 34**, with a lighter colour.

[22] It is worth noting the collaboration of the *Communications Committee* and *Eurostat*, which has been accounted as a new data source even though Eurostat and Communications Committee appears as separate entries.

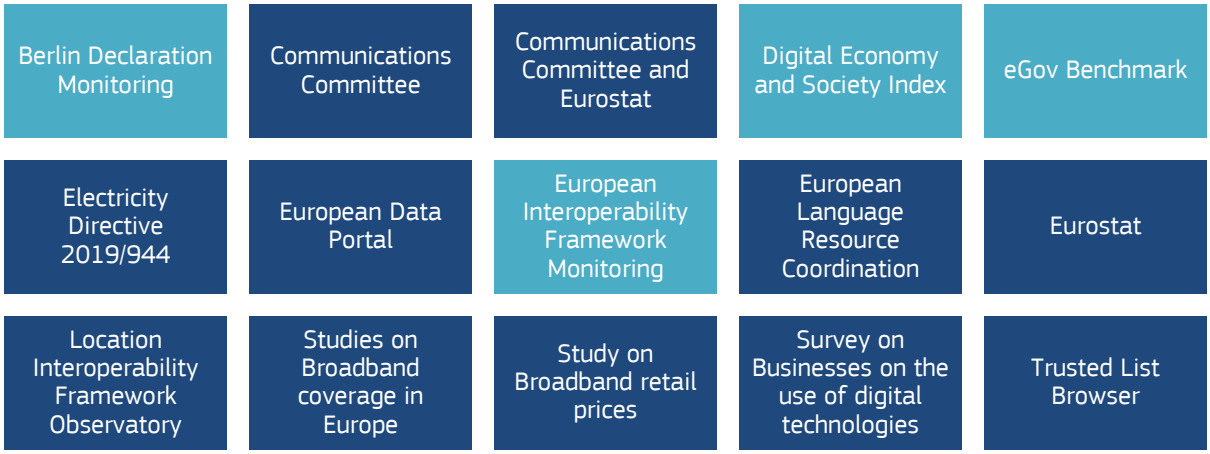


Figure 34: Data sources used in the analysed monitoring schemes sorted in alphabetical order

By the absolute number of indicators (**Figure 35**), EIF and BDM are the sources feeding more indicators, with respectively 51 and 30, followed by eGov (28), Eurostat (21), and European Data Portal (16).

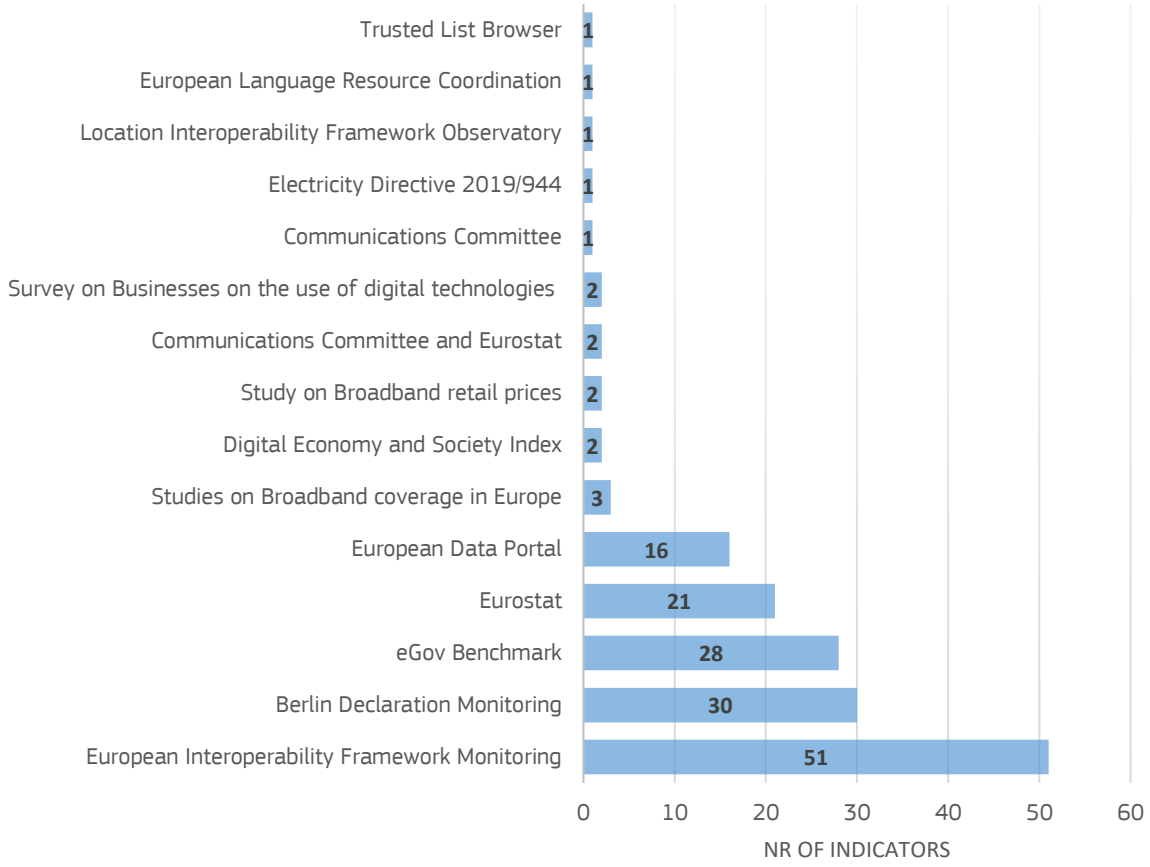


Figure 35: Number of indicators by data source

However, EIF and BDM results' prominence is due to the high number of indicators that comprise their scheme and are collected as primary data. On the other hand, the notable number of indicators from the *European Data Portal* and *Eurostat* suggests that they should participate in the efforts towards streamlined EC monitoring in the digital policy context.

As the statistical office of the European Union, it is not surprising that *Eurostat* is a recurrent data source. Eurostat's most reused datasets in the schemes analysed are:

- ***Information and Communication Technologies (ICT),*** with high reuse of data coming from:
    - *EU survey on the use of Information and Communication Technologies (ICT) in households and by individual*[114]. It is an annual survey conducted since 2002 aiming at collecting and disseminating harmonised and comparable information on the use of ICT in households and by individuals.
    - *ICT usage in enterprises (isoc_e)*[115]. Data provided in this domain are collected yearly by the National Statistical Institutes and based on the annual Eurostat model questionnaires on ICT (Information and Communication Technologies) usage and e-commerce in enterprises.
- ***European Union Labour Force Survey***[116] *provides quarterly results on labour participation of people aged 15 and over and those* outside the labour force.

Drilling down into the data source composition by scheme, the variety and number of sources used in DESI are particularly significant, followed by EIF and BDM. Eurostat's relative importance for DESI can, in particular, be seen in **Figure 36** and **Figure 37** in both relative and absolute terms.

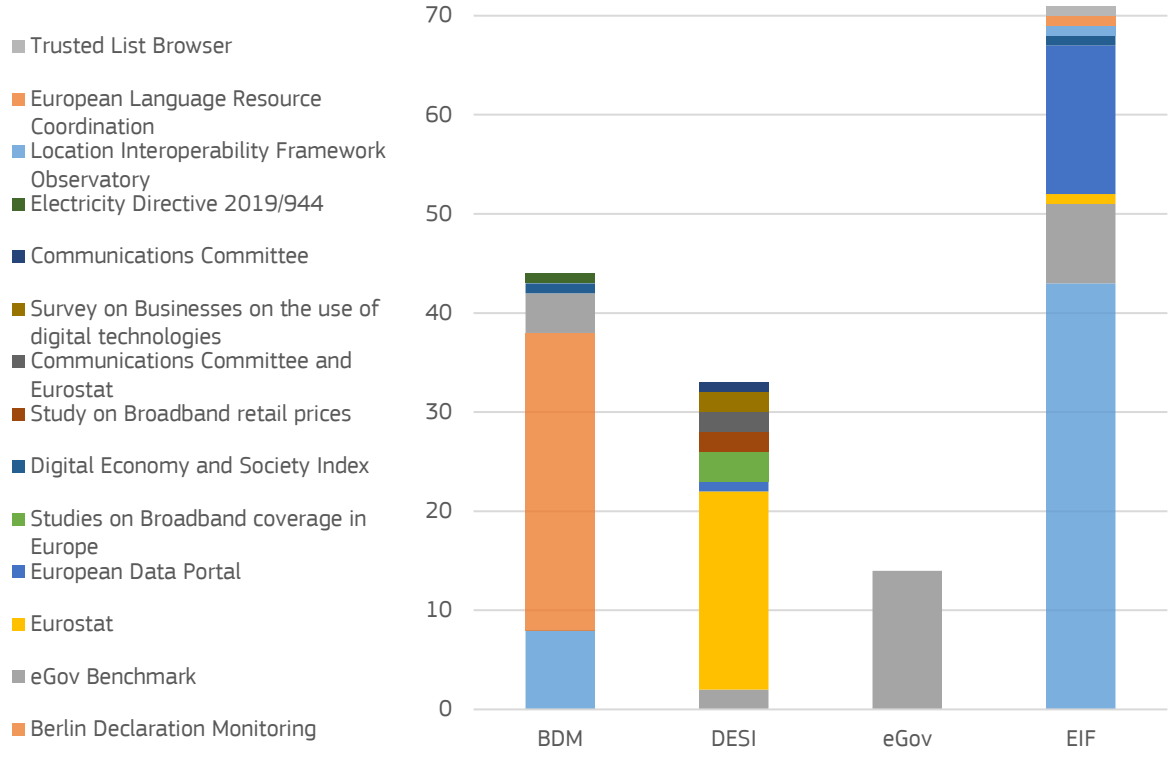


Figure 36: Data source composition of analysed monitoring schemes by indicators

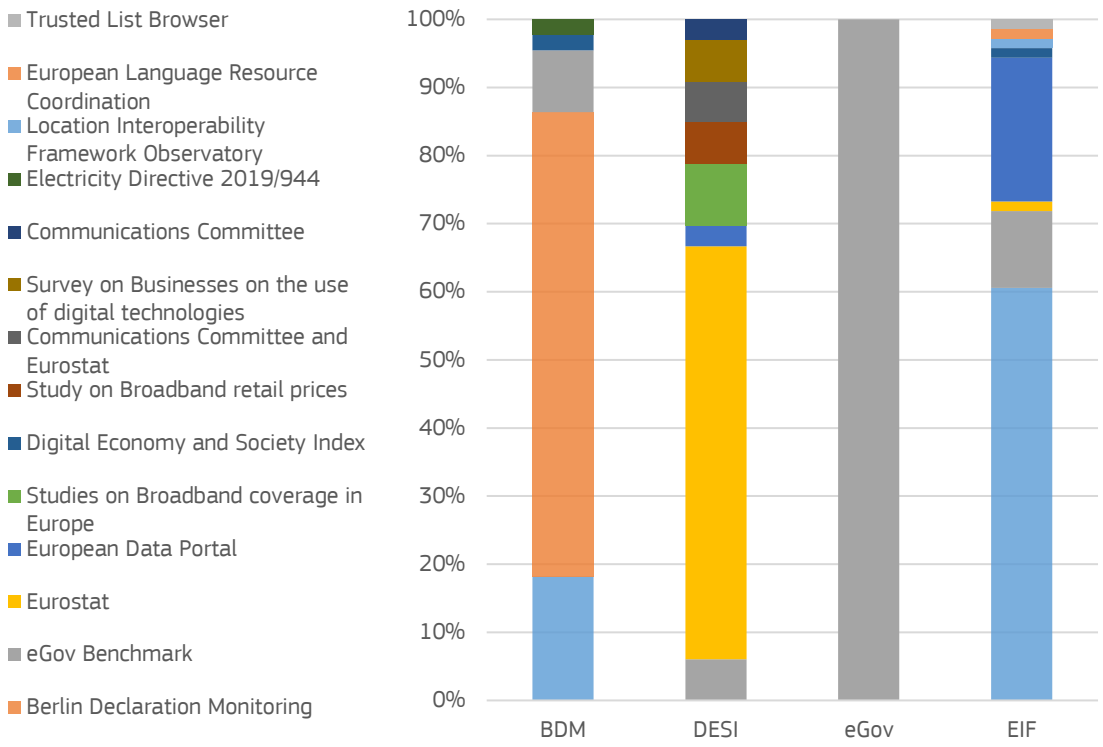


Figure 37: Data source composition of analysed monitoring scheme in percentage

A view of the source data flows (

Figure 38) reveals the contribution regarding the number of indicators they feed and the reuse between them. It shows, for example, how eGov is a source of information for the other three initiatives, feeding up to 15 indicators. In contrast, Eurostat provides 21 indicators for DESI and the EIF.

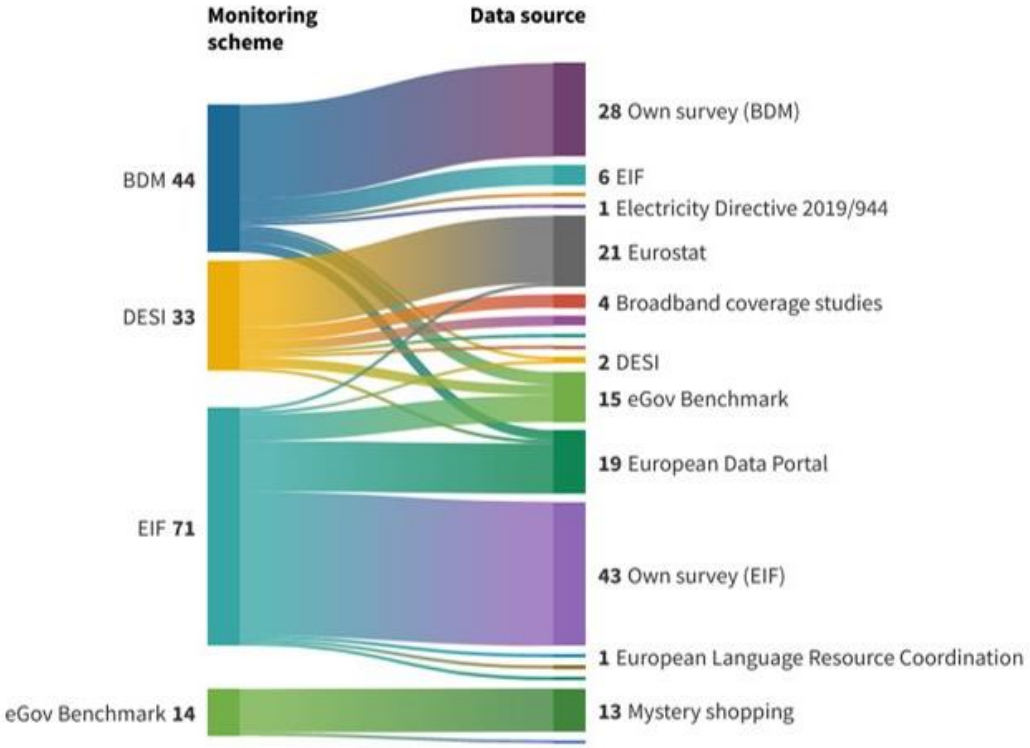


Figure 38: Indicators data flows

Data source origin

The share between primary and secondary data[23] sources used in the monitoring schemes seems to be balanced if analysed together with 52% secondary data and 48% primary (**Figure 39**), highlighting the existing indicator reuse again.

However, a detailed analysis of the scheme in **Figure 40** shows a very heterogeneous situation. While DESI is composed exclusively of secondary data, eGov only uses primary data.

EIF and BDM have a balanced situation, with a slightly higher presence of primary indicators. This illustrates the relative weight and effort concerning data collection needs for each monitoring scheme.

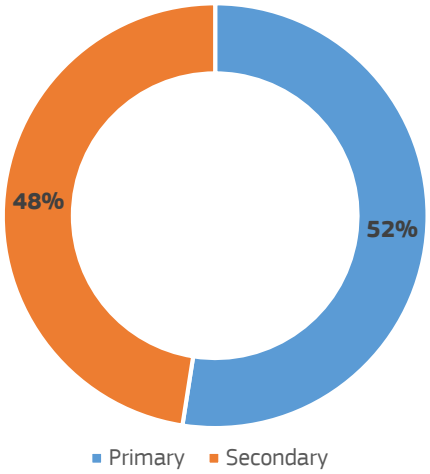


Figure 39: Proportion of indicators by its data source origin

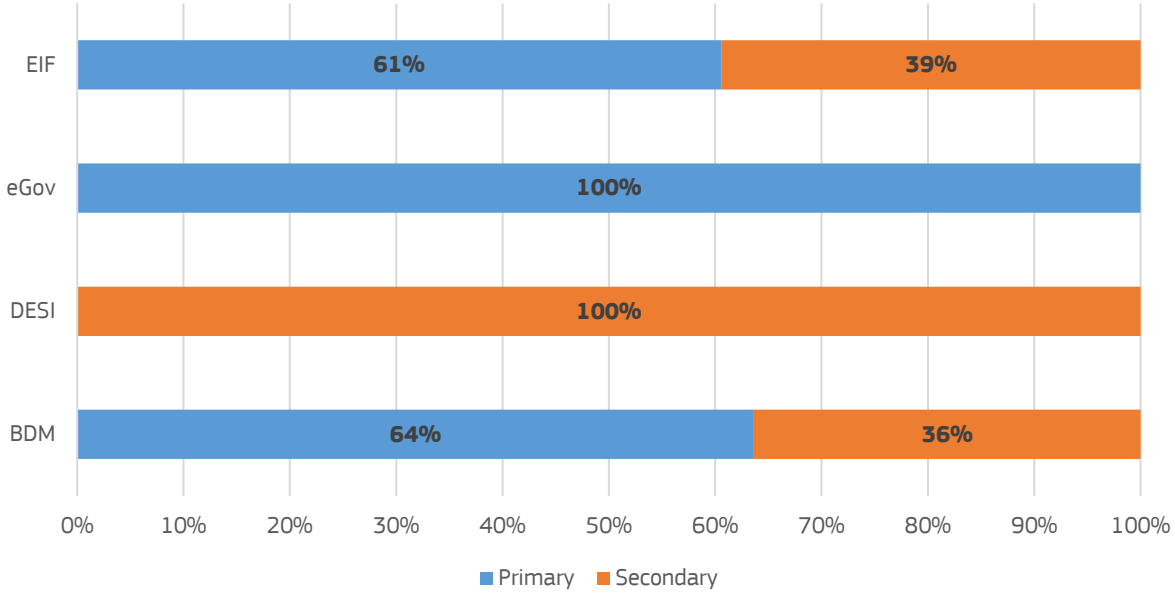


Figure 40: Proportion of primary and secondary sources by monitoring scheme

The notions of increasing data reuse to reduce a burden by looking to secondary indicators should be noted in this context. It may be helpful to explore further the composition of primary indicators that may rely on dependable and authoritative sources in the future. In addition, in some cases within the study, primary indicators become secondary ones by default when exchanged.

To some extent, the public value of monitoring does not rest solely within one monitoring scheme or even the wider ecosystem of reuse within EC digital policy but also on how such material is informative for the MS and others interested in the results.

[23] "Secondary data" refers to data collected by any party other than the researcher or those involved in a particular scheme.

Data gathering technique

The choice of the data collection technique significantly affects the monitoring exercises' results. Each technique has its advantages and disadvantages. **Figure 41** summarises the techniques used by the monitoring schemes during their data collection phases, highlighting the number of indicators that rely on them.

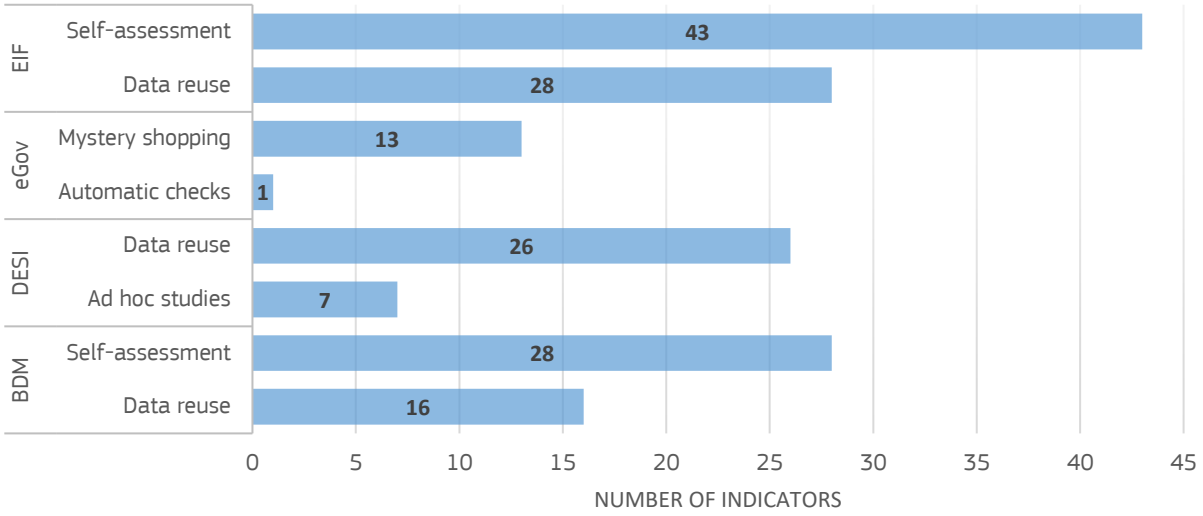


Figure 41: Data gathering techniques used across the monitoring schemes

The schemes present a mixed approach of data gathering techniques. More concretely, third-party data reuse occurs in DESI, EIF and BDM. *Self-assessment* techniques are verified in BDM and EIF for the data provision of 47 and 28 indicators, respectively. In contrast, eGov is based on a hybrid approach of *mystery shopping* techniques with some *automatic checks* of the online public services they assess.

Self-assessments are generally carried out using questionnaires. A **questionnaire,** according to the *Statistical Data and Metadata Exchange* (SDMX)[117] *standard*, a:

> *"Group or sequence of questions designed to elicit information on a subject, or sequence of subjects, from a reporting unit or another producer of official statistics".*

Questionnaires are generally affordable to generate and easy to answer and analyse, creating a relatively efficient choice for data collection from a set population of stakeholders.

They are also appropriate for collecting qualitative aspects[24] over a large group of foreseen responders, such as satisfaction, perceptions, knowledge and attitudes. They could be used for outcome-based monitoring if questionnaires are regularly run, as outcomes take time to emerge. However, there might be better options if what is being monitored changes rapidly.

However, questionnaires also come with drawbacks. Self-assessments can be highly biased due to inherent subjectivity; therefore, the responses' representativeness might be distorted. Bias might also originate from the questions, so pre-testing questionnaires are crucial to reducing it. It is also important to note that the results may only be generalisable if the sample of respondents is sufficiently representative.

Mystery Shopping is a particular observational study where a qualified researcher verifies the characteristics of the service or product. It is a technique that originates in the private sector and allows one to obtain information on the quality of the service and the satisfaction of the user-client. Among its less positive aspects are that it is not bias-free; it depends on the person and their training. The volume of work is low and very expensive since one person or a small group carries it out.

[24] n.b. These measures should not be confused with qualitative research techniques, such as stakeholder interviews, that may create complementary evidence for monitoring, providing anecdotal evidence that also offers rich descriptions of, for example, good practices or illustrates the matter at hand with the 'authentic voice' of a stakeholder.

Mystery shopping and *Ad-hoc studies* are performed in each context through dedicated consultancy support.

Regarding **data reuse**, it would be necessary to distinguish between the reuse of *official statistics*, including *Eurostat´s*, and *other statistics*, for example, data from the *European Open Data Portal*, *CEF dashboard*….. According to the European Statistics Code of Practice[118], *Official statistics* are:

> *"Statistics describing on a representative basis phenomena of public interest to policymakers, the economic agents and the public at large.[25]"*

In addition to the techniques identified in the analysed schemes, other techniques often used in monitoring exercises are, for example, interviews, focus groups, case study analysis, customer journey mapping, usability tests, online and transactional tracking, etc. According to the United States Agency for International Development (USAID)'s "*Monitoring toolkit*"[119], considerations to guide method selection will depend on required frequency, rigour, analysis, local context, available personnel and cost.

Quantitative/Qualitative indicators

A direct consequence of the chosen data-gathering technique is the indicators' qualitative/quantitative nature. Both types are useful and have inherent advantages and limitations.

Quantitative indicators, also called "*hard data*," are based on fact-based information and are collected through a counting process and measured numerically. In contrast, **qualitative indicators,** also called "*soft data*", are produced through qualitative methods drawing from questionnaires or case studies. Qualitative indicators do not necessarily involve quantification and might be opinion-based.

Quantitative indicators are often expressed with formulas such as "*number of*", "*proportion of*", "*percentage of*", etc. Qualitative indicators, instead, use formulas such as: "*level of*", "*presence of*", "*evidence of*", "*Availability of*", "*Existence of*", "*Potential of*", etc.

Examples of each type that can be found among the analysed schemes are:

- Qualitative: *Existence of national guidelines on the publication of Public Sector Information (Indicate 3 of EIF);* Active exchange of crisis management data between MS (Indicator 44 of BDM)
- Quantitative: *Number of workshops/events organised on cross-border initiatives at national level or European level. (*Indicator 3 of BDM); *Above basic digital skills -Individuals with 'above basic' digital skills in each of the following five dimensions: information, communication, problem solving and software for content creation and safety-* (Indicator 1a2 of DESI)

Figure 42 shows the ratio of the indicators analysed is approximately three-quarters of qualitative indicators.

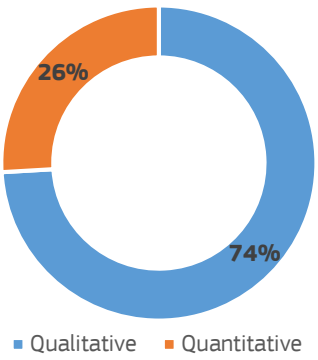


Figure 42: Ratio of quantitative vs qualitative indicators

[25] The definition is followed by the remark: "*They are developed, produced and disseminated by the statistical authorities in compliance with the provisions of the Union and national law and the European statistics Code of Practice / National Codes of Practice.*"

The differences are accentuated at the monitoring scheme level (**Figure 43**). DESI is especially noteworthy as it is the only scheme mainly based on quantitative indicators, with more than 90% of them.

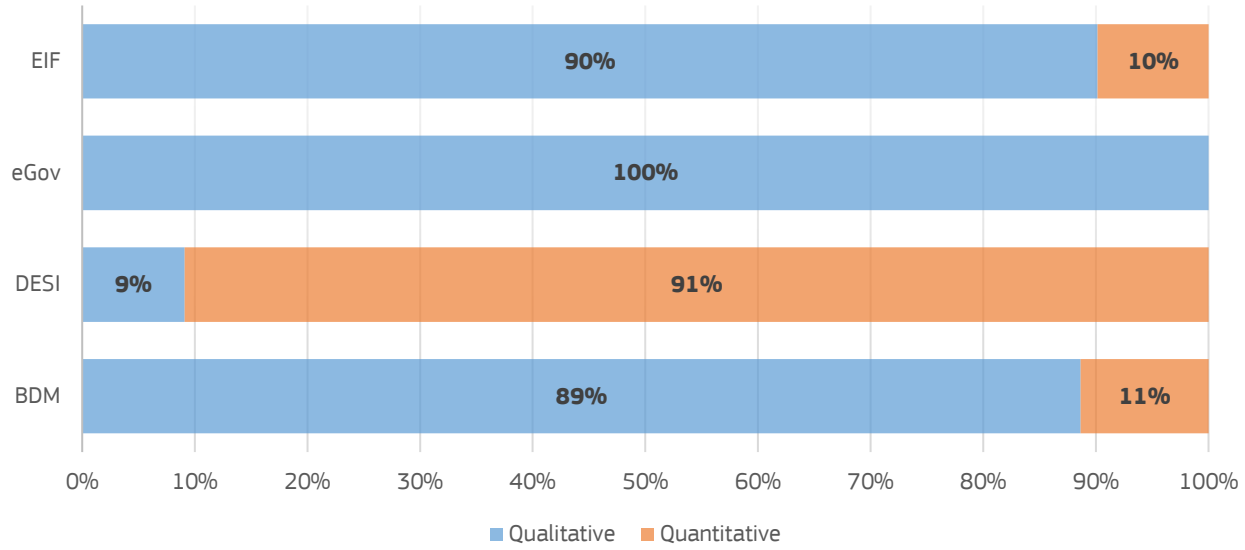


Figure 43: Proportion of qualitative vs quantitative indicators by analysed schemes

Indicator role in the impact pathways

Understanding what information indicators capture about the progress of digital policies in the EC is necessary to interpret the short- or long-term results from the policy "impact pathway"[26] perspective.

Different frameworks conceptualise impact pathways, adding more or fewer stages. For the study, uses the Better Regulation guidelines' *stages* are used:

- **Input**: Resources used to determine, for example, the initiative's efficiency and cost. They answer the question of *what is needed*. Generally, inputs include money, technical expertise, relationships and personnel.
- **Output**: if activities are delivering tangible or intangible products. Outputs are directly connected with the operational objectives of the initiative. Hence, they are a reasonable measure of progress but have a weak external effect. Outputs answer the question *what is delivered/produced*?
- **Outcome**: if benefits are starting to be delivered. Outcomes give insights into the awareness of delivered outputs.
- **Impact**: if high-level strategic goals are met with stronger external effects as a consequence of using the outputs.

The exercise revealed the difficulty of assigning the indicator role to the impact pathway framework. The reason is that the role depends strongly on the monitoring scheme's vision and expectations in the medium and long term. Therefore, to conclude, the results should be confirmed with people strategically involved in the design and maintenance of each monitoring initiative.

However, a first approximation to the exercise indicates that most indicators, if not all, are of "*response type*" and, more specifically, *output* type. On the one hand, they are closely related to the direct objectives pursued

[26] "Impact Pathways" is a technique used in "Program Theory" and "Theory of Change", where the path to social impact is outlined schematically, showing the intermediate results necessary for the project products to generate real benefits.

by each monitoring scheme by measuring their tangible or intangible results. On the other hand, they would not seem to capture *strong external effect* information, at least according to how the indicators labels are expressed.

For example, both BDM and EIF have defined their indicators to faithfully reflect the follow-up of each political action in BDM and the EIF recommendations[27]. Although with different evaluation methodologies and data gathering, the same happens with the eGov Benchmark and DESI.

As an observation, in a more holistic scenario of streamlined monitoring, the indicators could play a different role than initially designed. For example, the DESI indicators related to Digital Skills could be considered "inputs" in this case.

[27] An example of this would be indicator 39 in EIF, "*Extent to which public administrations evaluate the efficiency and effectiveness of interoperability solutions*", clearly answering in form of OUTPUT recommendation 19, "*Evaluate the effectiveness and efficiency of different interoperability solutions and technological options considering user needs, proportionality and balance between costs and benefits.*"

4.2.3 Indicator content analysis

We now examine the details to completely address the second part of the question: *Which monitoring schemes and specific indicators address interoperability and digital transformation of government?*

Thematic coverage: Frequent keywords used

A first approximation to the leading question is the content captured by the indicators. A word cloud in

Figure 44 shows the words most often used[28] in the indicator's labels. Words such as *digital*, *services*, *data*, *public*, *cross-border*, and *national* are particularly prominent, suggesting topics of common interest and/or potential points of overlap across schemes.

However, this visualisation must be considered carefully since the image might not be fully representative, given writing styles that promote, for example, synonyms. The input text highly influences the proportion (number of indicators per scheme) and the same semantics used in the indicator title.

For example, in eGov and DESI, indicator names are made of a few words, such as "*Mobile friendliness*", while in EIF, the Indicator names are more expressive and specific. For example, KPI 55 "*Existence of a common scheme for interconnecting loosely coupled service components and put in place and maintain the necessary infrastructure for establishing and maintaining public services*".

Despite the above-noted limitations, the exercise helps uncover the themes involved.

Word cloud based on the names of indicators and frequency of the top 20 most repeated terms.

Frequency	Term
46	public
39	data
27	digital
26	services
20	open
13	administrations
13	national
12	cross-border
12	interoperability
12	online
11	information
11	reuse
10	ICT
10	solutions
8	availability
8	mobile
7	business
6	accessibility
6	citizens

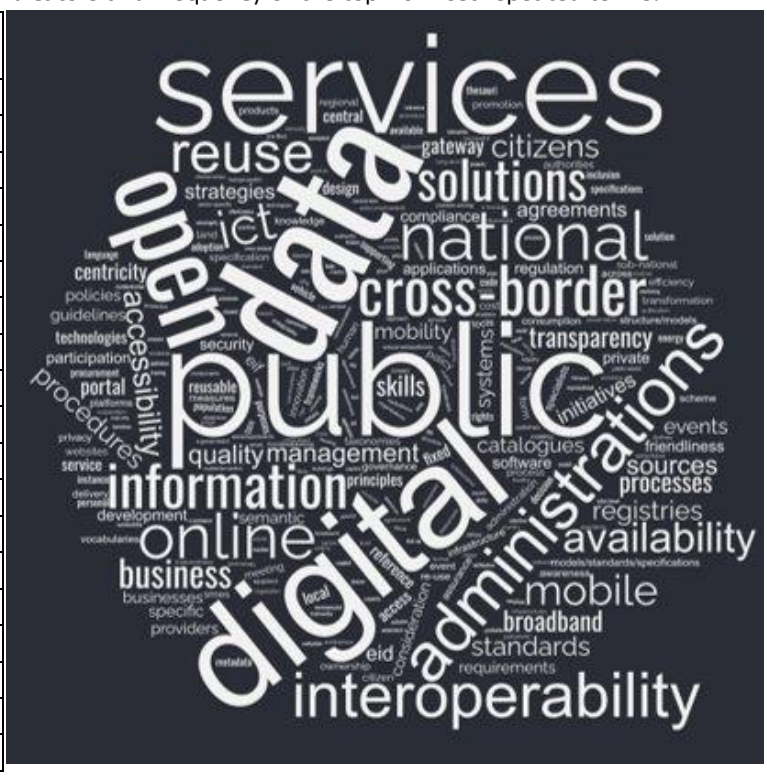


Figure 44: Word cloud based on the names of indicators and frequency of the top 20 most repeated terms

[28] once they have been cleaned of irrelevant words such as articles, verbs, etc.

Thematic coverage: Topic identification

A more detailed analysis of the indicators' content allows us to identify the variety of topics covered by the four monitoring schemes. Given the high number and heterogeneity of topics of interest, they have been grouped into twelve thematic groups (**Figure 45**). This classification was built from the ground up for the study, grouping the content of the indicators and reflecting their scope. The groupings would maybe, therefore, need to be evaluated and extended should the indicators change.

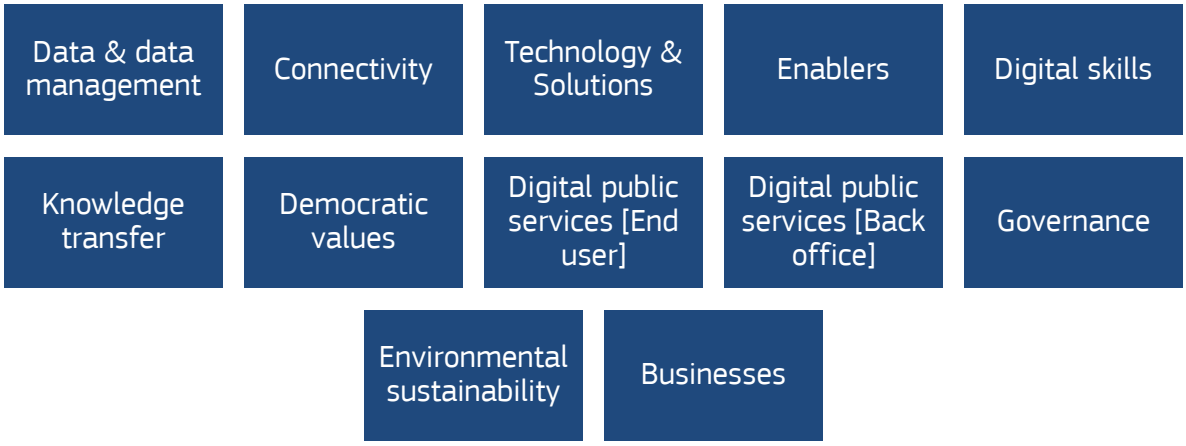


Figure 45: Cluster of topics identified on the analysed monitoring schemes

The sub-topics[29] that make up the clusters are listed in **Table 5** below.

Table 5: Topics and subtopics considered within the identified thematic clusters

DATA ASSETS & DATA MANAGEMENT	CONNECTIVITY	TECHNOLOGY & SOLUTIONS
DATA - Open data - Base registries - Authentic sources - Authoritative sources - Public Sector Information - INSPIRE - Personal data **DATA USE & MANAGEMENT** - Information preservation - Metadata, master data and reference data - Taxonomies, controlled vocabularies, Thesauri, code lists/ Semantic assets - Data quality - DCAT-AP compliance - Machine readability	**BROADBAND TYPE** - Fixed/ Mobile broadband - Fast broadband coverage - Fixed Very High Capacity Network coverage - Fibre to the Premises coverage - 5G coverage & spectrum **TAKE UP** **COVERAGE** **PRICE**	**EMERGING TECHNOLOGIES** - AI & automated decision-making - Big data - Cloud **SOFTWARE & SOLUTIONS** - Catalogues - Platforms - Interoperability digital solutions - smart buildings and products - Electronic information-sharing tools - Enterprise Resource Planning package **COMPONENTS** - Frameworks - models/standards/specification **OTHER TECH ASPECTS**

[29] It should be noted that many topics are closely related to each other, making it difficult to sometimes make a clear cut. However, although assigning topics and subtopics to clusters can be somewhat arbitrary, the inter-cluster analysis that follows has been done so that they are not mutually exclusive.
The assignment of indicators to clusters is highly conditioned by how they have been named or defined. An example is the EIF 06 indicator "*Active consideration of the use of open source software when developing new IT solutions, account for it in the total cost of ownership of the IT solution*", which covers technological and governance aspects. Therefore, it has been assigned to both "TECHNOLOGY & SOLUTIONS" and "(DIGITAL) SERVICE DESIGN [BACK OFFICE]".

- Data license assistant - Open data in decision making - Data management policies & plans		- Digital sovereignty - Open Source - Reusability - Modular architecture - Digital intensity - Social media
ENABLERS	**DIGITAL SKILLS**	**KNOWLEDGE TRANSFER**
- eID - e-Invoices - eDocuments - Authentic sources - Digital Post - Trust services providers	- basic digital skills - basic digital content creation skills - ICT training providers - ICT specialists - ICT graduates - Female ICT specialists - Human capital – digital skills - Digital skills in Public Sector	**VISIBILITY & AWARENESS RAISING** - Best practices - Events / Workshops - Knowledge & data exchange - Strategic projects & policy measures - Foster debate [ethical & technological expert councils] - EU Participation & Cooperation **DOCUMENTATION** **MONITORING** - Uptake - Evaluation **NETWORKING** - Sector-specific and/or cross-sectoral communities - Cross-border / National
DEMOCRATIC VALUES	**DIGITAL PUBLIC SERVICES [END USER]**	**DIGITAL PUBLIC SERVICES [BACK OFFICE]**
- Fundamental rights - Transparency - Human centricity - privacy - security	**E-GOVERNMENT USERS** **USABILITY** - User centricity - Web Accessibility - Mobile-friendliness - Multilingualism - User support - prefilled forms	**E-GOVERNMENT SERVICES** - Life events - Cross-border/seamless **PROCESSES** - Defined business processes, working routines, and procedures. - Aspects of co-creation, *usability*, *reusability,* and *once-only principle (*prefilled forms, etc.*)*
GOVERNANCE	**ENVIRONMENTAL SUSTAINABILITY**	**BUSINESSES**
STRATEGY - Agreements / Formalised relationships - Governance structures - Shared Strategies/Policies/Plans **COMPLIANCE** - Compliance / Adoption to legal acts/standards/Implementation - Recommendations/principles application - Policies on innovation & procurement	- ICT energy efficiency - Energy consumption & GHG emissions evaluation - The lifespan of digital equipment - Ecodesign of digital public services - ICT for environmental sustainability	- SMEs (Small and Medium Enterprises) selling online. - Selling online cross-border - Digital public services for businesses - Digital intensity

Thematic coverage: Alignment and overlaps

Figure 46 allows us to understand the areas of alignment and overlaps at the scheme level.

In decreasing order of the number of indicators, the clusters that stand out the most are those related to *knowledge transfer, back office aspects*, digital public services, technology and solutions, and governance and data management.

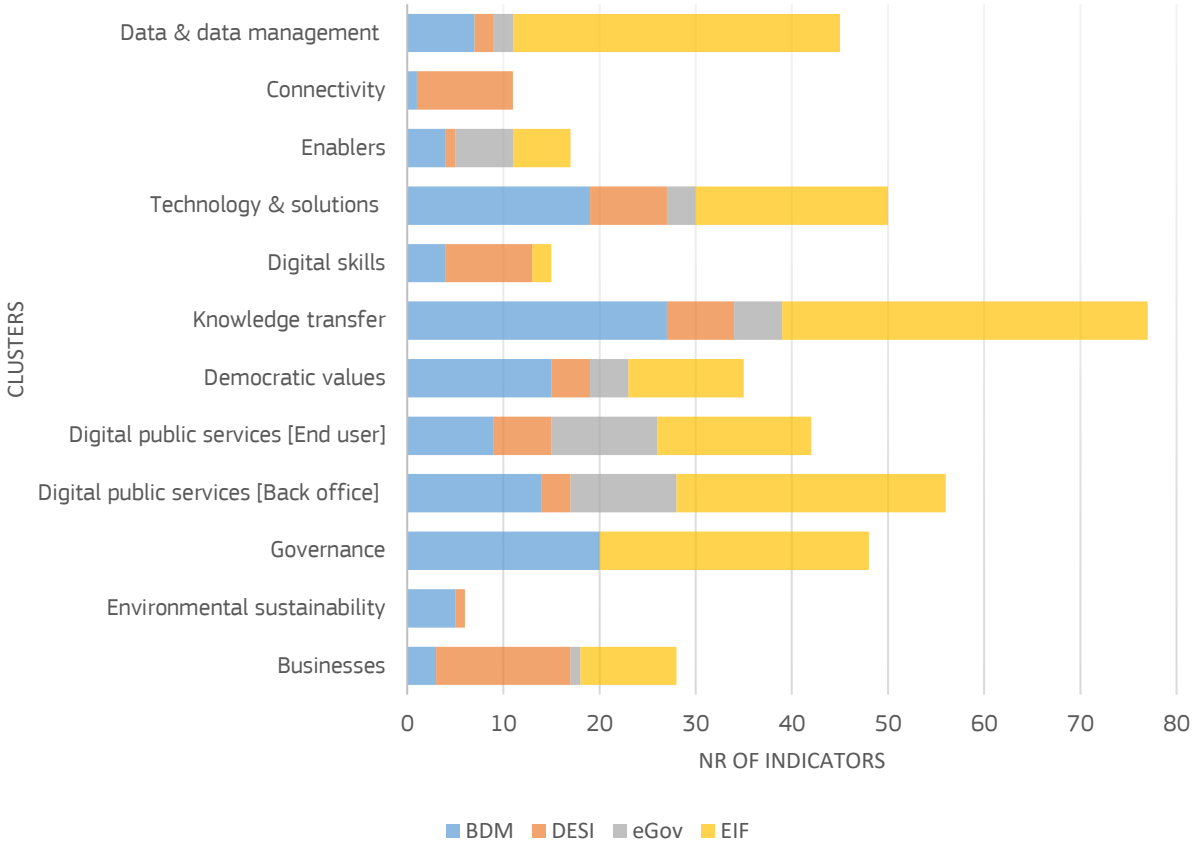


Figure 46: Number of indicators related to the identified clusters of topics

More in-depth, at the scheme level, we observe differences:

- EIF has a rather practical focus on measuring organisational aspects of information-sharing, including governance and activities of all kinds to promote interoperability. On the other hand, its interest in technology and process details stands out. Much focus is placed on "*data*", with particular attention to "*open data"* and "*base registers*". Detailed aspects of data management are also sought, covering the entire data management life cycle (description, quality control, distribution, reuse). It also pays close attention to technological aspects, particularly in the presence and use of interoperability solutions, whether software, platforms, services or specifications.
- DESI indicators mirror its areas/dimensions of interest: Connectivity, Digital skills, emerging technology and take-up by businesses, and public digital services that include end-user usability aspects.
- The focus of the eGov Benchmark is tied to aspects of digital public services for the end user that reflects processes and design decisions in the back office. Although, to a lesser extent, it is seen to be related to Democratic values.
- Although covering many topics, BDM focuses on aspects of Knowledge transfer, Governance and Democratic values.

Although **Figure 46** makes it possible to understand the general topics and the extent to which the schemes relate to them, it does not confirm potential redundancies.

Awareness of redundancies or repetitions is essential to identify sources of unnecessary burdens to the MS. Table 6 shows the results of mapping *shared topics* across schemes.

Importantly, the detailed analysis of the indicators confirms that information is not requested repeatedly[30]. The only repetitions observed are those from the reuse of indicators, which are not counted as redundancies.

Several topics, however, are of interest or shared between schemas. When this happens, generally, the content is requested from different angles (such as democratic values) or seeks detailed information. Moreover, the analysis deals with the indicators. Still, there remains the possibility (although now less likely) that the underlying data requested or the questions posed may have some overlaps.

Table 6 Mapping of "*shared topics*" across monitoring schemes

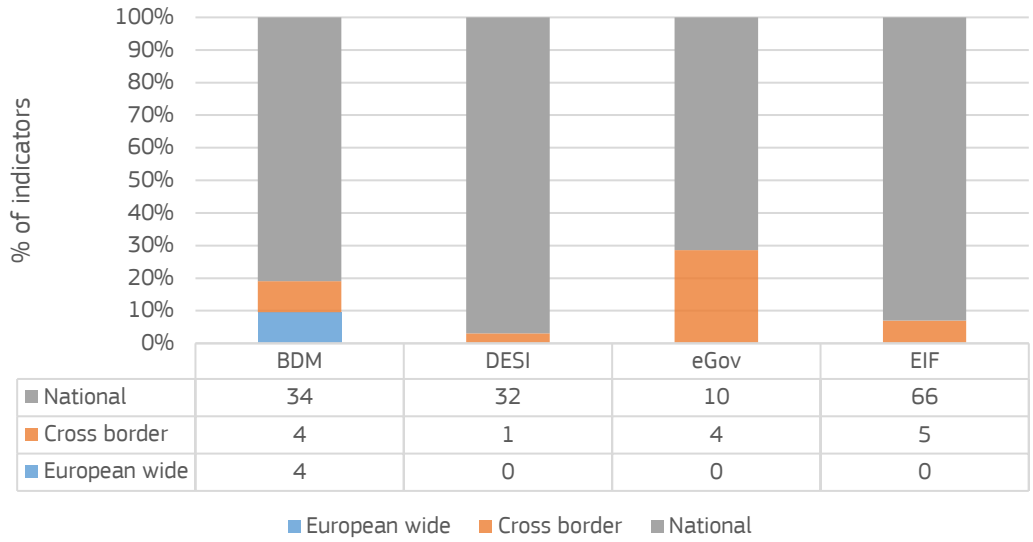
Common topic	BDM	DESI	eGov	EIF
Open data	☑	☑	☑	☑
AI	☑	☑	☒	☒
eID & trust services	☑	☒	☑	☑
Digital skills	☑	☑	☒	☑
User centricity	☑	☒	☑	☑
Environmental sustainability	☑	☑	☒	☒
Service Transparency	☑	☒	☑	☒
Mobile-friendliness & mobile channel	☑	☑	☑	☑
Legend ☒ Not shared topic ☑ Shared topic				

Indicators' administrative and societal scope

The content analysis allowed for discovering other interesting aspects in an EC streamlined monitoring scenario. These aspects are the *administrative scope* and the *stakeholders* referred by the indicators, which may differ from the default public administration national scope of the monitoring exercise. For example, different indicators show interest in cross-border or sub-national organisational aspects or relationships with end users such as citizens or companies.

[30] However, since the MS are involved in different stages of the monitoring scheme cycle, the perception of repetition could originate in validation phases where the set of primary and reused indicators might need to be (re)validated. Processes should be put in place by the teams coordinating the monitoring exercise to reduce this possibility.

Figure 47 highlights the different administrative scopes identified. Although, in absolute terms, EIF[31] seems to gather more cross-border indicators (5), it is the eGov Benchmark that, proportionally, considers this aspect more. Also noticeable is the tendency of BDM to capture information at the European level.



	BDM	DESI	eGov	EIF
National	34	32	10	66
Cross border	4	1	4	5
European wide	4	0	0	0

Figure 47: Proportion of indicators by administrative scope targeted

Figure 48 shows that the scheme indicators gather information on different societal groups influenced by digital policies, with a mixed approach found in all schemes. However, DESI is perhaps most in alignment with the initiative's scope covering the whole spectrum of society. Unsurprisingly, BDM, EIF and the eGov Benchmark focus more on aspects related to public administration. However, there are some cases of indicators oriented towards specific stakeholders: business, citizens, "*users*" when the previous two are treated equally or are not distinguished, and "*so*ciety" when the indicator does not refer to anyone, for example, in the case of indicators related to connectivity.

[31] It is worth noting that although EIF already provided for cross-border aspects, 2022 indicator revision has increased this aspect strongly in response to EIF evaluation. Available at: https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12579-Interoperable-digital-public-services-European-Interoperability-Framework-evaluation-strategy_en

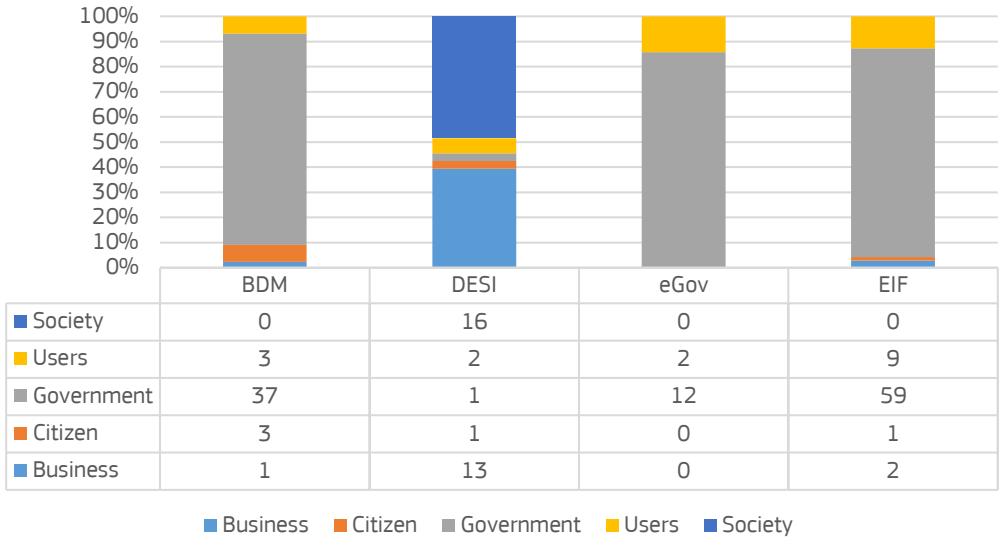


Figure 48: Proportion of indicator by stakeholder targeted

4.2.4 Terminological analysis

In the landscape analysis, terminological variety begins before arriving at the indicator level, with "monitoring schemes" calling/branding themselves with terms such as "index", "observatory", "benchmarking [tool]", and "monitoring". Beyond those analysed, we can also find terms such as "barometer", "watch", "radar", "dashboard", and "scoreboard". None should be considered right or wrong, as terms can be considered more technical, evocative, symbolic or specific, including the system's key functionality. Although they all share the idea of measurement, they are not necessarily equivalent.

Such heterogeneity adds complexity to the monitoring landscape, so this study intentionally calls them *monitoring schemes* to accommodate all.

Although the terminology analysis above was done over the *indicator label*, a more meticulous exercise could start from a conceptual model extracting the key concepts to perform semantic mappings and, if necessary, alignments.

Despite differences in the structural/metadata concepts, already noted in the section introducing the scheme structure, the analysis results show no significant differences in the terminology used across schemes. Nonetheless, some nuances have been uncovered between schemes and, interestingly, within them.

There are situations where the same term has a slightly different meaning or is sometimes broader or narrower depending on the conceptual model of the monitoring scheme. An example of this is "*User centricity*". EIF's underlying principles definition of "*user centricity*" involve a multi-channel service delivery approach, single point of contact, leverage of user feedback and the *Once Only Principle*. In contrast, the eGov Benchmark aspects of user-centricity are online availability, mobile friendliness and user support.

Other notable elements are, for example, the different use of the terms "*customer-centric*", "*human-centric*", or "*user-centric*." It is unclear if the choice for each form is intentional, but unquestionably, the perspective changes, and so are the potential answers collected.

The EIF, compared to other schemes, uses highly technical terminology; for example, when referring to data management aspects, such as *authoritative sources* (Called in eGov benchmark *Authentic Sources*[32], *base registers* (also called *base registries*) and external sources.

Using all these technical and hyper-specific concepts might be justified to supply evidence for each EIF recommendation and overall model on detailed topics. Still, these concepts might be fully grasped only by a

[32] Called in eGov benchmark "Authentic sources"

specific audience profile. Therefore, the need for such a high specialisation could be revised. Besides, using a preferred, unique or unified form of terms would be advisable, avoiding synonyms and stylistic artefacts.

For example, some uniformity could quickly occur when referring to "descriptions [of data]" to call them *metadata*. Similarly, with data and *master data* or r*eference data* and "*taxonomies, controlled vocabularies, thesauri, code lists*". In the same way, some terms in BDM, such as *digital equipment* and *digital tools and infrastructure*s or *ICT for environmental sustainability* in DESI, could be further harmonised if they share the same meaning. This noted, a check is desirable about what some terms may mean in certain communities, given that the somewhat contained landscape of digital policy may address a range of experts, for example, more closely associated with certain standards and technologies.

In addition, although well-known to the study team, some acronyms were found, such as *DCAT-AP*[33] and CAMMS[34] in the EIF. Such terms should be clarified for the respondent and potential reusers to understand their meaning. Similarly, references to legal instruments could be improved if provided some context. For example, indicator 37 in BDM, labelled "*Adoption of implementing acts following Article 24(2) of Directive (EU) 2019/944*", or indicator 72 of EIF, "*Status of implementation of the INSPIRE Directive*". Those might be understandable by experts in the field. Still, the extra step of look-up the nature of a legal act or its specific article may limit potential reuse. A good example might be indicator 28 in the EIF, "*Compliance with the European accessibility standards of the Directive on the accessibility of the websites and mobile applications of public-sector bodies*."

Another aspect worth reviewing is whether the indicators are *concrete* and *precise* enough. An indicator should cover only one aspect simultaneously. Although anecdotal, the EIF indicator 11's name, "*Existence of an Open Data portal (the extent to which data can easily be found at one central place for reuse purposes)",* is likely to be interpreted differently and potentially even incorrectly. For example, is the emphasis placed on the presence of an Open Data Portal or its aspects of usability and easy discoverability?

Communication management is essential in all organisations, whether public or private. The consistent use of terms increases the comprehension of texts and helps, for example, to do consistent translations. Making a glossary available would allow the monitoring activities to share, control and update the terminology. A glossary is more than a list of terms and abbreviations, allowing for anchoring the conceptual model. Furthermore, in a European context, managing and having access to multilingual glossaries of terms is more critical, especially if the monitoring activity involves retrieving information from the MS at any of their administrative levels.

As a best practice, EIF and BDM already embed definitions in their joint questionnaire. However, referring to them in end-products would be interesting, too. Moreover, NIFO's interactive glossary[120] includes many key terms from the EIF on its website. Making a glossary an online resource may allow consistent and transparent referencing of key concepts.

Some immediate recommendations stemming from this exercise are:

- Avoid using periphrasis or synonyms, as this could lead to vagueness or inaccuracy in responses and results. Give preference to a more rigorous and unified terminology.
- An in-depth review of the terminology used in the questionnaires is crucial since they act as the first point of interaction with the respondent.
- Offer an auxiliary glossary easily accessible to help respondents/stakeholders understand what the term precisely refers to answer more rigorously and avoid misinterpretations.
- *Regarding structural and metadata concepts linked to the monitoring exercise, such as: "indicator" or Aggregation method*, it is advisable to use them with the purpose and the definitions coined by mature organisations in the field. A compilation of glossaries is available in **Annex 7**.

[33] DCAT Application profile for data portals in Europe
[34] Common Assessment Method for Standards and Specifications

4.3 Alignment across schemes: Interoperability & 2030 Strategy

With these insights, we can now approach questions such as: *What are the gaps, overlaps and emerging opportunities in the monitoring landscape? What is the level of coherence of the monitoring schemes?* We analyse their alignments, especially the interoperability policy and the Digital Decade. The mapping exercise that follows required a high degree of subjectivity. To try to alleviate bias, the team conducted peer reviews among colleagues to see where opinions could vary.

4.3.1 Alignment to EIF interoperability principles

One of the study's objectives was to analyse whether there could be indicators related to interoperability that could be candidates to use as a secondary source for EIF monitoring in the shortlisted monitoring schemes.

To this purpose, the study team analysed the 88 unique indicators against the Interoperability principles of EIF available in **Annex 3.**

Although there is a high degree of subjectivity in the analysis, the results in **Figure 49** show that BDM (with the indicators reused from EIF also discarded) is the scheme that could provide candidate indicators with an updated EIF. Especially noteworthy is its strong relationship with the principles of *reusability*, *transparency* and *user centricity*, unsurprisingly rooted in the Berlin Declaration. It is followed by the eGov Benchmark, with indicators that strongly contribute to *administrative simplification* and *user centricity*.

As shown below, even though the interviews confirmed the key role Interoperability could play in digital transformation, it does not seem to be an aspect that is explicitly mentioned or measured in the analysed indicators. However, mapping them against the lenses of the EIF Interoperability principles makes finding relations to Interoperability easier.

The mapping results reveal that several elements could be incorporated into a revised EIF. Therefore, there is room for more reuse between schemes. However, caution should be taken when relying on any candidates. In the case of BDM, at the time of writing this report, its continuity after 2024 was not guaranteed.

In addition, from internal discussions held with those responsible for planned initiatives, schemes such as LORDI or the EDIH survey for public administrations aim to collect different interoperability aspects. Therefore, new complementarities could arise in the following months to enrich the data sources, which a revised EIF could benefit from. In addition, it could be argued that the local level of government that LORDI and EDIHs engage with may also address a larger range of public-facing services that could benefit from increased Interoperability at the data or information system level, including in cross-border contexts.

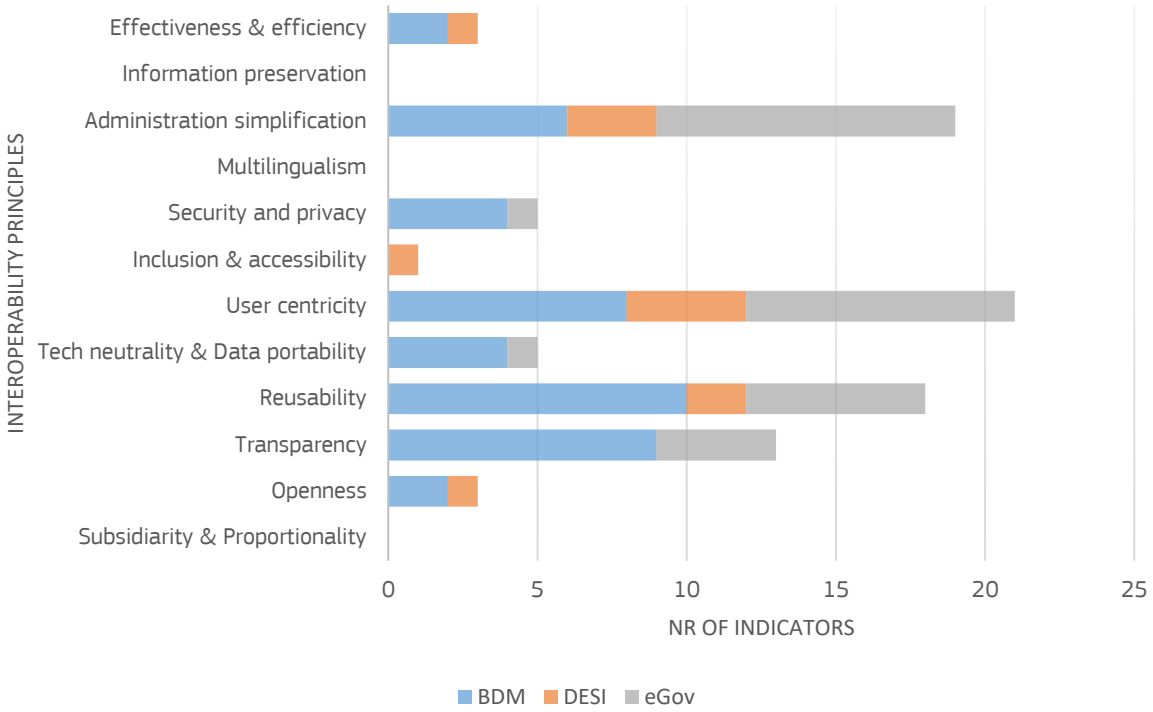


Figure 49: Number of indicators from BDM, DESI and eGov that relate to the underlying EIF interoperability principles

An alternative way to understand the contribution that each of the schemes could offer is by comparing their relative coverage in a radar chart.

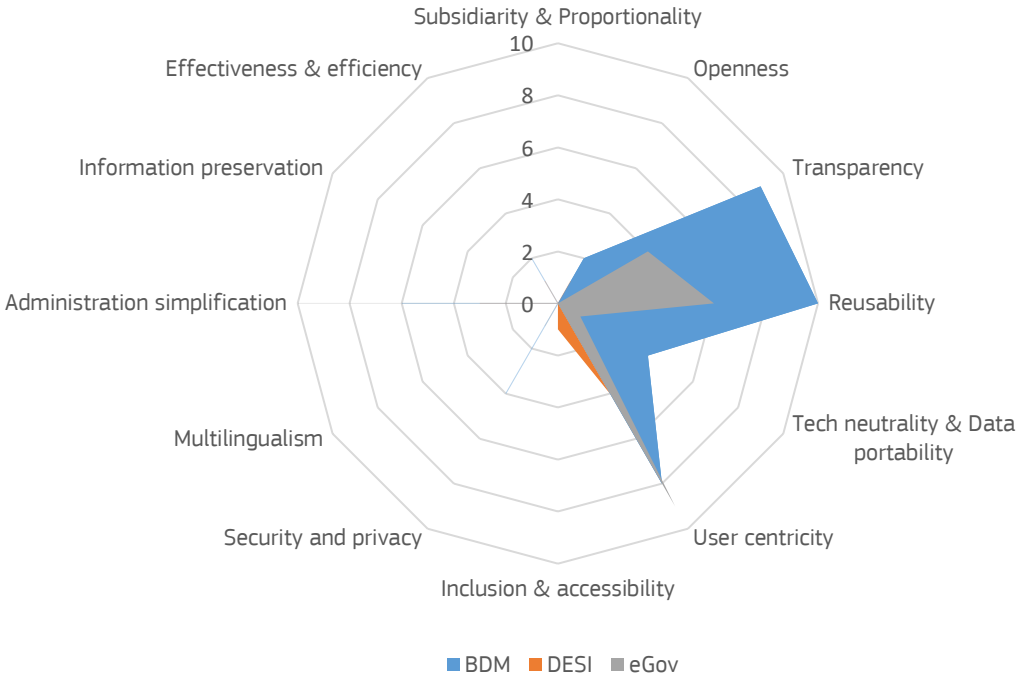


Figure 50: Interoperability principles coverage

4.3.2 Alignment to the Digital 2030 Strategy

Another key objective of this study was to understand how aligned the current EIF and BDM schemes are with the Digital Decade strategy, especially with the targets set for 2030 and the European Declaration of Digital Citizenship principles that will mark the way to achieve them. (See **Figure 51** and **Figure 53**)

SECURE AND SUSTAINABLE DIGITAL INFRASTRUCTURES	DIGITALISATION OF PUBLIC SERVICES	DIGITAL TRANSFORMATION OF BUSINESSES	SKILLS
• **Connectivity**: Gigabit for everyone, 5G everywhere • **Cutting edge Semiconductors**: double EU share in global production • **Data - Edge & Cloud:** 10,000 climate-neutral highly secure edge nodes • **Computing**: first computer with quantum acceleration	• **Key Public Services**: 100% online • **e-Health**: 100% of citizens having access to medical records • **Digital Identity**: 80% of citizens using digital ID	• **Tech up-take:** 75% of EU companies using Cloud/AI/Big Data • **Innovators**: grow scale-ups & finance to double EU Unicorns • **Late adopters**: more than 90% of SMEs reach at least a basic level of digital intensity	• **ICT Specialists:** 20 million + gender convergence • **Basic Digital Skills**: min 80% of population

Figure 51: Digital Compass cardinal points and their 2030 targets

Again, the inherent subjectivity of the analysis should be noted. Still, thematic areas of common interest and gaps have been highlighted. These insights can be handy for identifying synergies between initiatives and, if necessary, reinforcing weak areas in successive indicator reviews.

The mapping of the EIF and BDM indicators against the cardinal points of Digital Compass shows a high degree of alignment, particularly with the cardinal point of *Government* and, to a lesser extent, *Skills*. The relationship between *Businesses* and *Infrastructure* is notably less, not because the schemes need to be further aligned but because these two areas were not originally envisaged within the scope of the EIF and BDM.

Although the EIF is more focused on *back-office* aspects or, in other words, "*how to ensure interoperability*", and the 2030 Digital Decade text concentrates more on the *front office* and *user experience*, both are complementary since the common goal lies in improved efficiency and aims to provide better and more innovative public services.

Perhaps issues that are a little more borderline or taken for granted may be those related to considering open-source software or catalogues of (open) solutions and data or another type.

Because the 2030 targets are relatively specific, there are only a few points of complementarity with the EIF and BDM, as shown in **Figure 52**.

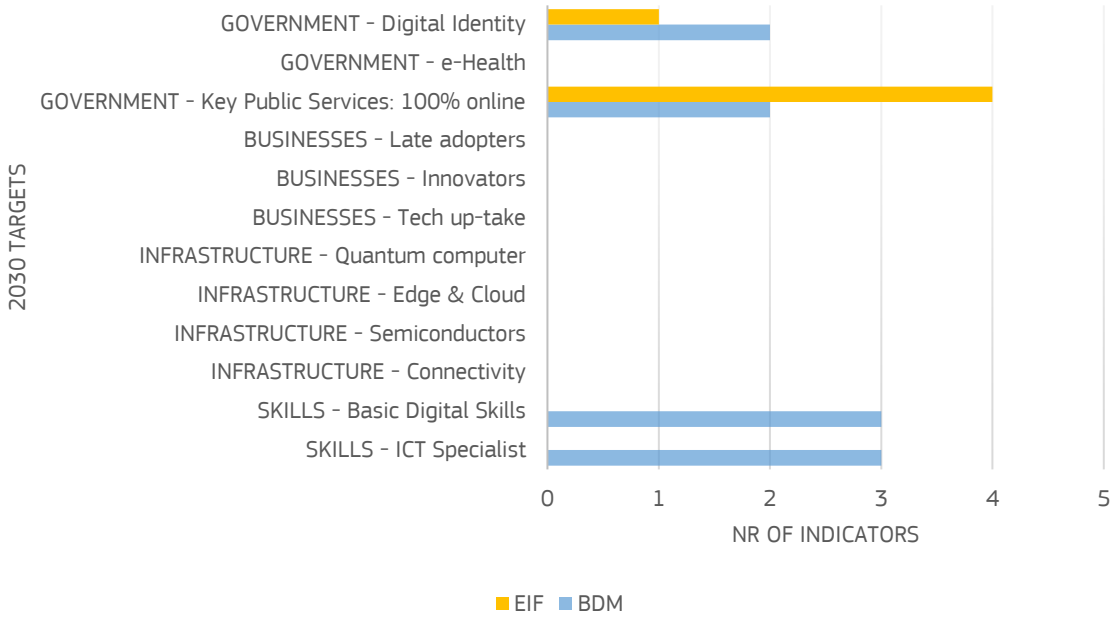


Figure 52: Nr of indicators in EIF and BDM related to the Digital Decade 2030 targets

The EIF has allowed domain-specific interoperability frameworks to link to the core EIF, notably citing the work enabling geospatial data-sharing under the INSPIRE Directive through LIFO. As such, the e-health component of the Digital Decade targets may also be in scope when both public and private sector health records are considered. Moreover, patient confidentiality and access to sensitive information can logically tie to the eID elements that the government's cardinal point considered. In addition, any work on a European health data space may also draw on aspects of cross-border and cross-sector interoperability. These aspects, however, have not been explored to date. Still, diving deeper into specific public services and policy-making areas should be considered, where health is a topic with notable impact and relevance to citizens.

Besides, also digital skills are noteworthy for the public sector, both in general terms related to their capacity to implement interoperability-related issues and being seen as a component or vehicle of the digital transformation of government in some academic research. The mapping against the European Declaration of Digital Rights and Principles is also a somewhat subjective review.

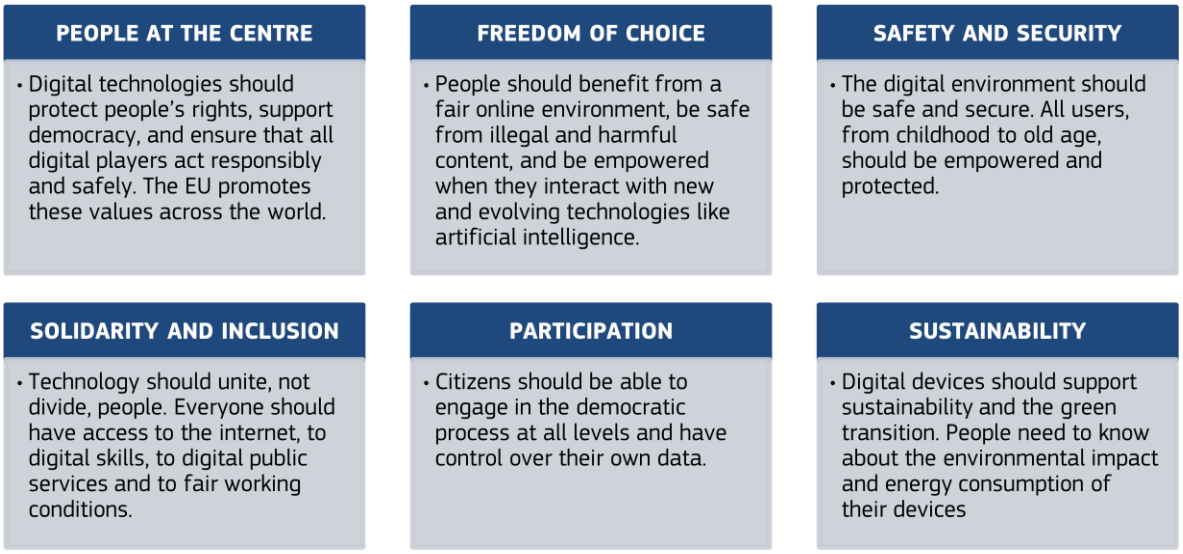


Figure 53: Principles of the European Declaration on Digital Rights and Principles

The mapping in **Figure 54** suggests that BDM and EIF are well aligned with the Declaration.

The connection with BDM is, however, more notable as it covers most of the principles of the Declaration. EIF, for its part, focuses on a few principles, such as *Solidarity and inclusion* and, to a lesser extent, *Participation* and *Safety and security*. It is also worth noting that the principle of *solidarity and inclusion* is very broad, as stated below.

> *Everyone should have access to all key public services online across the Union. Nobody is to be asked to provide data more often than necessary when accessing and using digital public services.*
>
> *We commit to the following:*
>
> *– ensuring that all Europeans are offered an accessible, secure and trusted digital identity that gives access to a broad range of online services,*
>
> *– ensuring wide accessibility and re-use of government information.*
>
> *– facilitating and supporting seamless, secure and interoperable access across the Union to digital health and care services, including health records, designed to meet people's needs.*

It is also worth noting that the Declaration explicitly refers to "*Interoperability*" when referring to Digital Public Services e-Health.

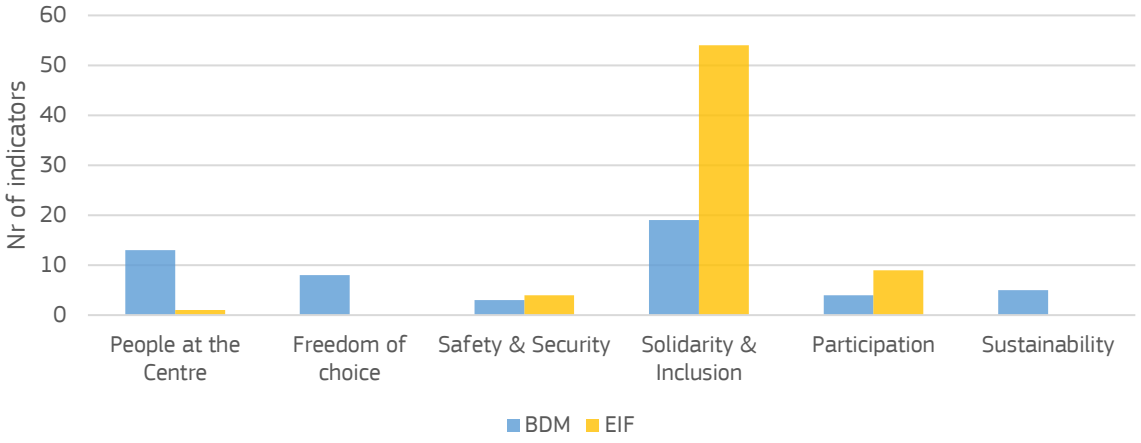


Figure 54: Number of indicators in BDM and EIF that relate to Digital Rights and Principles Declaration

The one aspect of EIF that stands out about the Declaration concerns *Digital Public Services* as a subsection of "*solidarity and inclusion*", where more or less 50 indicators cover this aspect more or less indirectly (**Figure 55**).

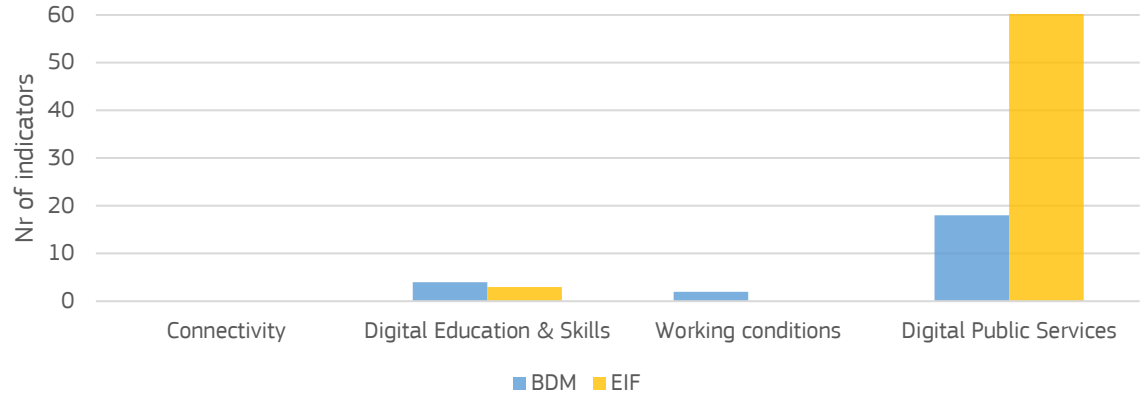


Figure 55: Number of indicators mapping to the sub-elements covered under the "solidarity and inclusion" principle of the Digital Rights and Principles Declaration

Moreover, four key topics come through clearly in the EIF and, to a lesser extent, in the BDM (which reuses EIF indicators), namely *reuse* (of government information), *seamless* integration across administrations, *accessibility*, and *once only principle*.

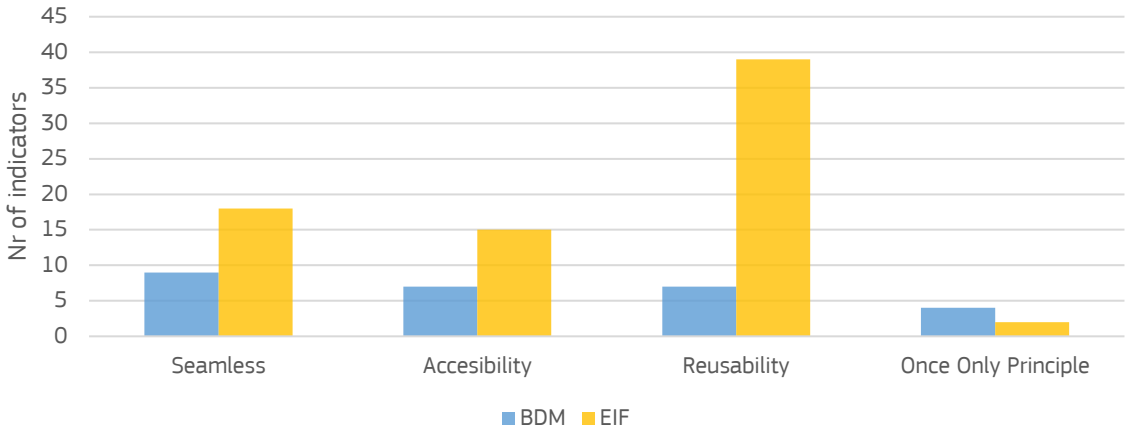


Figure 56: Number of indicators in BDM and EIF that relate selected topics of the Digital Rights and Principles Declaration

These groups of indicators either are explicitly mentioned or evoke elements of *solidarity and inclusion*, following the ideas of the Declaration, where such evidence may also supply a potential reuse of EIF and BDM evidence to assess developments in that policy area.

Based on this analysis, it can be argued that several areas of contribution and alignment are coming from the DIGIT monitoring schemes towards the Digital Decade, both as the targets of the Digital Compass and any assessments that may appear on digital rights and principles.

5. Stakeholder perceptions

Following the above details of the monitoring schemes, the study also gathered evidence from stakeholders in the EC and the MS through stakeholder interviews. These offer more details on the context of monitoring digital policies. Some discussion on benefits, burdens and gaps is described below. The anonymised list of interviewees is available in **Annex 10**.

5.1 European Commission perspectives

The desk study also provides the context to the stakeholder's interviews that took place in parallel with Commission staff as part of the landscape study, along with observations from the MS before outlining the gaps identified from this evidence base in Section 5. EC Interviews

The analysis examined the monitoring schemes, and we attempted to map them to the latest policy priorities. However, additional insights from practitioners are required to approach questions such as:

- *What are the verified usages or advantages of the different monitoring schemes?*
- *What are the challenges?*
- *How can the overall burden be reduced?*

In the summer of 2022, interviews and meetings took place with 12 Commission stakeholders responsible for monitoring digital policies. Similarly, in the autumn of 2022, four MS came forward to give opinions on their monitoring activities, mainly as group interviews. These interviews have been shaped and supplemented with meetings and workshops hosted by the study or in collaboration with formal meetings organised by DIGIT, including the interoperability expert group and Chief Information Officer (CIO) Network meeting. Some evidence from the interviews also supported the analysis of monitoring programmes, allowing this section to focus on their ideas around key concepts in monitoring and their opinions of the topic. The list of meetings and workshops held is available in **Annex 11**.

The section starts with examples from Commission staff. It covers particular concepts underlying *interoperability*, *digital transformation* and the two topics together as the key scope of the study and, to some extent, the basis for any reuse and alignment of monitoring activities before reporting on discussions with the MS about their approaches to monitoring, including identifying burdens and benefits. The semi-structured interview schedule was adapted for each interviewee so that not all questions were posed to all stakeholders with whom the study engaged. See **Annex 4** for details.

5.1.1 On *Interoperability*

As Interoperability is a key concern, the study aimed to gauge the extent to which related concepts were well understood by key actors inside the Commission engaged in monitoring activities. This also provided potential insights into where monitoring schemes outside DIGIT may contribute to future interoperability monitoring efforts. Interviewees addressed this from three perspectives, outlining how their activity related to Interoperability and digital transformation and the relationships they drew between them.

In general, interviewees' responses showed that *interoperability* as a concept is well understood and a key concern across digital policy. Comments range from the underpinning or fundamental of Interoperability or enabling activities, including between leading technological systems, to concerns that interoperability policy is needed to help speed up the creation of well-functioning online public services beyond the technical sphere.

- *"So, interoperability is paramount; it's at the centre of all the activities."*
- *"... interoperability is horizontal."*
- *"So, at the end of the day, of course, interoperability is at the heart of what we are doing... ...everything is enabled by interoperability."*
- *"(Interoperability is)... the principle of Europe itself, it's removing borders. - it removes borders, it breaks silos, it allows us to work seamlessly... and to communicate and have better services."*
- *"... you need interoperability if you have different data platforms. You need to have them interoperable, (also)... among sectors."*

- *"... when you link systems, you need to apply the same rules. So [interoperability is]... part of the framework of all the services we develop for e-government and also in the private sector. So, really, it's built-in... (it's an) enabler".*
- *"I would say the cliché, but (it)... deletes the red tape, for sure. Interoperability is not only the digital provision of public services, but it also interconnects different services and different public administrations that they provide similar or the service that you actually are seeking for"*
- *"Living-in.EU technical specifications are all about interoperability. Its raison d'être is to promote digital transformation following the principles of interoperability so that local authorities who are investing in digital infrastructure aren't locked in by various vendors and that there is a data platform that they can build".*
- *"The Interoperable Europe Act is acknowledging the fact that things have not progressed as quickly as they should have. Everyone is still doing their own thing, and as long as people continue to do their own thing, the level of integration digitally and the joined-up services won't happen."*
- *"(Some)... countries understood that we need a regulation, a common governance of interoperability because otherwise, it cannot work."*

It is, however, a concept with a limited common understanding, with one interviewee noting:

"... it is very difficult for politicians and policymakers to understand what is interoperability", which may be a challenge, as another interviewee stated that interoperability requires a *"... central pillar (that) is about the political will... political commitment*", especially when governments need to discuss and work together.

Moreover, one interviewee suggested that interoperability is:

"*... probably not the number one topic on the political agenda of the presidencies*".

This overarching role was also reportedly challenged by DIGIT's Director General, who, according to an interviewee, noted,

"*You are claiming that interoperability is the solution for everything, but you need to put this more in context. I don't see clear data in this direction*".

Moreover, the concept can be difficult to *decipher* from government ICT, with an interviewee noting:

"... (It) is very difficult to decouple purely interoperability aspects sometimes from (those)... related to fundamental digital services. How they are built, in a way that they are interoperable with others, is a very high level".

In addition, there have been instances where the nature of interoperability as a policy is seen to be stronger from a technical perspective rather than a politico-organisational one. For example, an interviewee said:

"... improved technical interoperability through the authentic sources indicator that we have (is)... the only interoperability... that we measure."

With another stating:

"... most people would probably think of technical interoperability as the main aspect of interoperability... there would still be the other kinds of interoperability as blocking factors".

This may be seen from the types of indicators that NIFO, for example, deals with and the ongoing work to elaborate further the organisational and legal interoperability layers, as well as the reinforcement of governance in the EIF. Although anecdotal, such comments raise questions about bridging the gap in collective understanding between technical and organisational interoperability aspects, which may also apply to evidence gathering in the MS.

Although these comments underline the importance of interoperability, its assessment within the Digital Decade is unclear, especially in the public sector area of the compass. Work may be needed to reflect its role, also in terms of the digital transformation of government.

5.1.2 On *Digital Transformation of Government*

Similarly, activities being monitored were seen as well-related to digital transformation, with interviewees indicating a range of activities that relate well to academic definitions of the term. Digital transformation was seen as related to technology but also principles. For example, one interviewee felt that digital transformation was one of the key themes of their monitoring activity "*It is all about digital transformation… (it is) everywhere*". Another noted that their activity would address "*the participation of citizens (which is) more about the rights*", thus relating digital transformation to the Digital Decade's digital citizenship developments. Another suggested:

> *"Sometimes (the transformation)… is not digital; it's just modernisation. Modernisation doesn't mean digitalisation",*

reflecting the "fundamental change" in government practice to which some definitions relate and seeing online public services as being a minor player compared to technical needs such as "accessibility (and)… user-friendliness" that, when in place,

> *"You think then about… making it interoperable with different levels of investment expertise and operational capability".*

Given some exploration of local transformations through LORDI, interviewees also recognised that the digital transformation of government touches upon some specific technological activities, including local digital twins and the role of technologies that create local dataspaces.

This was also illustrated by leading examples of elements that characterise or enable digital transformation, with "*digital skills*" highlighted by many as a topic that goes together with technological advances. This could be seen as a particular concern of the Commission, as skills are a cardinal point of the Digital Compass, with 80% of the population having at least basic skills. The EU has 20 million ICT specialists, with increased "*gender convergence*" characteristics that would impact public sector activities. For example, at the local level, digital skills could also include competencies related to specific technologies such as dataspaces, noting:

> *"… A huge barrier of expertise like negotiating contracts with data holders",*

This comment may relate to organisational interoperability assets such as Service Level Agreements.
The other components of digital transformation included mostly technology-related topics but also topics such as inclusion, accessibility and the twin transition:

- *"… the other one is technology. It's the type of technology and whether it's high-level technology that you use".*
- *"… innovative practices (including)… innovative services, innovative technologies being used to revamp digital services."*
- *"Security and privacy, just ensuring… the free flow of data. Of course, you have to ensure that (it)… is also linked to legal interoperability."*
- *"…it's about being able to cope and work in a different type of setting, and this requires adaptation and resilience… and having (the right digital skills that)… progress with technology, (as well as)… listening to your stakeholders so (that)… government is there to serve and… (develop)… services keeping your users in mind, always, and working with them."*
- *"Digital transformation is also ensuring that everyone is included; (from the)… illiterate not only digitally… and this is a huge challenge to the ones that are very advanced. So, it's about inclusion. It's about building effort.*
- *"Accessibility- all the interactions with businesses, citizens and the administrative level should be accessible. No one left behind… And Environmental- the free flow of data and increasing the level of data shared with different systems increase also the bandwidth; there is an ecological impact (linked to the twin transition)."*

Another interviewee noted that the emerging work on digital rights and principles was also strongly linked to digital transformation, stating:

"We believe that digital transformation of government needs to follow a set of values and principles to be able to ensure that we are all on the same track (delivering)… those objectives in line with our core European values and principles."

One interviewee also noted that *Digital Transformation* has a political dimension, with it being

"…a political tool for the MS to express the need to invest more in the modernisation of the state because this is not a high priority".

Interviewees also noted that Digital Transformation also has a political and policy dimension:

- *"(Digital transformation is) …a political tool for the MS to express the need to invest more in the modernisation of the state because this is not a high priority".*
- *"We want to build a transformation that really works for people, and that is adjusted to our values, the "European way" if you wish. And, to do that, we also need some monitoring."*

Some interviewees were asked to consider certain digital transformation components and their relevance to their monitoring activity.

"… the participation of citizens and the openness in participating in policymaking or service design. I think this is one, and of course, the inclusion. I don't know which value it can go with, the inclusion. By having, you know, online services and by providing key enablers for people to log into the services. So, I think these two could be considered."

Digital transformation of government, therefore, has a discrete role in digital policy and brings together both technical and organisational elements, as well as a growing interest in digital rights. The range of scope of such activities may point to some difficulties in coordinating requests for such information should there be an increased interest in monitoring digital transformation directly. With this in mind, the interviews were an opportunity to discuss how interoperability and digital transformation relate.

5.1.3 On *Interoperability* and *digital transformation* relationships

By design, the interview set out to understand if the interviewees saw a connection between interoperability and digital transformation. Care was taken to ensure a neutral position, so they were free to respond and not be led to supply a specific answer. Interestingly, in nearly all cases, interviewees felt that interoperability plays a role in the digital transformation of government, noting the importance of policy plans and developments, including work related to monitoring.

- *"We see interoperability in the broad sense in all its types as being really a huge part of the digital transformation of government and even more going forward. So that's why we're fully supportive of… the new piece of legislation that DIGIT is preparing at the moment."*
- *"So, for me, technology, of course, and digital skills are the two main pillars that contribute more in the digital transformation, with interoperability, of course".*
- *"NIFO is not only an observatory monitoring the EIF, but there is a lot… on reporting, on digital public administration… and other reports."*
- *"Interoperability is very cross-cutting… in many fields in society… if you are investing in new technologies, Blockchain, Cloud Computing, Artificial Intelligence and you don't take into account interoperability, probably you will end up in a mess."*
- *"All (digital rights and principles)… are linked one way or the other with interoperability because it's an enabler to deliver on them."*
- *"Digital transformation without interoperability is just everyone living on their own separate islands."*
- *"… the monitoring could evolve to have a little bit of interoperability everywhere."*

It was also suggested by an interviewee that the

"… cost of digital transformation is a huge barrier if you did have this kind of 'interoperable market'",

where support from local-level solution providers, such as SMEs, was highlighted as an aid to reduce such costs while preventing vendor lock-in with "*big players*".

In broader discussion, another interviewee wanted to place interoperability concerning digital transformation and digital rights and principles, where such comments can be seen to relate to the Digital Decade and any conceptual base of monitoring digital policy.

> *"Interoperability, it's a tool. It's an instrument for digitalisation. So, I would say in the chain of making the connection… because… digital values (are)… the crystallisation of things that you do before. You have digital rights, digital values that you apply to whatever you do before, but interoperability is, in my view, much deeper down in the whole chain of these connections."*

Such relationships between digital transformation and interoperability have not been addressed in detail. These topics can be considered a finding of this study from a research perspective, with potential impacts on the organisation of monitoring activities, the exchange of information between initiatives and potential collaborations across them in the future. Beyond these examples, interviewees also noted related topics, such as governments being able to learn from each other in the digital context, which would occur at all levels of government.

As the Digital Decade monitoring progresses, there may be a need to consider the extent to which explicit elements of digital transformation and interoperability are included in the analysis. A challenge may exist in this context because DESI, as a core monitoring element, has restrictive requirements on data inputs to the Index. The methodologies of somewhat subjective reporting in BDM and NIFO may not be robust enough. Interoperability can be seen as a *back-office* activity enabling the user-centric online service delivery that Commission policy promotes, so its inclusion in theory and practice for assessments will also need some elaboration to be able to strike a balance between capturing its status and performant role, while not creating a disproportional monitoring burden. Well-functioning interoperable systems may rest in the background and not be seen from the outside. Instead, interoperability barriers that must be addressed may require the most attention, including those that persist in exchanging information across borders and sectors.

The interviews did not explore this aspect in interoperability and digital transformation cases. Still, it may be a helpful checkpoint in further discussions to consider the benefits both areas bring and any barriers to address when improving the balance of measurements from the perspective of inputs, impacts and outcomes, including benefits.

5.2 Member State perspectives

The study undertook a series of interviews with groups of Member State experts in Italy and Sweden and individual interviews in France and Romania to be able to follow up on initial feedback from workshops and understand better the context of monitoring in the MS, as well as any interest to take part further in the study. The interview schedule is available in **Annex 5**.

5.2.1 National approaches to monitoring

Interviewees were asked to outline the mechanisms and methodologies to monitor national, regional and local developments on digital policies in their country. This allowed some understanding of the setup in the countries and the extended ecosystem. The first aspect uncovered from these discussions is the setup of national schemes. Regarding potential burdens, it was notable that many national schemes exist for their own needs on top of EC requests, leading to the exploration of examples, briefly outlined below. These included advanced examples and raised issues about the possibility of reusing this content for a data interoperability approach mapped and reused to meet EC requests. The pros and cons of such an approach would require discussion. The other key aspect of this part of the interviews is that, apart from Romania, the countries use a *triage* process to receive requests for details from the EC. These coordination centres involve a core team to capture details across various requests, including beyond the EC policy sphere. This has been a strong case in Sweden, a team working in Italy with policy and technical functions and in France, with at least one person in a managerial role. In turn, the difference in timing of these requests from different EC sources was recognised as creating some *burden* for those experts. However, the amount of overlap of detail on these subjects (such as advances in the adoption of Artificial Intelligence) would require deeper investigation beyond the current scope of the study. Still, some discussion with stakeholders should take place on this topic and the potential for the EC to increase their coordination and planning on topics to address this possible burden. In contrast, Romania reported on their new approaches to try and coordinate a somewhat fragmented approach to inter-departmental coordination to respond to monitoring. However, they also noted that their setup processes are likely to be impacted by new requests about the Interoperable Europe Act needs.

5.2.2 Potential multi-organisational burden

The discussion with these four MS also looked at how they respond to requests for EC policies alongside organisations such as the UN and OECD monitoring efforts. It was noted that the scope of the EC requests mainly differs from that of other organisations. This is a challenge, as EC policy can be seen to be a positive aspect of the monitoring efforts, resulting in changes in policy and assessment of improvements in various interoperability and digital transformation aspects. Still, the interests of other organisations may provide other benefits not yet uncovered by the study.

One key aspect is the coordination task involves a certain level of maintenance of the knowledge of their expert network and ensures engagement to receive responses. It is not a straightforward process of request and response. Moreover, it can be considered that the work of these gatekeeper teams has coordination burdens in both downstream and upstream data flows, including checking the progress of responses and potential content. This was also highlighted in terms of having to make interpretations for their national experts, including literal translation from English that may sometimes deal with topics that are difficult to express in native languages, which require further reflection as both syntactic and semantic interoperability issues as a potential burden that could be improved through multilingualism.

Given the request for support from Romania to improve their monitoring approach, it may be interesting to explore in more depth any good practices in coordination and consider twinning projects so that the Romanian administration may look at modernisation opportunities with a leading country with a similar administrative approach. Depending on the scale of the effort, there may also be a need for countries with such challenges, like Romania, to consider the role of European Regional Funds.

5.2.3 Monitoring benefits in the MSs

The study also explored how the current EC monitoring activities benefit the countries (or organisations) and not only burdens. For example, Italy has used EC resources to encourage subnational actors to develop online services in a *standardised* way. Efforts such as eGovernment Benchmark were highlighted as a series of targets that help to scope such efforts beyond their intended purpose as a guide to mystery shoppers. In France, the outputs of monitoring activities from DIGIT were being used as background material for ministerial briefings when the French minister had to meet European counterparts.

Other MS (outside the context of the interviews) have noted that questions coming from the EC can also improve an inter-organisational working sphere, where the example of innovative technologies (such as Artificial Intelligence) that are being discussed in various circles would be able to recognise each other, aiding national coordination as well as taking a position to supply information. Such issues should not be overlooked as providing benefits and outcomes beyond the scope of the specific monitoring efforts.

Overall, the interviewees reported that, to a greater extent, the monitoring results support unbiased benchmarking. For example, Sweden has a personal objective of "*being the best*" in digital transformation in Europe, and France has used the material to set some internal performance targets.

5.2.4 Reuse of EC monitoring schemes' outputs

The study wanted to know more about the use of the products beyond the benefits highlighted above, including potential room for improvement, the factsheets, dashboards, reports and other materials, and the importance. Apart from the above benefits, the MS who have spoken in meetings and interviews see the outputs as having relatively limited value. This also involved a line of questions where Member State representatives had questioned the costs of monitoring versus the benefits and (public) value of the outputs, including for potential reuse. This may lead to further questions about how outputs could be made more valuable, including any efforts to harmonise the outputs from various monitoring schemes (or related activities), including in their *look-and-feel.'*

5.2.5 National best practices

Interviewees were also asked if they had any good practices (as methods, tools, coordination practices etc.) at the national level that could be adopted/replicated across Europe or be submitted as additional content to help monitor digital policies. France suggested there was limited potential to reuse their approach in other contexts. Italy had a dashboard on services approach with some potential for lessons for others. Still, the variation in the

national context, capacity and interests across Europe should also be considered, including any extension to the investigation of national efforts, sketched out below.

5.2.6 Reflections on burden

Interviewees were asked about specific challenges in gathering/sharing data for monitoring digital policies with the EC. In essence, there are several issues repeated in most cases to do with the timing of requests, the issues around coordination noted above (which also have benefits), an additional burden in terms of (near) constant engagement across the monitoring cycle, including comments made in meetings related to the validation of findings from monitoring schemes and the arguments that may arise that the analysis support EC evidence differs from national assessments, impacting on rank in benchmarking activities. The main concern, however, is the additional time and resources needed to check, raising issues about where that may be automated to (some extent).

As well as language issues noted above, interviewees highlighted an emerging, extensive and complicated terminology across policy activities and monitoring that is likely to increase, including where a term may take a different meaning in different contexts. Beyond the specific terms, stakeholders also mentioned that some questions' wording could be cumbersome. In part, the examples given were related to the underlying policy topics being assessed with a desire to keep the integrity of the principles in play. An example includes the wording of some commitments in the Berlin Declaration, which were not transformed into a simple question as the scope could be misinterpreted. CIOs and experts have also called for the sheer number of questions to be examined. However, it should be recognised that the volume of material is larger than many public sector stakeholder surveys but less than monitoring efforts in other EC policy contexts, such as all the data associated with the (regulatory) monitoring in the environmental chapter of the *Acquis Communautaire*.
Moreover, some stakeholders have asked that measurements be framed more around gathering facts rather than opinions, which can also be associated with requests to examine technological rather than policy-related objectives. This is a challenge for the study and monitoring, as stakeholders are a mix of both (highly) technical experts and policymakers. This should be seen as a strength and part of the scope of the work. Still, an issue may arise in satisfying a reduction of the burden in monitoring when areas such as principles or concepts are in play that cannot be readily assessed online, even though proxies.

5.2.7 Problematic questions

The study also requested specific examples of the burdens related to evidence provision for the main monitoring schemes, including duplicate questions/topics for different reporting streams. Importantly, comments in meetings have pointed to such overlaps in general terms. Still, interviewees did not seem to have this *information at their fingertips*, possibly implying that there is no massive burden here and at least no pain points that they would like to correct immediately. However, this would require validation with more MS or a deepening of the landscape study to consider an analysis of the *upstream*-specific questions.
In addition, no steps have been taken to see if there are overlaps between EC requests, national interests and the questions posed by other (international) organisations or even academic studies. To note, contextual information is likely to be repeated in each monitoring scheme. At least in terms of some administrative data, this raises the potential to put the Once Only Principle into practice in the context of digital policy monitoring, digitalisation and interoperability. The former could also apply to a broader set of evidence and the reuse of data/indicators, creating an infrastructure supporting *supply once and reuse many times*, including in different dashboards or other outputs. Some discussion should take place with the UN (World Bank) and the OECD to see if there are overlaps, common areas of interest for reuse and any timing/coordination issues that may be creating hidden burdens outside of the immediate lenses of this study.

5.2.8 Future needs

Interviewees were also asked to reflect on the ideal/future needs of digital monitoring towards the EU's digital goals for 2030. In general terms, interviewees seem prepared to respond to requests no matter what they would specifically involve. This may have some role in forming any ideas of *burden*. Still, things seem to be also relatively stable in the key schemes. Still, there is maybe a challenge in this context if a co-creation approach shows a need to make notable methodological differences. Interviewees were also interested in exchanging good practices. However, the context may be more related to the ideas for setting up the Interoperable Europe Act. An issue to be considered is that there are calls for increased automation. Still, the role of the interviewees today is to provide self-assessment and benchmarking. The pros and cons of reducing that role may also need to be evaluated.

In this context, a final topic of interest has been some MS (e.g. Greece) proposing a central system for reporting monitoring activities. Some EC staff also proposed this platform approach and were recognised by contractors supporting some monitoring schemes. It should certainly be scoped further as a topic for discussion with stakeholders.

Interviewees were also asked about their potential involvement in streamlining and what concrete joint activities they would like to see between MS and the EC. In nearly all cases, there is an interest in the study, and I have volunteered to continue the collaboration.

6. Summary of burdens, benefits and gaps

Overall, this section addresses the following questions:

- *What is the level of coherence of the monitoring schemes? What is their rationale, and what role do they play? What are the verified usages or advantages of the different monitoring schemes? What are the challenges?*
- *What are the gaps, overlaps and emerging opportunities in the monitoring landscape? How to ensure synergies and alignment across the monitoring needs for digital policies in the EU in light of the new Interoperable Europe policy? How can the overall burden be reduced?*

The following section examines the nature of burdens alongside examples reported by stakeholders as a key concern of the current condition of monitoring digital policy. Along with those potential areas for improvement, the study also aimed to uncover existing benefits, where potential benefits and missed opportunities are reported as gaps.

6.1 Burdens

Burdens take many forms in monitoring activities, with many faced by other public tasks. Many of the issues discussed as burdens will be addressed below concerning gaps' when stakeholders have reported shortcomings in current activities, especially national representatives involved in the compilation, submission and verification of national data and related inefficiencies. As an introduction, however, it is useful to outline the nature of burdens in the context of the study.

In most cases, burdens relate to a certain amount of inefficiency tied to a task. This can be the familiar administrative burden of compiling information to meet a monitoring need. Similarly, certain processes with weaknesses related to monitoring needs may indirectly add to the burden of monitoring due to the overall public administration approach. There may also be barriers associated with technical issues that create burdens, including the need to invest in and maintain certain technical resources. This can be contrasted with the organisational context, which, although external to the monitoring process, will certainly influence how any issues are absorbed, avoided or carried out. Burdens may also be faced due to a lack of proper skills and expertise, implying that not all organisations will need to carry a burden in the same way or impact the organisation in the same way. Lastly, burdens create knock-on effects demanding human resources to address them and consume time, thus creating additional costs.

A recurring burden that emerged from the interactions with different representatives of MS is the administrative one. This can be seen from a Commission interviewee stating:

"(MS asked)… *not to come with too many new indicators because… the less, the better… we created a trusted environment, and they said, "That's just not possible. Now, you have to coordinate between your own services before asking us to coordinate with our services at the national level."*

Similarly, although efforts to bring the EIF and BDM in a single questionnaire were appreciated, this created a burden of more than 90 questions.

A similar burden comes when requests come in an unforeseen manner related to timing or simply because there is no capacity to respond in the foreseen timeline. This was reported in terms of having "too many support requests throughout the year", where there were also issues of a lack of skills/knowledge in the department receiving the request to coordinate then responses from other departments and public sector organisations with limited human resources.

At different times in the monitoring/policy cycle, stakeholders are engaged to supply inputs or validate processes and outputs. This was also seen as a burden by Member State representatives but not in all the key mechanisms reviewed. This has led to some blocking of new monitoring efforts in political contexts, with one Commission interviewee suggesting that:

"… there is already consultation fatigue; it's already there. This is the main reason the MS said in Council that they don't want the monitoring (in a new policy area). They are sick of the Commission coming back with the same surveys all the time."

Similarly, it is recognised that although the questions that are asked are different, it is considered that there are issues that overlap between schemes, albeit from different angles. Specifically, there are cases where requests are made to experts at separate times to deliver data and/or verify results on similar topics, particularly

when tied to a specific technical arena, such as investigating Artificial Intelligence by different policy areas in the Commission. Requests from several monitoring schemes and other EC initiatives, such as Open Data and other international organisations, including the OECD, the UN, and the World Bank, exacerbated this.

Another way in which burdens were regarded was related to the monitoring schemes' fragmentation, leading to what was seen as lower-quality responses and demotivation from those providing details. It is understood that a centralised vision of digitisation issues would have more force than separate initiatives, even in competition.

As much as possible, expert groups have asked the Commission to try to minimise the requests for information, with a clear request to aim to gather specific needs, essentially asking for coordination in monitoring activities in digital policy and, potentially, priority setting. At the same time, *voluntary burdens* can originate when MS commit to monitoring without necessarily having the full capacity to perform the required tasks or generate the evidence needed. An interviewee gave an example in the context of the *Single Digital Gateway*, which was noted to be an ambitious regulation.

> *"It listed out all different services that should be online (but)... it is kind of impossible for the people trying to implement it to actually implement it. ... So on the one hand, some MS can't keep up, and on the other hand, some of them are just signing up to things, and then they're not doing it".*

There are also cases when, even if the Commission and MS work together on scoping details to be monitored, feedback is given that creates burdens to be carried or where the extent of the burden is not clear until monitoring starts. In one case, a Commission interviewee noted that Member State representatives:

> *"... told us already before launching the data collection that some KPIs would be very difficult to monitor*".

Similarly, in response to the request for comments on revising the EIF model in preparation for the 2023 data collection, comments were received by the Commission that questioned aspects of the data collection and processing process. Suggestions came to simplify the work, including changes/optimisation of the questionnaire tool, as it would lack key data-completion features, such as the ability to save a copy of the details provided. This could imply a need to go deeper into requirements gathering for how MS gather and supply evidence and assess whether existing systems are fit-for-purpose or could be improved.

Such issues can also go into much detail about how information is provided. There was, for example, disagreement about the use of details provided in optional fields that enrich questionnaire responses, where it seems that this additional information was never used in reports' texts. Given the efforts involved, such redundancy could be seen as a waste of time and was frustrating for Member states. A review of content and how it would be processed should take place and be transparent to stakeholders.

Likewise, burdens were also seen to come in line with missing the scope of certain elements to be measured, with an example of the number of workshops carried out being seen as inadequate to the topics at hand, especially as the assignment of scores was felt to lead to improper comparisons between *larger and smaller countries. These methodological issues will be discussed further below. However, care is needed to assess burdens with all stakeholders. An issue has emerged where an interviewee from the Commission felt that MS:

> *"...don't report specific problems. They have general complaints, and when we ask them for specific examples, they can't give them to us".*

This issue was directly addressed to the small group of MS representatives. The study has interviewed, and so far, no specific question has been noted as problematic. The context of the interviews should not be taken as conclusive. Still, any deeper analysis of possible burdens and redundancies should continue to examine where overlaps are present. This may also be performed by better/joint indicator governance across monitoring schemes and a more detailed analysis of relationships to key policy concerns.

Also, concerning future work and burdens, the study has recognised costs and benefits (see below) related to monitoring but has not considered taking up the task of a cost-benefit analysis of monitoring schemes. Some desk research, however, has examined burdens in the statistics domain that may contribute to this topic.

For example, Eurostat has considered issues of "*cost and burden*" in data exchange, formally defining it as the cost:

> *"...associated with the collection and production of a statistical product, as well as the burden imposed on respondents".*

The cost is associated with a statistical product and can be financial, human or time-related. It may consist of staff costs, data collection costs and other costs related to reporting obligations. These elements can be seen to relate well to the examples of burdens cited above.

Moreover, a burden is often measured by costs for the respondents (businesses, institutions, households, individuals) imposed by a statistical obligation. The overall burden of delivering the information then depends on a) the number of respondents; b) the average time required to provide the information, including time spent after receipt of the questionnaire ("*recontact time");* and c) the hourly cost of a respondent's time.

In addition, the "*real burden*" of monitoring should also be considered as the measured burden minus the "*perceived benefits*" that are partially addressed below.

6.2 Benefits

It was important for the study to examine burdens and problems emerging in the current monitoring activities and the benefits and positive aspects reported in the SWOT analysis below.

6.2.1 Expected benefits of the EC schemes

In general, the monitoring schemes have expected results that are quite similar. They aim to uncover where there have been areas of improvement in developing digital government while highlighting areas of excellence and, to some extent, good practices from which others can learn. This is their main purpose. The schemes also aid targets and comparison-making, allowing the MS to know their positioning in other European countries through benchmarking and bench learning, including the potential to highlight *reusable* solutions (of interest to interoperability) and good practices across digital policy themes. A Commission interviewee noted that such activities are also useful to accession and neighbourhood countries. Monitoring is a key part of the policy process. The activities around it create inter-relationships between the Commission and the MS and, indeed, between the MS. The political nature of monitoring discussed above should be recognised as bringing benefits beyond simple measurement.

6.2.2 Perceived benefits by Member States

Some interviews with the MS recognised the usefulness of the DESI reports in aligning digitisation strategies and setting improvement guidelines that will be reflected in the increase in position in the European DESI ranking.

Italy, for example, stressed that despite the demanding work needed to review the list of web services and portals to be evaluated against the different aspects that the eGov framework provides, this allowed the identification of malfunctioning aspects where it will invest for their resolution.

6.3 Examples of gaps and issues uncovered by the study

Following the desk study and stakeholder interviews, the following section outlines gaps and other issues relevant to improving the current monitoring schemes and some ideas for future activities.

Capacity - In some cases, it was noted that the checking and validation of data being received could be more thorough, but that capacity was lacking. One interviewee stated, *"... there is a bit of interaction and eventually fine-tuning of the result values*," but that ideally, more could be done.

Trust, data quality and reporter bias - There is a desire to have a more accurate and sometimes more independent view on details being reported and analysed, including issues of reducing potential reporter bias, with interviewees stating:

- *"(Member State responses are)... purely self-assessment... There is not... an independent audit or independent data collection."*
- *"...personally I'm slightly sceptical. It's not that the data is self-reported (is an issue)".*
- *"Belgium ranks quite high (in indices but)... I've never seen so (difficult to use)... IT tools in the 21st century, it's amazing."*

Member State also raised the quality/trust issue regarding the validation approaches with an additional burden created to carry out this validation, with Commission interviewees reporting issues from MS saying, "*you are*

wrong. We have better data". As well as being a gap, this example illustrates trust issues between stakeholders. In addition, independent audits were considered in terms of mystery shopper methods, as used in the eGov.

Critical mass of responses – Currently, efforts to establish LORDI will face the issue of achieving a critical mass of contributions to enable comparisons and benchmarking. The approach would have a *headstart* by introducing data from around 300 cities participating in the DIGISER project.

Local level responses – Although plans are in place via LORDI, an existing gap is evidence of digital transformation at the sub-national level, where the results could contribute to the policy and economic activities of the European Semester by 2024.

Burdens and automation in the context of monitoring digital rights and values, an interviewee made the following comment:

> *"…we want to keep it light. We're going to rely as much as possible on automatic data collection and existing data… to avoid adding burdens".*

Missing data – Another interviewee highlighted cases where the items being monitored are simply absent, noting "…the lack of data is the… huge barrier on the Member State side".

Saturation – Assessments are reaching *saturation* that may miss "*measurement opportunities"* or no longer measure the most relevant issues.

Agility – Approaches to keep apace with future needs appear lacking, including technology and policy, as illustrated by the comments of Commission interviewees.

- *"… we don't have the flexibility and the agility to be able to adjust these sets of targets and KPIs to the situation."*
- *"So, we want to build on having time series to compare with previous years in the measurements, but also we cannot extend it to… 2030, because there might be updates based on the needs and the advancements of the technology and also the policy in it.*
- *"It's difficult to make a clear-cut separation between current needs and future needs".*

It may, therefore, be reasonable to question the extent to which existing monitoring systems are fit-for-purpose beyond their current scope and how they may contribute to future activities.

Gaps between monitoring schemes

Shared governance - In considering more harmonised approaches to sharing evidence, an interviewee suggested a need for:

> *"a clear governance system that will enable an annual Rendez-vous", with the output being a related report.*

Cross-DG collaboration - A challenge is recognised by interviewees in meeting the needs of, for example, developments in the twin transition. Therefore, the separate files of digital and environment/climate may also create new coordination and communication issues for the Commission if the evidence is sought on the digital component in this context, addressing communities who are experts in their specific environmental domain and related standards and technologies.

No conceptual model - Interviewees noted that a fundamental building block might be missing in terms of a common conceptual reference model or framework, which also impacts the gaps between monitoring schemes. One interviewee stated:

> *"We don't even have sometimes the conceptual framework for assessing that. And then when we have it, it's very new and very consuming… capital intensive in terms of capacity… We need both (quantitative and qualitative approaches)… a narrative to have examples… nothing is impossible to assess, we just need a framework, and you just need a reference, and then you can assess… (We need) to develop a conceptual framework that explains how we will… describe a situation quantitatively and …complete that with qualitative assessment."*

Alignment by the time - The issue of timing and alignment pointed out in some interviews, illustrated by the statement:

"*Having a timing aligned for the reporting is going to make the life of everyone easier*."

Common platforms – Although currently in the design and implementation phase, the emergence of local-level activities such as LORDI and EDIHs points to a gap in the alignment of the evidence being gathered between these two DG CONNECT initiatives. Possible approaches may involve co-promotion of the related surveys. Their processing is quite different, and there would be interoperability challenges and notable development costs in reusing content across platforms. In addition, even recording *"once only"* the simple characteristics describing stakeholders could be considered as of common interest, but this would also be difficult to implement.

A question remains if a local-level interoperability and digital transformation resource should be created for cities and regions to signpost all the relevant resources and monitoring activities the Commission are undertaking. The interviewees asked about streamlining and sharing evidence, including where different policymakers or organisations could see data "*according to their goals*". Such discussion relates to MS's calls for a shared platform for data providers and users nationally (see below).

Gaps for the future – Methodologically, but also in terms of content, there are some issues about measuring impacts and outcomes, a topic the study has started to explore but has not been able to fully address to date, as well as the level of detail needed to measure digital transformation well. This is reflected in the statement by interviewees, noting:

- *"... (a lack of)... assessment of the effectiveness of the infrastructure. So, in a sense, we can assess the length of kilometres of fibre deployed, but we cannot really assess easily the end-user quality of the service because it's linked to many different factors, and it's also difficult to assess."*
- *"Just looking at the amount of users, for me, it's not enough. Looking at the amount of services that are online is not enough to be able to explore values and principles because it doesn't tell you if those are respected or not."*
- *"My general feeling It's that ... they are a little bit too superficial for... where we are in the in the digital transformation cycle, let's say now and looking ahead to the digital decade."*
- *"We are just now going deeper in this analysis, looking also at the practical implementation in... infrastructures and services. It's very difficult to, in practice, check... how the (interoperability)... applies to one particular digital service. It's complicated to measure this."*
- *"... and then, this is a general consideration, (there is a)... lack of kind of comprehensiveness of the monitoring. And the other thing is that the monitoring itself can be improved."*
- *"... to use something more maturity-wise rather than just individual KPIs, that is hard sometimes to understand."*
- "There are two things the monitoring will have to evolve to keep up with the changes coming from the new policy, the new obligations coming from the new policy and eventually with a new EIF... (there are also) moving targets around us only on the legal side with the Data Act."

Terminology and stakeholder understanding - A challenge occurs in this context in getting the details from specific individuals in organisations, who may be experts who do not share the same terminology as those requesting information for monitoring, including going to a level of activity where detail matters. This may become an increasing challenge as more topics are being addressed from diverse backgrounds, as technology evolves and as policy approaches to address technical challenges (such as digital rights) mature.

New methods for assessing interoperability's contribution to digital transformation - An important *gap* recognised by the interviews would be the evolving needs of interoperability and digital transformation policy and that an opportunity exists to devise new methods. Interviewees noted this in terms of creating new methods:

- *"...a new method that could also best serve to the new policy... checking, you know, the uptake of interoperability. And also doing in a way... that we can isolate as much as possible this dimension from other dimensions on digital transformation and digital services".*
- *"What is lacking today is an assessment of the effectiveness of the infrastructure... we cannot really assess easily the end-user quality of the service because it's linked to many different factors, and it's also difficult to assess. So, if we could have a better perception of the outcome of the infrastructure rather than the*

development of the infrastructure, it will be even better. Because then it will link with the perceptions of people, which is, I think, more important."

There is, therefore, a desire from some Commission staff to gather more insights and details from the MS and/or alternative approaches to KPIs to consider the extent to which organisations are achieving interoperability or becoming more transformed. A question emerges, in turn, as to whether more targeted monitoring or a change of approach towards maturity would be considered a burden or an improvement by stakeholders. All this takes place in a shifting policy context, both legally and in terms of the guiding framework for interoperability, presenting opportunities for such change and challenges, including the relationships between legal acts.

Transparency, inclusivity and outcomes - An interviewee also said that when monitoring services and reflecting on rights and principles, "*How do you ensure that you're transparent towards your users, that you're inclusive*?" Such comments also point to a desire to assess outcomes alongside consideration for principles related to engaging stakeholders.

User-centricity - Similarly, the depth of understanding of the uptake of interoperability was also framed in terms of user-centricity, where an interviewee noted that

"... we don't have a real tracking of how user experience that interoperability. We could... develop user profiles and... sit with (people)... in a room and have them use the services... and then we can accompany them".

Alignment's recognition - Considering both the methodological and policy perspectives, stakeholders during the study highlighted the benefits of more alignment between monitoring activities that would also likely reduce burdens inside and outside the Commission. Although already defined in the study scope, stakeholders must recognise and report these issues; one interviewee stated that by improving coordination and alignment.

- *"First of all, the Once Only Principle will not be violated; we will not be sending the same things; there will not be overlapping of work... so you get information, and you use it, actually, without knowing that something is there".*
- *"(More streamlining across initiatives would be helpful)...because a lot of stakeholders we are requesting data from are the same. So if we could have something exactly on the same timeline, and for instance, with one with one questionnaire only, that could be that could be even nicer".*

Visibility and policy silos - There may be issues with the "*visibility*" of a given initiative if there are not as many direct requests for details from stakeholders.

This can be contrasted with another interviewee's comment, where action by the Commission may set up silos to respond to pressing policy needs, where one interviewee noted:

"Instead of addressing MS comments and reducing all the forums and just putting things together, there is this temptation of the Commission to have teams dealing with a lot of topics and showing that they are quite active, but then we lose the point of just addressing MS' needs... Not to forget that our clients are the MS."

This may also relate to coordination issues, but the perception inside the Commission of possible inefficiencies in policy-making should also be noted.

Missing (common) strategy - There may also be gaps in policy, at least based on previous practice:

"There's no Action Plan for now. This should be developed, and frankly, I don't know who is doing this. We don't have the mandate. So, it should be someone in CONNECT or DIGIT, but still at a high level."

Policy speed - It was also acknowledged that the pace of policy evolution presented challenges in this context:

"I think the difficulty in digital policy is the extremely rapid evolution of the context and of the technology itself...we are having to try to catch up ... and (face)... policy challenges that this evolution is bringing forward."

Advanced methods and AI - There is also a desire to use new technologies or apply more advanced analytical methods. For example, an interviewee mentioned wanting to "*... build on real-time Big Data*", including from the local level. An emerging topic, yet to be fully articulated, has been Artificial Intelligence (AI)'s potential role in supporting some monitoring aspects.

- *"… it would be very nice to have a kind of system that allows (you) to make some specific requests … by AI … if you want to know something and just you have to record the system, and then you get some answer about what you're asking."*
- *"Something else… can be the use of new technologies like AI to even measure some things."*

This may relate to discussions of automation in the monitoring process. Although more work will certainly be needed to understand which for of *AI* could be considered a collective approach across policy monitoring, some opportunities and challenges can already be noted, as with any methodology and technology. The first is the ability to organise and analyse much larger amounts of data that uncover otherwise hidden patterns, removing repetitive tasks from analysts. The second issue is, however, the representation of policy concerns and principles through algorithms, especially where the subject matter is not easy to measure in the first instance. A possible way to approach this topic is to use a sandbox approach to bring the technical and cultural challenges into one frame and find where useful and acceptable output can be created for all stakeholders.

A Monitoring "dataspace" and APIs - Considering solutions to improving monitoring and increasing potential automation, there were also calls for an infrastructure approach from the MS, proposing one system as well as Commission staff recognising this potential alongside using *Application Programming Interfaces* (APIs) to aid assessments:

- *"For me, this would be ideal: that we put together in the Commission… all the data we collect. Just even this is going to make a difference. … We will also be able to justify- say, look, we have put in one place all the data we collect. We have ensured that what we're asking you is not present there."*
- *"At the end of the day, it could be a big database… populated by different monitoring systems and then used by different stakeholders in different ways according to their needs. And, of course, we have discussed with Sven… and I think you are also part of the discussion… and this may happen if all systems are… interoperable, one to each other, using the same approach and using more, kind of, APIs."*
- *"… it's difficult to identify specific API's for interoperability… through authentic sources, and prefilled forms… we can measure interoperability… (alongside the)… availability of services… interconnecting systems… through a portal".*

Digital Transformation policy - An interviewee noted that "*digital transformation needs some regulation and also to be able to share data between public and private, to enable… of course, to respect data protection, privacy."*

EC policy management - At least three interviewees noted the importance of good policy management activities. As well as ensuring long-term goals were in place. Good planning was done for activities such as potential further alignment. It was felt that senior management in the Commission was informed and/or supporting changes to monitoring activities. For example, one interviewee said that alongside coordination and governance, a *"…clear direction from hierarchy and (their) clear commitment*" is important because *"… there might be the case that directors or… DGs… agree, but then they leave it behind, somehow (and) forget about it*", with the risk that a lot of effort is put in but faces decision-related barriers. Engaging with the CIOs has raised awareness within DIGIT's hierarchy. Still, any alignment process should also ensure that DG CONNECT leaders can clearly take a position relating to the foreseen co-creation process and the sharing of evidence for outputs such as the Digital Decade's first annual report.

Expert Liaison - There may also exist a governance or coordination gap, as one interviewee noted that *"… the Commission should be more proactive and play a role of an expert, or to connect with experts to help with the transformation on the ground and not only at the ministry level of the MS federal level."*

Statistical/contextual content - It was suggested that some MS do not have the data needed to respond to certain monitoring questions, as well as a desire to have more statistical information should be gathered relating to services/users, including through administrative data:

- *"…the lack of (existing/accessible) data is the… huge barrier on the Member State side".*
- *"… (we should gather data to have) segmentation by age, gender and other statistical information".*
- *"More general statistical information (especially at a local level)".*
- *"… the satisfaction of services measurements… from Eurostat annual surveys (could be good data to use)."*

- *"(It would be good)… to get information from administrative data. Meaning that you get from… the demand side information to the supply side".*

Assessing interoperability at the service level - Such issues of the technical assessment of individual services for interoperability were also noted by another interviewee, stating that:

"… the most difficult part is the actual uptake of interoperability in individual services. There are so many and even also to define how you measure interoperability in one particular service".

Sector/Service experiments – Moreover, in exploring the status of online services, some interviewees saw the possibility of moving away from survey approaches and focusing on certain sectors in order:

"… to test the process of requesting, (for example) unemployment or social benefits in each Member State."

Approaches such as *mystery shopping* and *user panels* were noted. A learning experience through a pilot looking into interoperability and digital transformation in detail across borders could be of interest to the later stages of this study.

Cross-border services - A gap currently being addressed by DIGIT in the context of NIFO has been cross-border online services:

- *"…because… this cross-border dimension is not really at the core. So, we are checking "country X is doing this, country Y s doing that", but the cross-border interoperability for some services, or for some infrastructures, is missing actually… what is missing now is the last mile that is the cross-border connection and support (to)… trans-European services and different European Union policies".*
- *"… the cross-border dimension is being built now progressively but not in an orchestrated (or)…coordinated manner. We have examples, the Once-only Technical assistance in the Single Digital Gateway, TAXUD and eJustice. Few examples in some domains, sectors but (all) … totally scattered and disconnected from each other".*
- *"The number … of citizens that are actually concerned by cross-border interoperability is quite limited, especially in … small MS… the goal was to convince them that it was not only for citizens across two countries but across all the Union. It's roughly 20 million people to interact with public services as they would be in their home country".*

This dimension may have increasing importance for the new Interoperability Act, and MS have been consulted about the topic. Especially as the Act is *"… meant to build everything more coherently and overarchingly. So, the monitoring will have to change…"* It should be noted that some work already takes place on this topic in collaboration with eGov.

Segmentation by Location and Scale - An interviewee also mentioned an increased interest in activities at different levels of government, where they felt that

- *"…there is something that could be articulated better between the EU level and the national level and regional level and cities*
- *" and another suggested that "The last mile is not only the cross-border dimension, it's (also)… the local dimension".*

Similarly, challenges related to interoperability also sit between local and national levels, with one interviewee noting,

- *"… in having interoperable systems within a country connecting the local administration with the national administration… we can't really capture with the Benchmark Study*".

Local and regional level activities and, to some extent, their relationship to national efforts through the European Semester reporting partly falls within the scope of LORDI. This emerging activity does not foresee any aggregation possibility to the regional and national level until, at best, a "*second version*" but where an understanding across "*different areas of focus at the different levels of government"* as you *"… have to be aligned and at least aware of what each other are trying to do*".

However, the overall logic between its local/regional focus and how it fits within a national and European picture needs some consideration. Moreover, it was recognised that MS vary in the extent to which they engage in subnational interoperability and its monitoring:

"*… there could be quite a lot* laissez-faire *(in terms of) coordination, or trying to have a coordinated approach, or having a set of standards or a set of guidance principles… so that they'll be interoperable internally within their Member State*".

Such issues also present challenges for cross-border data-sharing and the setup and exchange of information for online services. Moreover, this should also not only be seen from the point of view of simply aggregating local data to a European-wide view but also from the multi-level governance dynamics that exist in this context and the way data is exchanged in both directions from local to global and vice versa, as well as any particular issues of exploring cross-border areas and the issues of interoperability that rest in this context. Geography matters.

Geospatial and organisational setting - Statistically, there may be issues with the nature of *reporting units* and the comparability of data across MS. This can be seen with considerations for what constitutes a *municipality* in the scope of LORDI.

"…there will be a combination of statistical data, but it's riddled with problems of what size is a municipality, what is a 'municipality', which is totally different in all the different MS? So… the statistical data is very difficult… all the municipalities are organised differently in terms of their roles and responsibilities."

Missing data for the Digital Decade - More specifically, monitoring in the Digital Decade will be notably based on DESI. Still, there will be some areas where DG CONNECT will need new evidence that will not be formally linked to the Index. An example will be the need to develop a track of work developing new KPIs for targets on innovators. An interviewee gave evidence of offering:

"…finance to double EU Unicorns… or indicators which did not exist".

Depending on how the KPI is developed, the finance of such unicorns may come from public funds or be monitored through public accounts. Although there may not be a burden for those engaged in interoperability and digital transformation of government, there may still be some efforts needed for the MS to present a cohesive picture for DESI and such related details. More specifically, in the public sector, DESI must be supplemented with details on electronic identification (eID) and the system access layer.

Outcomes and impacts - Although the study has started to explore outcomes and impacts, this remains a weaker part of the evidence base and requires further discussion with stakeholders. Interviewees highlighted these issues specifically in the context of assessing the uptake of EU values and the work on digital rights related to the Digital Decade, which were seen as particularly challenging from the point-of-view of assessment and monitoring, in part because of their novel nature and because these aspects can be seen to be somewhat closer to more fundamental rights and principles and fewer aspects that are tied to technology, with them asking:

"How can we really monitor inclusiveness, non-discrimination, the protection of kids (online), fairness and ethics?"

These matters may also impact (directly or indirectly) the functioning of the public sector or the digital transformation of government.

Underlying Technology - The depth of interest in interoperability and digital transformation in the public sector may also lead to two areas at various levels of activity, the underlying technology and the outcomes of its use, potentially for all stakeholders, with one interviewee noting:

"… Our management would like to see is how technology is used in the public sector. Now, we look at the outcome, whether you have good quality public services. But they want to know the… underlying IT systems in the MS, what technologies they use."

Socio-technical issues - In particular, any advances in assessing (techno) social issues, digital rights and principles would interest DG CONNECT for outputs being programmed for June 2023.

- Digital Divide is *the "gap between those who can access and use information and communication technologies (ICT) effectively and those who cannot"*. One interviewee said:

"… but there are also some social issues like the digital divide or… these sorts of elements which are not easy to capture".

- An interviewee highlighted this topic as a particular gap in digital policy assessments that was difficult to monitor alongside other social issues.

- This was reflected in the comments of another interviewee who emphasised the difficulty of assessing policy uptake for topics like "*Web accessibility*", where the granularity of the Directive (EU) 2016/2102 does not offer enough detail to support detailed assessment in practice/operation. Granularity is an issue repeated by interviewees, where one also noted the difference between wanting to know *"How interoperable is this service?"* and "*how… has (it) … been built based on strong interoperability considerations from the back-office perspective, but also from the front office*".
- Digital literacy is the "*Ability to use information and communication technologies (ICT) proficiently".*
- *Digitisation is the "Conversion of an analogue signal conveying information (e.g. sound, image, printed text) to binary bits". While* Digitalisation is the "*Application or increase in the use of digital technologies by an organisation, industry, country, etc.*"
- Digital-based innovation: Product or business process innovation that contains information and communication technologies (ICTs), as well as innovation that relies significantly on ICTs for its development or implementation.
- Others: Innovation indicators (activity, output, expenditure; Domestic and foreign Digital investments – turnover –employment, Knowledge management, Gender balance)

Output "*gaps*" – Following the needs of the Digital Decade, the potential to consider an overview of the state of "*digital Europe*" was also noted by an interviewee, suggesting:

> "*A single comprehensive report on digital… the tip of the iceberg of digital policy, (including) elements on the BDM and how it has been progressing…*"

An issue also emerged about how information and indicators are shared across initiatives but that websites supplying output evidence may not all have up-to-date information, pointing to a need for coordination in when information is released and informing users internally of when there would be a need to update. This links to information management principles and the need to manage and share authentic data, ideally from one source that others can reuse. This may become increasingly important if more agile approaches or dynamic data are used in monitoring digital policy and presenting potential requirements for any stakeholder/shared platform with the MS.

In addition, although there were some cases from the interviews where Commission staff knew where others used the outputs of their activity, this was rare. A more formalised approach to providing access to indicators and the relationships this creates between stakeholders while keeping open data approaches would ensure that indicator reuse was well managed while extending the landscape view of the indicator ecosystem that this study has initiated.

Alternative outputs- labelling – There has also been some consideration for different ways of acknowledging the contributions of evidence towards some monitoring activities, including creating a European label in the context of Smart Cities and Communities.

Transparency of outputs – There are also sometimes issues about the scope of particular monitoring activities, with an interviewee noting:

> "*This is a regular complaint that we get from some stakeholders and MS-… "You are asking me this question… but, in practice, what are you going to measure out of this question?*"

7. Towards potential solutions

As the Better Regulation Guidelines indicate regarding monitoring activities, the *"responsibility for the effective application of legislation rests with the MS. Still, the Commission and MS should agree on the best way to monitor implementatio*n."

Based on the results so far, we can now approach the question:

How might the monitoring schemes be re-designed to fit future policy needs, reduce the burden, and provide actionable and useful results for the EC and the MS??

To reduce burdens on MS and within the EC, increase benefits of (re)using the monitoring results, and understand Interoperability and DTG in the public sector of the EU, the most promising way ahead would be to increase the engagement between the involved actors in a true co-creation process building on the already established relationships. This might include the re-shaping of monitoring approaches based on different scenarios (co-design), dry-runs of the most promising scenarios with volunteering organisations (co-testing), and joint discussion and agreements on future monitoring approaches based on the results of these tests (co-evaluation).

To provide a baseline and frame potential solutions, the study presented contrasting options to stakeholders for feedback. A summary is provided in **Annex 6**.

To gather further evidence from the MS and validate findings towards a co-creation process, a SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis and a series of recommendations were developed. This material is presented in a separate report X to aid stakeholder engagement.

In parallel, and based on discussions with some MS, a new track of activity explored current practices and novel ways of monitoring. This includes considering *Better Regulation Guidelines on IT capabilities of a monitoring system* that can aid further scoping and assessment if stakeholders want to upgrade or develop a new technical solution to support monitoring. Given an interest in improving documentation, a list of Standards and Specifications alongside examples of indicator registries that aid indicator management is provided in **Annex 8** and **Annex 9**, respectively**.**

The work has also started examining new data-gathering methods, including semi-automated, participatory and hybrid approaches that could enrich current practices and content.

IT capabilities of a monitoring system according to *Better Regulation Guidelines*

Although the streamlining process requires an effort, above all of the organisational types, it is worth highlighting several technical aspects already outlined in the Better Regulation guidelines when setting up a monitoring system.

"Setting up a monitoring system could benefit from IT support. Digitalisation will lead to simplification, burden reduction and fewer errors only when the monitoring processes and related data flows are well considered and streamlined in advance. To this end, it is important that policy officers consider the use and the reuse of IT systems and reuse of data, whenever possible, as well as data protection aspects".

Capabilities of such an IT system could include:

- cataloguing data collection requirements (frequency of data provision, actors, etc.);
- collecting or harvesting data;
- data storing;
- data quality assurance, including (automatic) validation;
- data processing and analysis;
- database interoperability;
- data visualising, sharing and disseminating results;
- data access and discovery (for example, by making available metadata or referencing your data on data.europa.eu).

In addition, it will be necessary to closely follow the next EU sectoral dataspaces approach, which undoubtedly covers aspects of interest in data access and governance.

New approaches for data gathering

Other novel techniques that could be considered include participatory approaches, such as the call for *volunteering* or large calls as *crowdsourcing,* as well as *Hybrid approaches*, including as well data reuse and observational techniques such as *Mystery shopping*, user journey mapping, usability tests etc.,

In brief, c*rowdsourcing* is defined by the Merriam-Webster online dictionary[35] as:

"The practice of obtaining needed services, ideas, or content by soliciting contributions from a large group of people and especially from the online community rather than from traditional employees or suppliers".

Among its benefits is the possibility to collect valuable and dispersed data at a cost typically lower than traditional data collection methods. However, it also has trade-offs, including data quality assurance or sampling issues.

Examples of initiatives that already make use of a participatory approach are:

- ***UN Online Services Index (OSI)*** and ***Local Online Services Index (LOSI)*** The 2022 edition[121] engaged several United Nations Volunteers, United Nations staff and interns in the assessments for OSI and LOSI.
- The ***Global Open Data Index***[122] tracks whether open data is released in a way accessible to citizens, media and civil society. It is unique in crowdsourcing its survey results of open data releases worldwide.

These can be contrasted with or supplemented by (semi)automated approaches such as *web analytics* and *transactional monitoring.* Stakeholders have mentioned such approaches throughout the study without providing specific examples. Some examples of automation and existing practices in the MS are given below to aid further discussions.

The first step towards automation would be to identify which metrics of digital public services could form a set of indicators that can regularly provide insights into the progress of digital government transformation. As in the private sector, it is necessary to regularly measure web traffic and the performance of transactional digital public services to detect and adjust potential problems or improve them continuously. Some such indicators could be "Number of transactions", "eID usage", but also "cost per transaction", "completion rates", "digital uptake", or "user satisfaction".

Organisations regularly share some of this data in the MS through administrative records, often available as open (government) data. These data sets are generated due to administrative operations provided by different bodies, especially government agencies.

Moreover, tools already help show the effectiveness of websites, mobiles, and social networks that can monitor user interaction with services from server logs, even in real-time.

However, besides this short-term monitoring, it would be interesting to track outcome-based indicators, that is, indicators that reflect the external and internal success due to digital transformation processes. Examples of these could be the evaluation of the internal workflows of public administrations, potentially offering a clearer picture of interoperability in practical terms. Indicators such as operational efficiency, time and resources saved, and innovation rate could contribute to the effects of enhanced interoperability.

Regarding the way to "*automate*" monitoring, we foresee the following approaches:

1. A system that automatically extracts agreed metrics of a set of digital public services for every MS.
2. A system that harvests and validates the results of harmonised indicators provided by the MS

Regarding the second option, it is necessary to know the starting situation in the MS to understand possibilities and bring positions closer. **Table 7** presents a non-exhaustive list of some of the systems or resources already deployed by the MS that measure some performance aspects, such as usage and uptake of their digital public services. Although they are very heterogeneous, they can be used as a first understanding of, for example, the

[35] Crowdsourcing definition according to Merriam-Webster online dictionary https://www.merriam-webster.com/dictionary/crowdsourcing

metrics of interest to the MS or a case study set to identify good practices in, for example, organisation, navigation, presentation and interpretation of the material presented. The following details are also presented on a first attempt to classify the MS resources by type: websites, interactive dashboards, web apps, reports and open datasets.

Table 7: Member State systems and datasets measuring aspects of their digital transformation

MS	Resource name and link	Type
Belgium	Digital Dashboard - Belgium.be	Website & Interactive dashboard
France	Observatoire numérique - Tool *Je donne mon avis*	Website & Interactive dashboard
Denmark	https://digst.dk/tal-og-statistik/	Webpage - Statistics dashboard
Germany	Dashboard Digitale Verwaltung	Website & Interactive dashboard
Greece	http://webapps.gsis.gr/dsae2/statmanagerfair2022 https://www.gsis.gr/en/public-data/statistics-interoperability-center-ked from 2017 until today produced in quarterly	Webapp / reports
Italy	https://avanzamentodigitale.italia.it/it	Website
Portugal	https://www.autenticacao.gov.pt/web/guest/estatisticas-de-autenticacao https://dados.gov.pt/pt/organizations/agencia-para-a-modernizacao-administrativa/	Website/ Open dataset
Slovakia	https://www.slovensko.sk/sk/statistika-slovensko-sk	Open dataset
Spain	https://dataobsae.administracionelectronica.gob.es/cmobsae3/dashboard/Dashboard.action?request_locale=en	Website/ Interactive dashboard
	https://espanadigital.gob.es/indicadores/espa%C3%B1a-digital	Website/ Interactive dashboard

A question arises about the extent to which such content could be made interoperable and used for monitoring at the European level.

Other projects and approaches worth exploring beyond the EU context are listed below, and extend the list of types to include guidelines for publishing metrics.

Table 8: Initiatives related to approaches to automate or streamline the monitoring

Origin	Resource name and link	Type	Detail
EU project	Digital Government MetaMonitor	Website/Dashboard	It provides an overview of the availability of key indicators in nine European countries.
EU project	CO-VAL Co-creation DASHBOARD	Website/Dashboard	Tracks user-centred collaboration in several countries.
EU project	UserCentriCities – Benchmarking Dashboard	Website/Dashboard	Ranks the performance of European cities and regions in designing and delivering digital services that focus on their citizens and their needs.
United Kingdom	https://www.gov.uk/service-manual/measuring-success/data-you-must-publish	Guidelines for metrics publications	Digital Public Service providers must publish data on the four mandatory key performance indicators (KPIs): cost per transaction, user satisfaction, completion rate, and digital take-up.
United States	Digital Analytics Program	Website/Dashboard	The program helps government agencies understand how people find, access, and use government services online through a unified analytics platform for the U.S. (United States)—federal government agencies without tracking individuals and anonymising visitors' IP (Internet Protocol) addresses.
GovTech applications	Some examples in the market are: https://digitalstate.io/ https://opengov.com/glossary/public-administration-software/		

8. Conclusions

This report marks an important milestone in the JRC/DIGIT study, looking into today's monitoring schemes related to European digital policies. It has examined in depth the beacon initiatives relevant to interoperability and the digital transformation of government for both those long-standing and currently in the preparation phase.

The report has outlined the scope of the study and the need to undertake this work, including basic concepts to understand the nature of monitoring in the EC policy cycle and the specific needs for digital matters. The policy context presented has seen increased activity in and around interoperability and other digital transformation topics within the scope of this study. Potentially, more legal acts may emerge in this context. Consequently, there would likely be an increase in monitoring and a need to ensure increased alignment and coordination to avoid unnecessary burdens in monitoring and reporting with the MS.

The work has been a landscape study, aiming to delineate and explore individual monitoring schemes from different aspects, recognising a wider circle of activities that may impact or inform the development of monitoring in the future, including at a local government level through LORDI, and the key monitoring schemes that were explored in depth, namely the work of NIFO monitoring the current EIF monitoring, the BDM, DESI and the eGov, where the latter two will also play a key role in monitoring for the Digital Decade targets related to the public sector. Work has examined both organisational and technical features of these monitoring schemes, examining, for example, the stakeholder groups involved and their engagement in the indicator lifecycle and drilling down and analysing the individual indicator level to explore the nature of the material that stakeholders are supplying information about. Importantly, this has also uncovered the existing exchange of information between schemes, as recommended by Better Regulation guidelines. Therefore, this work provides a base for exploring other monitoring schemes or going even deeper into the questions posed to stakeholders, conceptual matters, and the data flows that reach out to the wider ecosystem of actors providing details for digital policy monitoring in Europe.

With an eye on the EIF and digital-ready policymaking to explore streamlining and alignment opportunities, the study has examined how these key schemes manage and document their resources and methods. This more quantitative analysis was contextualised by stakeholder interviews inside and outside the EC related to the key monitoring schemes. This material allows key concepts to be discussed, gaps to be identified and a further understanding of alignment potential to be examined. This approach also allowed the JRC to act as a neutral intermediary and an active and trusted participant in some cases. This effort is also hoped to set the groundwork for collaboration between stakeholders in the remaining work foreseen in the study.

To further map the terrain in this context, the report has also explored the main burdens, benefits and gaps identified by stakeholders and the desk research, where repeated calls for certain actions have been grouped to build a clearer narrative of what the sample of stakeholders is highlighting. In addition, as this report mainly contains the evidence base for further analysis and potential next steps, it has also included additional investigations, including exploring some of the approaches and information systems being used in the MS, presenting monitoring as *European Digital Public Service* with opportunities for increased interoperability and digital transformation, also in line with EC strategy.

Which monitoring schemes and specific indicators address interoperability and digital transformation of government?

What is the level of coherence of the monitoring schemes? What is their rationale, and what role do they play? What are the verified usages or advantages of the different monitoring schemes?

The study has achieved its main aims so far in identifying and analysing monitoring schemes related to interoperability and the digital transformation of government. This has included delineating a group of four key monitoring schemes, namely NIFO, BDM, DESI and the eGovernment Benchmark, and investigating them in depth regarding their policy and stakeholder context and the characteristics of the stakeholders involved. The investigation of these schemes has also recognised a wider set of actors which may affect or aid developments in this context, where planned work on local-level digital transformation through LORDI and support to public sector innovation through Digital Innovation Hubs are of particular note. In all cases, the monitoring aims to measure progress in policy uptake but mainly from the point of view of current status and no longer-term impacts and outcomes. The role is somewhat informative and less regulatory. The legally binding nature of the forthcoming policy for the Interoperable Europe Act and the Digital Decade monitoring should be noted as a change in assessment approach, with DESI acting as a major contribution to the latter.

The four main monitoring schemes can be seen to be well-resourced, and internally to the schemes, there is notable coherence in the work undertaken. This can be seen by the strong base for collaboration, including reviewing indicators with experts from the MS and ensuring assessments are current. There is also a process of validating outputs, including where suggestions for improvement are offered to stakeholders. Other benefits include material useful for benchmarking individual country progress, as well as making comparisons on ranking with peers.

Such involvement could help set the scene for, for example, any potential changes in scope and approach in line with new policy developments. However, it should be noted that although Commission Expert Groups are active in this context, several new groups have emerged in recent years, posing challenges to coordination for the EC and MS when populating those groups with the right staff.

Good internal coherence can also be seen in terms of relatively high data quality, thanks in part to the support received from external consultants as well as the relatively familiar techniques and tools used to gather content. In addition, some specific guidance is in place when more technical approaches are used to help transparently outline data processing. Similarly, data is likely to be complete in terms of producing good coverage over time, and for all MS and typical reports and factsheets and, to some degree, open data can be seen to aid transparency and potential reuse. However, outputs have been questioned regarding how they could be made more useful for a wider stakeholder base.

In terms of coherence between schemes, the fact that, within the EC, indicators are reused and that informal contacts are made to aid exchange should be noted, alongside equally collaborative meetings and discussions that the study has engaged with. Data reuse follows the policy-making advice of *Better Regulation*, offering some base for further collaboration on aligning or streamlining monitoring activities. Conceptually, this base also has a relatively well-grounded starting point, as stakeholders have a mutual understanding of interoperability and the digital transformation of government and outline interoperability as a key component of the latter.

- *What are the challenges?*
- *What are the gaps, overlaps and emerging opportunities in the monitoring landscape? How to ensure synergies and alignment across the monitoring needs for digital policies in the EU in light of the new Interoperable Europe policy? How can the overall burden be reduced?*

Within this context, challenges arise in the way indicators are monitored, with a need to further evaluate if all indicators in some schemes have reached saturation or are no longer as relevant when they were introduced as desired specific results (such as the adoption of certain approaches) have now been achieved. The emergence of new policy drivers has shown that there is no current priority setting in the indicators present that may need to be re-examined. Similarly, regarding reducing burden, there may be a need to consider some indicators not being measured yearly, as the underlying topics of concern are not likely to experience notable or volatile change. In addition, MS believe both the volume and type of information gathered for the indicators are too much, and some schemes pose questions that normally require several government parts' inputs. Such self-assessments approaches are seen as less objective. MS sometimes raises issues about analyses' validity when contrasted with national data. Although these issues expose a range of methodological issues, it should also be recognised that although collaboration is open and active, any future monitoring efforts should reinforce all parties' trust in the evidence across the monitoring cycle.

Although each monitoring scheme has its own (reasonably well-documented) logic, the requirements and rigours of schemes such as DESI mean that data would not always be readily compatible, even if accessible for reuse. A common approach to documentation could be sought to aid transparency and content reuse. In addition, the approach to producing and visualising outputs varies a lot, making reuse less easy, including the need for a broad "*data literacy"* to engage with all outputs for the EC and Member State stakeholders.

The EC also has some overarching coordination issues should the monitoring effort move towards greater alignment. As there is no one policy lead for digital (nor should there need to be), there is no unified plan (such as the former eGovernment Action Plan as a common r*allying point*) or executive power to create a unified monitoring approach. Conceptually, there is also no all-encompassing view of digital policy, impacting where priorities lie, the relationships between policy efforts and where changes could take place that help to achieve strategic goals. This also means that at a more operational level, to some extent, there are probably also inefficiencies within the EC to manage the data flows related to the monitoring schemes instead of a common approach, including the costs of maintaining any related ICT tools and IT infrastructure. Moreover, changes in staffing and lack of common documentation may present challenges for business continuity and the lack of

organisational interoperability assets (such as Service Level Agreements) when indicators are being reused but when delays occur, impacting downstream reports in other schemes. In general, none of the schemes has formalised its workflows, implying challenges in identifying other paths for efficiency/alignment and some basis for modernising practices. The data rewiring flows in line with digital transformation thinking and the ambitions of the EC's digital strategy. At the indicator level, no reference list would aid both transparency and reuse (including through technical resources such as a dedicated indicator registry). In addition, the annual review cycle may need to be re-examined, considering changing policy to enable more agile monitoring approaches, including data at different times (currently being explored by LORDI).

— How might the monitoring schemes be re-designed to fit future policy needs, reduce the burden, and provide actionable and useful results for the EC and the MS?

Opportunities lie in setting indicator priorities with new policy needs, allowing less relevant indicators to be deprecated to reduce monitoring reporting burdens. However, this may need to be examined in the context of having evidence from longitudinal studies tied to the impact of policy interventions. With this in mind, indicators should also be evaluated to understand how they may better inform policymaking from the point-of-view of understanding the impacts and outcomes of, for example, adopting a particular recommendation, fulfilling a commitment or achieving a target.

From a research point of view, the study also offers a baseline for the extension to monitor developments in relevant sectors engaged with ICT in government, thus broadening the view of the digital policy landscape. This extension may consider the deeper ecosystem of actors and activities at both national and subnational levels, with the advantage of understanding the wider data flows and the community interested in achieving increased interoperability and the digital transformation of government.

From a techno-organisational point-of-view, the study has shown that digital policy monitoring faces challenges of interoperability and modernisation (in terms of digitalisation in general and digital-ready policymaking and aspects of the digital transformation of government, in particular). A way of framing and addressing these areas is to consider improved information exchange within and between monitoring schemes to the extent that they can be considered part of a data infrastructure or, at least as a metaphor, a dataspace. Such infrastructures have a range of technical and organisational aspects. Still, the key to the potential improvement and alignment of monitoring would be some standardisation of the documentation used to describe the monitoring schemes and their related indicators, potentially extending to the terminology used in the requested evidence and the formats of the data being shared. This may also involve technical solutions to better govern the indicators in scope, with associated governance approaches, including the potential to adopt registry approaches, as mentioned above. As an infrastructure, users are important actors. The alignment of existing inputs and outputs potentially through one system or *common database* has been raised by several stakeholders both inside the EC and in the Member States, as well as by contractors supporting such work.

Moreover, if the outputs were more user-driven, an extended community interested in digital policy could be explored, especially links with the academic community, which may also bring useful and novel inputs to monitoring certain policy aspects. Such approaches may be extended further to bring to bear the range of approaches contained in monitoring schemes as a pilot to evaluate the interoperability and digitalisation efforts in a specific policy or sector, also to understand the value of this "360^0 evaluation" and what may be missing. Similarly, calls for automation could involve mapping, modelling and understanding the relationships between data flows towards improved data capture, processing and presentation automation. It may also involve experiments to see how online cross-border services could confirm their interoperability credentials against frameworks and solutions (extending the data infrastructure concept to engage with online services themselves) or even consider the role data analytics and Artificial Intelligence could play in reducing the monitoring and reporting burden, alongside the new challenges and opportunities that may involve. If such wider approaches were to be considered as part of, or even a substitute for, existing monitoring practices, then alternative data sources should also be in scope, including data from citizens/users and crowdsourcing, peer-reviewed assessments, thus drawing on an extended evidence base, that may also draw inspiration in other regions of the world developing digital government.

The way forward to a meaningful monitoring approach for all stakeholders would be to enter a *co-creation process* but, importantly, add meaning to that concept, particularly to the current monitoring schemes' context. This would include the governance processes, scope, authority, efforts and resources for all stakeholders. Failure to do so may result in missed opportunities and consultation fatigue.

Europe has a strength in its diversity, and those learning are maybe achieving *personal bests* that should be congratulated even if they are relatively less mature than leading countries. The scope of new policies may also

need some groundwork in any co-creation activity. The complexity of the current monitoring context will evolve with new requirements and understanding that rightly involve a multi-stakeholder and multi-disciplinary approach. Organising, testing, reforming, communicating and capacity building should not be overlooked to enable the best possible start to meet the ambitions of monitoring interoperability and the digital transformation of government in the future.

Where the evidence for these arguments rests in this document, the further analysis and potential ways forward together, as a common starting point, are outlined in the next report: *Identifying opportunities for streamlining European monitoring of digital policies*.

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Abbreviations

AI	Artificial Intelligence
API	Application Programming Interfaces
BDM	Berlin Declaration Monitoring
CAMMS	Common Assessment Method for Standards and Specifications
CEF	Connecting Europe Facility
CIO	Chief Information Officer
Co-VAL	Value co-creation in public services for transforming European public administrations
DG	Directorate General
DG CONNECT	Directorate General for Communication Networks, Content and Technology
DG DIGIT	Directorate General for Informatics
DG GROW	Directorate General for Internal Market, Industry, Entrepreneurship and SMEs
DG REFORM	Directorate General for Structural Reform Support
DCAT-AP	Application profile for data portals in Europe
DESI	Digital Economy and Society Index
DIGITAL	Digital Europe Programme
DSM	Digital Single Market
EC	European Commission
ECA	European Court of Auditors
EDGES	European Digital Government Ecosystem
EDIHs	European Digital Innovation Hubs
EGDI	E-Government Development Index
eID	Electronic Identification
eIDAS	Electronic Identification, Authentication and Trust Services
EIF	European Interoperability Framework
EIF4SCC	EIF for smart cities and communities
ELISE	European Location Interoperability Solutions for e-Government
EURES	European employment services network Scope
ENoLL	European Network of Living Labs
eGov	eGovernment Benchmark
ESPON	European Observation Network for Territorial Development and Cohesion
EULF	European Union Location Framework
EUPACK	European Public Administration Country Knowledge
ICT	Information Communications Technology
IDA	Interchange of Data between Administrations
IDABC	Interoperable Delivery of pan-European eGovernment Services
INSPIRE	Infrastructure for Spatial Information in Europe
ISA	Interoperability Solutions for European Administrations

ISA^2	Refers to the European Programme interoperability solutions and common frameworks for European public administrations, businesses and citizens
I^2PAS	Innovative and Interoperable Public Administration and Services
JRC	Joint Research Centre
COIN	Composite Indicators and Markers Competence Centre
KPI	Key Performance Indicator
LIFO	Location Information Framework Observatory
LOSI	(United Nations) Local Online Service Index
LORDI	Local and Regional Digital Indicators for smart cities and regions
NIFO	National Interoperability Framework Observatory
NIFO/EIF	In the context of this study, EIF monitoring and Digital Public Administration factsheets are considered as a single monitoring scheme.
MIM	Minimal Interoperability Mechanism
PEPPOL	Pan-European Public eProcurement On-Line
PSI	Public Sector Information
MS	Member State
OASC	Open and Agile Smart Cities
OECD	Organisation for Economic Co-operation and Development
OSI	(United Nations) Online Service Index
OOP	Once-only principle
OOTS	Once Only Technical System
RACER	Relevant, Accepted, Credible, Easy to monitor, Robust
RRF	Recovery and Resilience Facility
SDG	Single Digital Gateway
SDMX	Statistical Data and Metadata Exchange
SMART	Specific, Measurable, Achievable, Relevant, and Time-Bound
SOA	Service-oriented architecture
SPOCS	Simple Procedures Online for Cross-border Services
TEN	Trans-European Network
TESTA	Trans European Services for Telematics between Administrations
UNeGovDD	United Nations e-government development database
USAID	United States Agency for International Development

Definitions

Many of the definitions used in this report come from *Eurostat's Concepts and Definitions Database*[30]

Term	Definition	Source
Aggregation	A process that transforms microdata into aggregate-level information using an aggregation function such as count, sum average, standard deviation, etc.	SDMX Metadata Common Vocabulary 2009. Compiled in Eurostat's Concepts and Definitions Database
Analytical unit	Real or artificially constructed unit, for which statistics are compiled.	SDMX Metadata Common Vocabulary 2009. Compiled in Eurostat's Concepts and Definitions Database
Attribute	Quality of feature, especially one that is considered to be good or useful. Examples: availability, accuracy, integrity, confidentiality, effectiveness.	Eurostat, ESSnet "Memobust". Compiled in Eurostat's Concepts and Definitions Database
Automate	To make a process in a factory or office operate by machines or computers, to reduce the amount of work done by humans and the time taken to do the work	Online Cambridge Dictionary
Benchmarking	Process of comparing performance against that of others in an effort to identify areas of improvement.	OECD terminology - Organisation for Economic Co-operation and Development (OECD), "Applying Strategic Environmental Assessment. Good Practice Guidance for Development Co-operation", Compiled in Eurostat's Concepts and Definitions Database
Best practice	Approach or procedure recognised as most efficient and effective in producing a desired result. Best practice is based on the experience of experts in particular fields and is usually promulgated through the agreement and endorsement of experts and expert groups.	United Nations, "UN Glossary of Classifications Terms". Compiled in Eurostat's Concepts and Definitions Database
Bias	Effect which deprives a statistical result of representativeness by systematically distorting it, as distinct from a random error which may distort on any one occasion but balances out on the average.	The International Statistical Institute, "The Oxford Dictionary of Statistical Terms". Compiled in Eurostat's Concepts and Definitions Database
Burden	Administrative burdens on enterprises are seen as impediments to their competitiveness.	Andrew Machin, "Statistical burden on businesses". Compiled in Eurostat's Concepts and Definitions Database
Code list	Ordered list of assigned codes and their meanings in the given identification and/or classification scheme.	Economic Commission for Europe of the United Nations (UNECE), "Terminology on Statistical Metadata" Eurostat's Concepts and Definitions Database
Comparability	Extent to which differences between statistics can be attributed to differences between the true values of the statistical characteristics.	SDMX Glossary 2018 - Eurostat's Concepts and Definitions Database
Component	A component refers to a sub-group of a composite indicator. A composite indicator may include several components, which represent different domains or aspects of the phenomenon. For example, the Social Progress Index is conceptually divided into three components: Basic human needs, Foundations of well-being and Opportunity	JRC - Composite Indicators & Scoreboards Explorer

Term	Definition	Source
Composite indicator	A composite indicator or an index is a mathematical aggregation of individual indicators aimed at quantifying a multidimensional and complex concept.	JRC - Composite Indicators & Scoreboards Explorer
	Aggregate a set of indicators into a single measure, such as country ratings and well-being indicators but also ratings of financial institutions and instruments	2021 Better Regulation toolbox
	A composite indicator is formed when individual indicators are combined into a single index, on the basis of an underlying model of the multi-dimensional concept that is being measured.	Eurostat, "Terminology relating to the Implementation of the Vision on the Production Method of EU Statistics", Compiled in Eurostat's Concepts and Definitions Database
Controlled vocabulary	Vocabulary to be used for specific classifications which have specific meaning as given by the author or agreed by experts.	United Nations, "UN Glossary of Classifications Terms". Compiled in Eurostat's Concepts and Definitions Database
Cost and burden	Cost associated with the collection and production of a statistical product, as well as the burden imposed on respondents.	SDMX Glossary 2018.
[Data] Collection	Systematic process of gathering data for official statistics.	Eurostat's Concepts and Definitions Database
Data reference period	Segment(s) of the time period for which the observations have been collected (such as middle, average or end of period) for the target reference period.	SDMX Glossary 2018 - Eurostat's Concepts and Definitions Database
Dimension	Statistical concept used in combination with other statistical concepts to identify a statistical series or individual observations.	SDMX Glossary 2018 - Eurostat's Concepts and Definitions Database
Digital Government	Digital Government refers to the use of digital technologies, as an integrated part of governments' modernisation strategies, to create public value. It relies on a digital government ecosystem comprised of government actors, non-governmental organisations, businesses, citizens' associations and individuals which supports the production of and access to data, services and content through interactions with the government. A fusion of advanced technologies and the integration of physical and digital systems, the predominance of innovative business models and new processes, and the creation of smart products and services	OECD Recommendation of the Council on Digital Government Strategies, OECD, 2014, p. 6
Digital Government transformation	Digital Government Transformation (DGT) is the introduction of radical changes, alongside more incremental ones, in government operations, internal and external processes, and structures, to achieve greater openness and collaboration within and beyond governmental boundaries, enabled by the introduction of a combination of existing ICTs and/or new data-driven technologies and applications, as well as by a radical reframing of both organisational and cognitive practices; it may encompass different forms of public sector innovation across different phases of the service provision and policy cycle to achieve key context-specific public values and related objectives such as, among others, increasing efficiency, effectiveness,	Exploring Digital Government Transformation in the EU

Term	Definition	Source
	accountability and transparency, to deliver citizen-centric services and design policies that increase inclusion and trust in government	
Digital transformation	profound transformation of business activities, competencies, and business models to fully leverage the opportunities of digital technologies	EuroVoc
	Fundamental changes in the way how public organizations are structured and operate, how public services are delivered, how policies are developed, implemented, and evaluated, as well as how citizens engage in democratic processes resulting from the introduction of technologies	Zhang et al, 2014
e-government	The term "e-government" focuses on the use of new information and communication technologies (ICTs) by governments as applied to the full range of government functions. In particular, the networking potential offered by the Internet and related technologies has the potential to transform the structures and operation of government.	OECD – Glossary of statistical terms
European Interoperability Framework [EIF]	Framework that gives specific guidance on how to set up interoperable digital public services.	
European Public Service	A European public service comprises any public sector service exposed to a cross-border dimension and supplied by public administrations in Europe, either to one another or to businesses and citizens in the European Union.	Revised 2017 EIF. Compiled in NIFO Glossary
Index	(1) Ordered list of some specific data selected from and related to a larger body of text or to a data file. (2) Ratio or other number derived from a series of observations and used as comparative indicator.	Economic Commission for Europe of the United Nations (UNECE), "Terminology on Statistical Metadata" Complied in Eurostat's Concepts and Definitions Database
Indicator	Summary measure related to a key issue or phenomenon and derived from a series of observed facts.	Eurostat, "Terminology relating to the Implementation of the Vision on the Production Method of EU Statistics". Complied in Eurostat's Concepts and Definitions Database
	An indicator is a data element that represents statistical data for a specified time, place and other characteristics.	JRC - Composite Indicators & Scoreboards Explorer
Interoperability	Interoperability is a key factor in making a digital transformation possible. It allows administrative entities to electronically exchange meaningful information in ways that are understood by all parties. It addresses all layers that impact the delivery of digital public services in the EU, including: legal, organisational, semantic and technical aspects.	Revised EIF, compiled by the NIFO glossary
[EIF] Interoperability principle	The EIF principles are fundamental behavioural aspects to drive interoperability actions. There are 12 principles relevant to the process of establishing interoperable European public services. They describe the context in	Revised EIF compiled by the NIFO glossary

Term	Definition	Source
	which European public services are designed and implemented.	
Log information	Metadata produced during a specific run of a process [contained in a log file]	Adapted from Eurostat, "Memobust Glossary"
Metadata	data that provides information about other data	Merriam Webster dictionary
	Information that is needed to be able to use and interpret statistics. Metadata describe data by giving definitions of populations, objects, variables, the methodology and quality.	Eurostat, "Terminology relating to the Implementation of the Vision on the Production Method of EU Statistics" Complied in Eurostat's Concepts and Definitions Database
Monitoring	Monitoring is a continuous and organised process of systematic data collection (or access) throughout the life cycle of an initiative to oversee its progress	2021 Better Regulation toolbox
Monitoring scheme		
Mystery shopper	a person who is employed, often by the owners, to visit shops, hotels, etc, incognito, and assess the quality of the service offered	Collins Dictionary
	Citizens of, and within each of the EU27+ countries, who are trained to evaluate services using a questionnaire that are pre-defined in conjuncture with the countries' representatives and the Commission. Each year, Mystery Shoppers evaluate services that are related to one of four life events, which cycle every two years. One year, the life events Business Start-Up, Career, Family and Studying are evaluated, and the other year Regular Business Operations, Moving, Owning and Driving a Car, and Starting a Small Claims Procedure are the subject.	eGovernment Benchmark results for the 2021 reports
Objectivity	An attribute confirming that statistics are developed, produced and disseminated in a systematic, reliable and unbiased manner. It implies the use of professional and ethical standards, and that the policies and practices followed are transparent to users and survey respondents.	Based on European Union, Regulation (EC) No 223/2009 - Complied in Eurostat's Concepts and Definitions Database
Official statistics	Statistics describing on a representative basis phenomena of public interest to policy makers, the economic agents and the public at large. Remark: They are developed, produced and disseminated by the statistical authorities in compliance with the provisions of the Union and national law and the European statistics Code of Practice / National Codes of Practice.	European Statistics Code of Practice - Compiled in Eurostat's Concepts and Definitions Database
Performance measurement	Assessment against a set of predetermined criteria of the economy, efficiency and effectiveness with which an organisation carries out a particular activity or range of activities. Organisations may be set regular targets on particular aspects of their performance - financial returns, efficiency, quality of services supplied, etc. - against which their performance is monitored and evaluated.	OECD terminology - Organization for Economic Cooperation and Development (OECD), "Effects of European Union Accession, Part 1: Budgeting and Financial Control" Complied in Eurostat's Concepts and Definitions Database

Term	Definition	Source
	Regular measurement of outcomes and results, which generates reliable data on the effectiveness and efficiency of an individual, a group, an organization, a system or a program.	Eurovoc
Peer review	A special kind of external audit, carried out by an organisation for another organisation of a similar status (i.e. by a peer organisation), for instance a National Statistical Institute (NSI) is reviewed by another NSI. In general, it is less formal than an audit. It aims rather at assessing the general quality than at controlling the conformity with an external quality standard.	Based on the Second Round of ESS (European Statistical System) Peer Reviews Glossary
Classification scheme	Information for an arrangement or division of objects into groups based on characteristics, which the objects have in common.	[Metadata] Registry
Qualitative [data]	Data describing the attributes or properties that an object possesses.	Economic Commission for Europe of the United Nations (UNECE), "Glossary of Terms on Statistical Data Editing"
Quality	Degree to which a set of inherent characteristics fulfils requirements. Quality is a multi-faceted concept. The dimensions of quality that are considered most important depend on user perspectives, needs and priorities, which vary across groups of users. Several statistical organisations have developed lists of quality dimensions, which, for international organisations, are being harmonised under the leadership of the Committee for the Coordination of Statistical Activities (CCSA). A generic list would include the following dimensions, all of which are defined elsewhere in the Metadata Common Vocabulary: - Relevance - Accuracy - Timeliness - Punctuality - Accessibility - Clarity/ interpretability - Comparability - Coherence - Integrity - Credibility - Methodological soundness	ISO 9000/2005: Quality Management and Quality Assurance Vocabulary. Compiled in Eurostat's Concepts and Definitions Database
Quality indicator	A statistical measure that gives an indication of output quality. However, some quality indicators can also give an indication of process quality, like e.g. response rates.	Eurostat, "Handbook on improving quality by analysis of process variables". Compiled in Eurostat's Concepts and Definitions Database
Quantitative [data]	Data expressing a certain quantity, amount or range.	Economic Commission for Europe of the United Nations (UNECE (United Nations Economic Commission for Europe)), "Glossary of Terms on Statistical Data Editing". Compiled in Eurostat's Concepts and Definitions Database

Term	Definition	Source
Reference period	Timespan or point in time to which the measured observation is intended to refer.	SDMX Glossary 2018 - Compiled in Eurostat's Concepts and Definitions Database
Response burden	The effort, in terms of time and cost, required for respondents to provide satisfactory answers to a survey (Australian Bureau of Statistics). The time it takes the respondent to complete the survey questionnaire plus the time spent for extracting data from the business files (Statistics Finland). The time required to perform the task of completing a survey (Statistics Austria).	
Scoreboard	A scoreboard is a collection of indicators related to a common concept, in which all individual indicators are presented up-front.	JRC - Composite Indicators & Scoreboards Explorer
Self-assessment	A comprehensive, systematic and regular review of an organisation's activities and results referenced against a model/framework, carried out by the organisation itself. Maturity self-assessments evaluate an organization's practices and performance and identify improvement and innovation opportunities. Self-assessment results are used to identify and recognise best practices and to encourage innovation and improvement.	Eurostat, "Handbook on Data Quality Assessment Methods and Tools (DatQAM)"

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Annexes

Annex 1 List of unique indicators extracted from BDM, EIF, DESI and eGov Benchmark

Scheme	Indicator ID	Indicator Name
BDM	KPI 1	Inclusion of fundamental rights principles in public sector innovation policies
BDM	KPI 2	Inclusion of fundamental rights principles in technology procurement rules
BDM	KPI 3	Number of workshops/events organised on cross-border initiatives at national level or European level.
BDM	KPI 4	Existence of platforms to exchange and further develop national strategies with regard to digital transformation
BDM	KPI 5	Number of strategic projects with the aim of increasing awareness of the relevance of a value-based digital transformation
BDM	KPI 6	Existence of initiatives promoting the set up of ethical and technological expert councils to provide advice to, and foster debate among citizens
BDM	KPI 7	Online information on citizens ability to participate in policy making processes
BDM	KPI 8	Online information on how users can enrol in activities to improve the design and delivery of services
BDM	KPI 9	Compliance with the European accessibility standards of the Directive on the accessibility of the websites and mobile applications of public-sector bodies
BDM	KPI 10	Mobile Friendliness
BDM	KPI 11	Cooperation between EU MS to ensure cross-border access to services via the mobile channel
BDM	KPI 12	Existence of a national strategy to enable citizens to use their mobile devices to carry out digital public services
BDM	KPI 13	Human capital – digital skills
BDM	KPI 14	Online Availability - User Centricity
BDM	KPI 15	Extent to which strategies or frameworks take the EIF into account
BDM	KPI 17	Notification to the European Commission of the national eID scheme
BDM	KPI 16	Promotion of digital skills and awareness in the public sector
BDM	KPI 18	Incentives for private sector bodies to use European trustworthy and notified eID
BDM	KPI 19	Strategy/policy outline measures supporting the re-use of open data by the public sector
BDM	KPI 20	Existence of an Open Data portal (extent to which data can easily be found at one central place for reuse purposes)
BDM	KPI 21	Existence of specific activities to support for the reuse of Open Data
BDM	KPI 22	Existence of raising awareness initiatives on new concepts such as personal data management based on user consent

Scheme	Indicator ID	Indicator Name
BDM	KPI 26	Active consideration of the use of open source software when developing new IT solutions, account for it in the total cost of ownership of the IT solution
BDM	KPI 23	Compliance with the Regulation (EU) 2018/1724 of the European Parliament and of the Council of 2 October 2018 establishing a single digital gateway to provide access to information, to procedures and to assistance and problem-solving services
BDM	KPI 24	Existence of initiatives to foster agreement on ICT security requirements for the public procurement of data processing services
BDM	KPI 25	Participation of MS in EU Actions essential for digital sovereignty
BDM	KPI 27	Use of modular architecture when developing and deploying cross-border digital solutions
BDM	KPI 28	Active consideration of the use of open source solutions for the deployment of cross-border digital services
BDM	KPI 29	Use of common models/standards/specifications for describing catalogues of public services, public data and interoperability solutions
BDM	KPI 30	Extent to which a Member State is meeting the requirements set by the Single Digital Gateway Regulation on the online availability and accessibility of the administrative procedures
BDM	KPI 31	Existence of interoperability agreements through which public administrations cooperate with each other
BDM	KPI 32	Transparency with regards to automated decision making process used in digital public services
BDM	KPI 33	Use of quality standards of data sets to fed into AI systems when designing digital public services
BDM	KPI 34	Share best practices on the development of successful human-centric AI systems in the public sector that can be used by all public administrations at European, national and sub-national levels
BDM	KPI 35	Knowledge sharing on public sector innovation strategies
BDM	KPI 36	Knowledge sharing on human centric technologies
BDM	KPI 37	Adoption of implementing acts following Article 24(2) of Directive (EU) 2019/944
BDM	KPI 38	Participation to actions at EU Level for improving the interoperability in smart buildings and products
BDM	KPI 39	Actions at national or sub-national level for improving energy efficiency, optimise local consumption of digital tools and infrastructures
BDM	KPI 40	Evaluation of the energy consumption and GHG emissions resulting from ICT activities in the public sector
BDM	KPI 41	Lifespan of digital equipment used by the public sector
BDM	KPI 42	Ecodesign of digital public services
BDM	KPI 43	Guidelines on healthy and appropriate use of digital technologies;
BDM	KPI 44	Active exchange of crisis management data between MS
DESI	1a2	Above basic digital skills

Scheme	Indicator ID	Indicator Name
DESI	1a1	At least basic digital skills
DESI	1a3	At least basic digital content creation skills
DESI	1b3	Enterprises providing ICT training
DESI	1b2	Female ICT specialists
DESI	1b1	ICT specialists
DESI	1b4	ICT graduates
DESI	2a2	At least 100 Mbps fixed broadband take-up
DESI	2a3	At least 1 Gbps take-up
DESI	2a1	Overall fixed broadband take-up
DESI	2b1	Fast broadband (NGA) coverage
DESI	2b2	Fixed Very High Capacity Network (VHCN) coverage
DESI	2b3	Fibre to the Premises (FTTP) coverage
DESI	2c2	5G coverage
DESI	2c1	5G spectrum
DESI	2c3	Mobile broadband take-up
DESI	2d1	Broadband price index
DESI	3a1	SMEs with at least a basic level of digital intensity
DESI	3b5	AI
DESI	3b3	Big data
DESI	3b4	Cloud
DESI	3b1	Electronic information sharing
DESI	3b7	e-Invoices
DESI	3b2	Social media
DESI	3b6	ICT for environmental sustainability
DESI	3c3	Selling online cross-border
DESI	3c1	SMEs selling online
DESI	3c2	e-Commerce turnover
DESI	4a2	Pre-filled forms

Scheme	Indicator ID	Indicator Name
DESI	4a3	Digital public services for citizens
DESI	4a4	Digital public services for businesses
DESI	4a5	Open data
DESI	4a1	e-Government users
eGov	1.1	Online availability
eGov	1.2	Mobile friendliness
eGov	1.3	User support
eGov	2.1	Transparency of service delivery
eGov	2.2	Transparency of personal data
eGov	2.3	Transparency of service design
eGov	3.1	eID
eGov	3.2	eDocuments
eGov	3.3	Authentic sources
eGov	3.4	Digital Post
eGov	4.1	Cross-border online availability
eGov	4.2	Cross-border user support
eGov	4.3	Cross-border eID
eGov	4.4	Cross-border eDocuments
EIF	KPI 01	Extent to which strategies or frameworks take the EIF into account
EIF	KPI 02	Open data maturity
EIF	KPI 03	Existence of national guidelines to assist data providers in their publication process
EIF	KPI 05	Number of open datasets published by MS
EIF	KPI 72	Status of implementation of the INSPIRE Directive
EIF	KPI 06	Active consideration of the use of open source software when developing new IT solutions, account for it in the total cost of ownership of the IT solution
EIF	KPI 07	Promotion of the use of open specification to public administrations
EIF	KPI 08	Extent to which a MS is meeting the requirements set by the Single Digital Gateway Regulation on the online availability and accessibility of the administrative procedures

Scheme	Indicator ID	Indicator Name
EIF	KPI 09	Extent to which MS apply the recommended measures for central bodies of the European Sharing and Reuse Framework to check the reuse of existing IT solutions before developing a new one
EIF	KPI 10	Existence of collaborative platforms in each Member State that facilitate the reuse, sharing and development of IT solutions (e.g. open source software, semantic assets)
EIF	KPI 11	Existence of an Open Data portal (extent to which data can easily be found at one central place for reuse purposes)
EIF	KPI 12	Existence of policies supporting the reuse of Public Sector Information within public administration, by the private sector
EIF	KPI 13	Reuse of Open Data in decision making
EIF	KPI 14	Instance of national, regional or local events (e.g. hackathons or other Open Data events) held annually to promote Open Data and PSI reuse (organised by public, private or third sector organisations)
EIF	KPI 15	Existence of monitoring activities to measure the re-use of the own open data of the MS
EIF	KPI 16	Existence of specific activities to support for the reuse of Open Data
EIF	KPI 17	Existence of specific communication activities to promote national Portal or Open Data in general
EIF	KPI 18	Existence of references of the reuse of Open Data in your National Open Data portal
EIF	KPI 19	Extent to which citizens and businesses are free to adopt technologies or IT products that are most appropriate for their needs when accessing or reusing public services
EIF	KPI 20	Extent to which data is easily transferable between systems and applications
EIF	KPI 21	Internet use - Interaction with public authorities
EIF	KPI 22	Digital Public Services Dimension comprising of eGovernment (DESI_5_DPS)
EIF	KPI 23	Mobile Friendliness
EIF	KPI 24	Existence of a single points of contacts in the areas of information relevant for citizens and businesses
EIF	KPI 25	Existence of a customer-centric approach to design and deliver public services used by public administrations
EIF	KPI 26	Extent to which the five major Base Registries (Population, Vehicle, Tax, Land, Business) are available for reuse in digital public services
EIF	KPI 27	Usage of authentic sources
EIF	KPI 28	Compliance with the European accessibility standards of the Directive on the accessibility of the websites and mobile applications of public -sector bodies
EIF	KPI 29	Level of security and privacy defined for public authorities
EIF	KPI 30	Extent to which users of each of the 21 proposed procedures across the 7 life events of the Single Digital Gateway initiative are able to access instructions for completing the procedure in an official EU language broadly understood by the largest possible number of cross-border users

Scheme	Indicator ID	Indicator Name
EIF	KPI 31	Cross-border Mobility for life event 'Regular business operations'
EIF	KPI 32	Cross-border Mobility for life event 'General administration: moving'
EIF	KPI 33	Total number of language resources in different MS
EIF	KPI 34	Online Availability - User Centricity
EIF	KPI 35	User Centricity for citizen and business life events
EIF	KPI 36	Online Availability - Citizen cross-border mobility
EIF	KPI 37	Online Availability - Business cross-border mobility
EIF	KPI 38	Existence of long-term preservation policy for information owned and management by public administrations
EIF	KPI 39	Extent to which public administrations evaluate the efficiency and effectiveness of interoperability solutions
EIF	KPI 40	Existence of holistic governance of interoperability activities across all administrative levels (local, regional and national) and sectors
EIF	KPI 41	Existence of defined processes for the selection and adoption of standards and specifications
EIF	KPI 42	Extent to which administrations are managing ICT standards and specifications to ensure interoperability
EIF	KPI 43	Existence of a CAMSS or similar assessment method for standard and specification at Member State level
EIF	KPI 44	Use of ICT Catalogues
EIF	KPI 45	Instance of participation in standardisation works
EIF	KPI 46	Extent to which a governance structure for the provision of public services is implemented
EIF	KPI 47	Existence of interoperability agreements through which public administrations cooperate with each-other
EIF	KPI 48	Extent to which ICT is taken into account when preparing new legislation
EIF	KPI 49	Existence of modelling techniques to document business processes to deliver public services
EIF	KPI 50	Extent to which organisational relationships between providers and consumers are formalised
EIF	KPI 51	Existence of metadata, master data and reference data management policies
EIF	KPI 52	Existence of agreements on reference data in the form of taxonomies, controlled vocabularies, thesauri, code lists and reusable data structure/models to achieve semantic interoperability
EIF	KPI 53	Existence of sector-specific and/or cross-sectoral communities exist in fields affected by interoperability
EIF	KPI 54	Extent to which public administrations take into account the conceptual model proposed by the EIF

Scheme	Indicator ID	Indicator Name
EIF	KPI 55	Existence of a common scheme for interconnecting loosely coupled service components and put in place and maintain the necessary infrastructure for establishing and maintaining public services
EIF	KPI 56	Existence of a shared infrastructure of reusable services and information sources that can be used by all public administrations
EIF	KPI 57	Extent to which public administrations make authoritative sources of information available to others public administrations
EIF	KPI 58	Existence of agreements on reference data in the form of taxonomies, controlled vocabularies, thesauri, code lists and reusable data structure/models to achieve semantic interoperability of the Base registries
EIF	KPI 59	Existence of registry of Base Registries
EIF	KPI 60	Extent to which base registries draw up and implement a data quality assurance plan to ensure the quality of their data
EIF	KPI 61	Existence of a master data management and Quality Assurance (QA) plans for one or more of the five major Base Registries: Population, Vehicle, Tax, Land, Business
EIF	KPI 62	Extent to which procedures and processes are defined to integrate opening of data in common business processes, working routines, and in the development of new information systems
EIF	KPI 63	Extent to which each Member State is DCAT-AP compliant
EIF	KPI 64	Existence of a national plan to improve the quality of the (meta)data in the coming 12 months
EIF	KPI 65	Proportion of the data available in machine readable format
EIF	KPI 69	Existence of national guidelines or tools to assist publishers in choosing an appropriate licence for their data
EIF	KPI 70	Existence of catalogues of public services, public data and interoperability solutions
EIF	KPI 71	Use of common models/standards/specifications for describing catalogues of public services, public data and interoperability solutions
EIF	KPI 66	Extent to which public administrations are using external information sources and services while developing public services
EIF	KPI 67	Application of privacy and security principles
EIF	KPI 68	Number of trust services providers by country

Annex 2 Overview of analysed established monitoring schemes

Details as of November 2022[36].

Monitoring scheme	Digital Economy and Society Index	eGovernment Benchmark	European Interoperability Framework Monitoring	Berlin Declaration Monitoring
Acronym	DESI	eGov	NIFO/EIF	BDM
Purpose	*'The EU's digital barometer'*	*'Comparing online service-user experience.'*	*'Making interoperability a shared reality.'*	*'Comparing progress on adopting values and approaches for the DTG.'*
Brief description	Summarises Europe's digital performance indicators and tracks the progress of EU countries.	Brings insights into the state-of-play of e-government in Europe from a user perspective.	Snapshot of the developments of digital public administration and interoperability in Europe using the EIF framework	Assesses Europe's implementation of the Berlin Declaration Actions while gathering good practices on Policy Areas.
Responsible Unit	Directorate-General for Communications Networks, Content and Technology (CNECT) Digital Economy, Recovery Plan and Skills (CNECT.F.4)	Directorate-General for Communications Networks, Content and Technology (CNECT) eGovernment and Trust (CNECT.H.4) & Digital Economy, Recovery Plan and Skills (CNECT.F.4)	Directorate-General for Informatics (DIGIT) Interoperability (DIGIT.B.2)	Directorate-General for Informatics (DIGIT) Interoperability (DIGIT.B.2)
Policy mandate	The DECISION (EU) 2022/2481 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL OF 14 DECEMBER 2022 ESTABLISHING THE DIGITAL DECADE POLICY PROGRAMME 2030 refers to some DESI indicators for monitoring progress towards the 2030 targets. An implementing Act is expected, including the definition of indicators and sources.	COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS EU eGovernment Action Plan 2016-2020 Accelerating the digital transformation of government[37]	DECISION (EU) 2015/2240 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL OF 25 NOVEMBER 2015 establishing a programme on interoperability solutions and common frameworks for European public administrations, businesses and citizens (ISA2 programme) as a means for modernising the public sector[38]	The ministerial Berlin Declaration on *Digital Society and Value-based Digital Government* was signed by the ministers responsible for digital transformation in the public administration of the European Union Member States.
Status	Active - Stable	Active - Stable	Active - Stable	Active - Stable
Planned updates	Alignments towards Digital Decade have already been applied.		2022 data collection will also include a "cross border" perspective in the dashboard. EIF will be reviewed and continued under Interoperable Europe Act [2023/2024]	Ensured until 2024 2022 data collection will add some updates to the methodology. Raw data and a dashboard will be made available.

[36] The methodological sources referred are those available at the time of the research, namely: DESI's 2022 Methodological note, eGov Benchmark 2020-2023 Method paper; EIF 2020 Analytical model and Berlin Declaration's 2022 [First] progress report [Appendix I]

[37] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52016DC0179

[38] http://data.europa.eu/eli/dec/2015/2240/oj

Monitoring scheme	Digital Economy and Society Index	eGovernment Benchmark	European Interoperability Framework Monitoring	Berlin Declaration Monitoring
Frequency	Yearly	Yearly[39]	Yearly	Yearly
Time series available	2014 - 2021	2016|2017|2018|2019|2020|2021[40]	2015|2016|[41]2019|2020|2021	2021
Geographical Coverage	EU27 +[42]	EU27 + Albania; Iceland; Montenegro; North Macedonia; Norway; Serbia; Switzerland; Turkey ; United Kingdom	EU-27 + Iceland; Liechtenstein; Montenegro; Switzerland; Turkey; Ukraine	EU 27
Number of indicators	**Total**: 33 **Primary indicators**: 0 **Secondary indicators**: 33	**Total**: 14 **Primary indicators:** 14 **Secondary indicators:** 0	**Total**: 71 **Primary indicators**: 43 **Secondary indicators**: 28	**Total**: 44 **Primary indicators**: 25 **Secondary indicators**: 18
Data sources and methodologies	**Primary sources**: - *None* **Secondary sources**: - Eurostat - Communications Committee (COCOM) - Broadband coverage studies - Retail broadband prices studies - eGovernment Benchmark - Survey of businesses on the use of digital technologies - European Open Data Portal	**Primary sources**: - Mystery shoppers analysis - Automated tool **Secondary sources**: None	**Primary sources**: - Survey combined with BDM **Secondary sources**: - Eurostat - European Data portal - Location Interoperability Framework Observatory (LIFO) - DESI - eGovernment Benchmark - European Language Resource Coordination (ELRC) - Trusted List Browser	**Primary sources**: - Survey combined with EIF **Secondary sources**: - eGovernment Benchmark - EIF - Connecting Europe Facility (CEF) dashboard - European Data portal - DESI
Outputs Produced	- European report - Country profile reports[43] - Raw data - Dashboards and visualisation - Methodological note - Explanatory video	- European report - Country reports - Raw data - Dashboards and visualisation - Methodological note	- European report - Digital Public Administration country factsheets - Raw data - Dashboard - Infographics - Methodological note - Explanatory video	- European report - Country reports
Data management details	**Technical details** - Data and data visualisation tool	**Technical details** - Data and data visualisation tool	**Technical details**	**Technical details**

[39] Each year, Mystery Shoppers evaluate services that are related to one of four life events, which cycle every two years. One year, the life events Business Start-Up, Career, Family and Studying are evaluated, and the other year Regular Business Operations, Moving, Owning and Driving a Car, and Starting a Small Claims Procedure are the subject.

[40] There is a comparison break between e-Government Benchmark 2013-2019 and 2020 onwards.

[41] Gap between 2017 and 2019. Non-comparable monitoring assessments.

[42] For some dimensions, DESI has data for countries beyond EU 27.

[43] DESI country reports are available in English and the official country language(s).

Monitoring scheme	Digital Economy and Society Index	eGovernment Benchmark	European Interoperability Framework Monitoring	Berlin Declaration Monitoring
	powered by open-source software[44] - Linked data approach - [Shared with eGov benchmark] **Artefacts** - Metadata at the monitoring scheme level - Metadata at the indicator level - Available SPARQL endpoint **Visibility** - Shaping Europe's digital future Website - Present in the COIN Explorer platform[45] **Standards used** - Data and metadata following W3C RDF Data Cube Vocabulary - DESI was developed according to OECD/JRC's guidelines and recommendations in the Handbook on constructing composite indicators	powered by open-source software - Linked data approach - [Shared with DESI] **Artefacts** - Metadata at the monitoring scheme level - Metadata at the indicator level - Available SPARQL endpoint **Visibility** - Shaping Europe's digital future Website - Present in the COIN Explorer platform **Standards used** - Data and metadata following W3C RDF Data Cube Vocabulary	- Questionnaire set up with proprietary tool *Alchemer* - [Shared and launched with BDM] - Dashboard based on Microsoft Power BI **Artefacts**: - Available glossary **Visibility** - Joinup NIFO Collection - Factsheets Indexed in the EU data platform	- Questionnaire set up with proprietary tool *Alchemer* - [Shared and launched with EIF] **Artefacts**: - Available glossary **Visibility** - Joinup NIFO Collection
Monitoring approximate timeline	**Preparation**: throughout the year **Data Collection**: January, can last up to 2 years[46] **Data Processing**: July-March **Publication**: May - June	**Preparation**: September – mid -October **Data Collection**: 2 weeks in November **Data Processing**: mid-November – mid-December **Publication**: May-June	**Preparation**: September – mid-October **Data Collection**: mid-October till mid-January **Data Processing**: January-June **Publication**: July-September[47]	**Preparation**: September – mid-October **Data Collection**: mid-October till mid-January **Data Processing**: January-April **Publication**: May
Stakeholders involved	**Organisation(s)** - Various government departments	**Organisation(s)** - Mystery shoppers (consultants)	**Organisation(s)** - Various government departments	**Organisation(s)** - Various government departments

[44] Software available at https://github.com/digital-agenda-data/ . More documentation at: https://digital-agenda-data.eu/documentation

[45] The Composite Indicators and Scoreboards Explorer is an interactive tool produced by the Joint Research Centre to explore and visualise data from over 100 indices and scoreboards.

[46] Typically collected in Q1 and Q2 every year, processed in Q3-Q4 and published in Q4 to be used in the DESI of the following year. e-Government data is collected in Q3-Q4, processed and published in Q1 of the following year and then used in DESI

[47] EIF publication happens after DESI and eGov indicators

Monitoring scheme	Digital Economy and Society Index	eGovernment Benchmark	European Interoperability Framework Monitoring	Berlin Declaration Monitoring
	Network(s) - e-Government Benchmark Expert Group - DSM Strategic Group - Body of European Regulators for Electronics Communications (BEREC) - Information Society Statistics Working Group - ESTAT and Taskforce	- Various government departments **Network(s)** - e-Government Benchmark Expert Group	**Network(s)** - Interoperability of European Public Services Expert Group - NIFO subgroup	**Network(s)** - Chief Information Officer network
MS involvement	- Support the design, review and collection of indicators - Data/Report validation	- Support design and review of indicators - Select online services for evaluation - Data/Report validation	- Support the design and review of indicators - Input data - Data/Report validation	- Support the design and review of indicators - Input data - Data/Report validation
Usage by MS	Evidence from DESI and other monitoring activities has been used as evidence for ICT investments by ministers. Evidence aids the development of national strategies to see if performance in DESI meets nationally-set targets.	The eGovernment Benchmark has been used to advise local administrations about potential targets for online service improvement.	Evidence from the NIFO factsheets and details from BDM are used for ministerial briefings for foreign visits.	

Annex 3 EIF Underlying Interoperability principles

Subsidiarity and proportionality: The subsidiarity principle requires EU decisions to be taken as closely as possible to the citizen. In other words, the EU does not take action unless this is more effective than the same action taken at national level. The proportionality principle limits EU actions to what is necessary to achieve the objectives of the Treaties.

Openness: In the context of interoperable public services, the concept of openness mainly relates to data, specifications and software.

Transparency: Transparency in the EIF context refers to:

- Enabling visibility inside the administrative environment of a public administration. This is about allowing other public administrations, citizens and businesses to view and understand administrative rules, processes, data, services and decision-making.
- Ensuring availability of interfaces with internal information systems. Public administrations operate a large number of what are often heterogeneous and disparate information systems in support of their internal processes. Interoperability depends on ensuring the availability of interfaces to these systems and the data they handle. In turn, interoperability facilitates reuse of systems and data, and enables these to be integrated into larger systems.
- Securing the right to the protection of personal data, by respecting the applicable legal framework for the large volumes of personal data of citizens, held and managed by Public Administrations.

Reusability: Reuse means that public administrations confronted with a specific problem seek to benefit from the work of others by looking at what is available, assessing its usefulness or relevance to the problem at hand, and where appropriate, adopting solutions that have proven their value elsewhere. This requires the public administration to be open to sharing its interoperability solutions, concepts, frameworks, specifications, tools and components with others.

Technological neutrality and data portability: When establishing European public services, public administrations should focus on functional needs and defer decisions on technology as long as possible in order to minimise technological dependencies, to avoid imposing specific technical implementations or products on their constituents and to be able to adapt to the rapidly evolving technological environment. Public administrations should provide for access and reuse of their public services and data irrespective of specific technologies or products. The functioning of the digital single market requires data to be easily transferable among different systems to avoid lock-in, support the free movement of data. This requirement relates to data portability - the ability to move and reuse data easily among different applications and systems, which becomes even more challenging in cross-border scenarios.

User centricity: Users of European public services are meant to be any public administration, citizen or businesses accessing and benefiting from the use of these services. Users' needs should be considered when determining which public services should be provided and how they should be delivered. Therefore, as far as possible, user needs and requirements should guide the design and development of public services, in accordance with the following expectations:

- A multi-channel service delivery approach, meaning the availability of alternative channels, physical and digital, to access a service, is an important part of public service design, as users may prefer different channels depending on the circumstances and their needs;
- A single point of contact should be made available to users, to hide internal administrative complexity and facilitate access to public services, e.g. when multiple bodies have to work together to provide a public service;
- Users' feedback should be systematically collected, assessed and used to design new public services and to further improve existing ones;
- As far as possible, under the legislation in force, users should be able to provide data once only, and administrations should be able to retrieve and share this data to serve the user, in accordance with data protection rules;
- Users should be asked to provide only the information that is absolutely necessary to obtain a given public service.

Inclusion and accessibility: Inclusion is about enabling everyone to take full advantage of the opportunities offered by new technologies to access and make use of European public services, overcoming social and economic divides and exclusion. Accessibility ensures that people with disabilities, the elderly and other disadvantaged groups can use public services at service levels comparable to those provided to other citizens. Inclusion and accessibility must be part of the whole development lifecycle of a European public service in terms of design, information content and

delivery. It should comply with e-accessibility specifications widely recognised at European or international level. Inclusion and accessibility usually involve multi-channel delivery. Traditional paper-based or face-to-face service delivery may need to co-exist with electronic delivery. Inclusion and accessibility can also be improved by an information system's ability to allow third parties to act on behalf of citizens who are unable, either permanently or temporarily, to make direct use of public services.

Security and privacy: Citizens and businesses must be confident that when they interact with public authorities they are doing so in a **secure** and trustworthy environment and in full compliance with relevant regulations, e.g. the Regulation and Directive on data protection, and the Regulation on electronic identification and trust services. Public administrations must guarantee the citizens' **privacy**, and the confidentiality, authenticity, integrity and non-repudiation of information provided by citizens and businesses.

Multilingualism: European public services can potentially be used by anyone in any Member State. So multilingualism needs to be carefully considered when designing them. Citizens across Europe often have problems in accessing and using digital public services if these are not available in the languages they speak. A balance needs to be found between the expectations of citizens and businesses to be served in their own language(s) or their preferred language(s) and the ability of MS public administrations to offer services in all official EU languages. A suitable balance could be that European public services are available in the languages of the expected end-users, i.e. the number of languages is decided on the basis of users' needs, such as the level to which the service is critical for the implementation of the digital single market or national policies, or the size of the relevant audience. Multilingualism comes into play not just in the user interface, but at all levels in the design of European public services. For example, the choices made on data representation in an electronic database should not limit its ability to support different languages. The multilingual aspect of interoperability becomes also relevant when a public service requires exchanges between information systems across language boundaries, as the meaning of the information exchanged must be preserved.

Administrative simplification: Where possible, public administrations should seek to streamline and simplify their administrative processes by improving them or eliminating any that does not provide public value. Administrative simplification can help businesses and citizens to reduce the administrative burden of complying with EU legislation or national obligations. Likewise, public administrations should introduce European public services supported by electronic means, including their interactions with other public administrations, citizens and businesses. Digitisation of public services should take place in accordance with the following concepts:

- digital-by-default, whenever appropriate, so that there is at least one digital channel available for accessing and using a given European public service;
- digital-first which means that priority is given to using public services via digital channels while applying the multi-channel delivery concept and the no-wrong-door policy, i.e. physical and digital channels co-exist.

Preservation of information: Legislation requires that decisions and data are stored and can be accessed for a specified time. This means that records and information in electronic form held by public administrations for the purpose of documenting procedures and decisions must be preserved and be converted, where necessary, to new media when old media become obsolete. The goal is to ensure that records and other forms of information keep their legibility, reliability and integrity and can be accessed as long as needed subject to security and privacy provisions. To guarantee the long-term preservation of electronic records and other kinds of information, formats should be chosen to ensure long-term accessibility, including preservation of associated electronic signatures or seals. In this regard, the use of qualified preservation services, in line with Regulation (EU) 910/2014, can ensure the long-term preservation of information. For information sources owned and managed by national administrations, preservation is a purely national matter. For information that is not strictly national, preservation becomes a European issue. In that case, an appropriate 'preservation policy' should be applied by the MS concerned, to cope with any difficulties arising if the relevant information is used under different jurisdictions.

Assessment of effectiveness and efficiency: There are many ways to take stock of the value of interoperable European public services, including considerations such as return on investment, total cost of ownership, level of flexibility and adaptability, reduced administrative burden, efficiency, reduced risk, transparency, simplification, improved working methods, and level of user satisfaction. Various technological solutions should be evaluated when striving to ensure the effectiveness and efficiency of a European public service.

Annex 4 Questionnaire for European Commission staff

The purpose of this semi-structured interview/survey is to gather initial details of the 'monitoring schemes' foreseen in Task 1 of WP3 of I²PAS.

- Which monitoring schemes and specific indicators address the digital transformation of government and interoperability?
- What are the current gaps?
- How to move from a dispersed set of observatories monitoring digital government and find synergies and alignment from them through coordinated governance?
- How to ensure synergies and alignment across the monitoring needs in the EC and the new Interoperable Europe policy and Digital Decade?
- Are there alternative monitoring methodologies?
- How can the overall monitoring burden be reduced?
- What are the current and future needs for such monitoring?
- How can these [future] needs be met, including automated approaches?
- How to provide a monitoring mechanism that rewards those reporting?
- How could the real impact of the uptake of interoperability and digital transformation of government be measured across public services?
- How to move from a purely self-reporting of interoperability to other ways showing the actual uptake and gaps in interoperability, also covering digital public services?

Annex 5 Questionnaire to Member State representatives

Questions *about national practices and coordination*

- What mechanisms and methodologies do you have in place to monitor national, regional and local developments on digital policies in your country?
- How are you organised in terms of responding to requests for monitoring of the EC policies, as well as UN, OECD, etc.?
- Which benefits have emerged for your country/organisation because of the requests for information for monitoring the EU's digital policies?
- Do you use the factsheets, dashboards, reports and other material the EC is producing for activities in your country? Can you provide us with examples of how they are used? Are there any particularly useful indicators?
- Do you have any best practices (methods, tools, coordination practices etc.) and/or national-level monitoring that could be adopted/replicated across Europe or be submitted as additional content to help monitor digital policies?

Questions on *burden*

- Which challenges do you see in gathering data for monitoring digital policies or sharing data for monitoring digital policies with the Commission?
- Can you give specific examples of the burdens you face in providing evidence for the main monitoring schemes, e.g., can you pinpoint the duplication of questions/topics… is there a known overlap for reporting to different streams?

Questions on *future needs*

- What do you think are the future needs of digital monitoring towards the EU's digital goals for 2030?
- What are your expectations of Member States' involvement in reviewing the monitoring schemes and KPIs related to interoperability and digital transformation? Which concrete joint activities between MS and the Commission would be most appreciated?

Other topics

- Have you measured the 'public value' of monitoring or investigated the impacts/outcomes of interoperability and/or digital transformation nationally apart from through KPIs/monitoring? If so, what methods were used, including any activities, training, events etc.?
- Are you aware of any (semi-)automatic techniques used to assess digital service delivery progress from the government and user perspectives?

Annex 6 Initial options for addressing strategic challenges

Considering a scenario-based approach and as a starting point for the co-creation process and fully open discussion with stakeholders, a set of scenarios has been identified to be jointly discussed, revised, extended, and prioritised (e.g. based on proportionality between costs and benefits). Importantly, these options are starting points for discussion, not definitive solutions. They initiate a collaborative process that sets the scene for the co-creation process to address commonly recognised challenges.

The scenarios include the following:

A - *Status quo*

- ***Status quo* with light coordination on *ad hoc* basis.**
- The same situation as today would remain, with the same pros and cons and the same Interoperability and DTG monitoring costs.

B- Internal alignment in the EC

- **A more synergistic approach with internal alignment in the EC and a coherent conceptual framework.**
- The same set of resources would be used to gather information with the MS but organising better the EC resources to align topics incrementally while reducing duplication (etc.).

C- Integrated ´data space'

- **Integrated approach to digital monitoring with a 'data space' for digital indicators.**
- An infrastructure and community space would be established for monitoring DGT and Interoperability in Europe, fostering the exchange of MS open government data.

D - Independent Research

- **An independent research approach.**
- A key methodology would be developed and deployed by teams of independent researchers in each MS to assess a 'critical mass' of online (including cross-border) services. Work would examine how they contribute to Digital Decade targets and other digital policies.

E - Alternative approaches

- As these are draft scenarios, stakeholders should propose substituting elements within a scenario with a better option.

F - A mixed approach

- Again, as a series of draft scenarios, the above approaches could be reformed, picking 'the best' from each, where a clear rationale for inclusion would be investigated and noted.

G - Alternative scenarios

- Stakeholders in the initial stages of the option design should be free to propose any other approach articulated with a clear motivation as to how that solution should help address the problems identified.

Figure 57: Possible scenarios for the way ahead on monitoring Digital EC policies

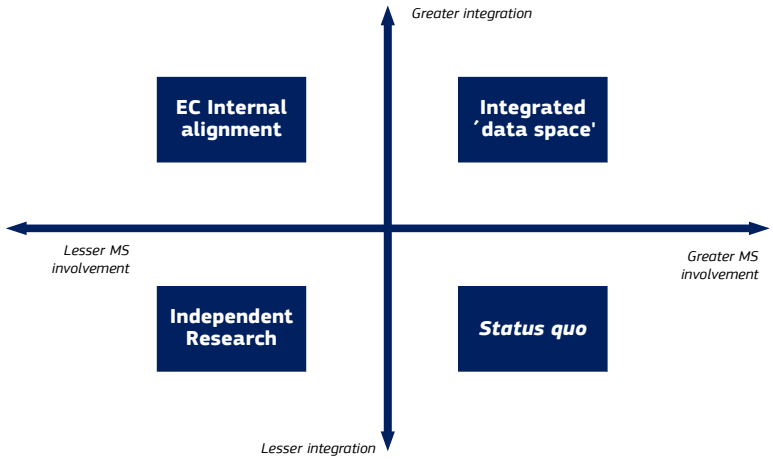

Figure 58: Scenarios positioned integration and MS involvement

Annex 7 Statistical concept glossaries

Glossary	Description
Eurostat's RAMON - Reference And Management Of Nomenclatures - METADATA CONCEPTS AND DEFINITIONS	Compiles statistical concepts from Eurostat and various sources and organisations such as EuroVOC, OECD, International Statistical Institute (ISI), International Association of Survey Statisticians (IASS)
OECD Glossary of statistical terms	Contains a comprehensive set of definitions of key terminology and concepts and commonly used acronyms of the main data items collected by the Organisation.
DDI -Controlled Vocabularies	A set of controlled vocabularies commonly used in social science research. Reflects uses of controlled vocabulary to support systems designed to identify, locate, and access data for research purposes. The needs of the DDI community drive content coverage, but use is not limited to this community.
ISI - INTERNATIONAL STATISTICAL INSTITUTE	The ISI glossary of statistical terms in several languages, some of which use special characters.
SDMX Glossary	An SDMX guideline defines terms in the SDMX Information Model, Data Structure Definitions, and Metadata Structure Definitions.

Annex 8 Standards and specifications for indicator documentation

The documentation must have a minimum set of elements in common and, if possible, harmonised. To illustrate this, the study has examined the following European and international standards that deal with indicator documentation:

Resource	Description
Statistical Data and Metadata Exchange (SDMX)	This ISO (International Standardization Organization) International Standard (ISO 17369) was developed in 2002 by the official statistics community (primarily international organisations, national statistical offices, and central banks) to help exchange statistical data and metadata. The technical specifications include resources on the Framework, the Information Model, Registry Specification – Logical Interfaces, and Technical Notes for implementers. SDMX TWG's official GitHub repository provides information on its REST API (the RESTful web services application programming interface specification), SDMX-ML., the XML (eXtended Markup Language) format specifications for exchanging structures, data, and reference metadata; SDMX-JSON. (JSON format specifications for exchanging structures, data, and reference metadata); SDMX-CSV (CSV format specifications for exchanging data and reference metadata).
Euro SDMX Metadata Structure (ESMS)	This standard is increasingly used for reporting national reference metadata files to Eurostat, including the following usage example "*ICT usage in households and by individuals (isoc_i)"*
ESMS-IP (Euro SDMX Metadata Structure – Indicator Profile)	The ESMS-IP is based on the Euro SDMX Metadata Structure (ESMS). It contains a short 'quality box' providing users with a summary assessment of the main quality characteristics of an indicator, guiding indicator use and analysis. It gives input to the selection processes of any new indicator sets, with the following involving usage examples: "*People at risk of poverty or social exclusion (sdg_01_10)"*.
ESS Standard Quality Report Structure (ESQRS).	ESQRS is a standard for producing and disseminating quality reports within the European Statistical System. ESQRS files provide users with detailed information for assessing the quality of the datasets released by Eurostat.
Data Documentation Initiative Alliance (DDI Alliance	Established in 2003, the DDI Alliance is an international collaboration dedicated to establishing metadata standards and semantic products for describing social science data, data covering human activity, and other data based on observational methods. Among its products, XKOS - Extended Knowledge Organization System is a notable software package that allows Simple Knowledge Organization System (SKOS) to be extended to help manage statistical classifications and concept management systems in the Linked Data World.
Dublin Core Metadata Initiative (DCMI)	The Dublin Core™ Metadata Initiative, or "DCMI", supports shared innovation in metadata design and best practices across the metadata ecology for various purposes and business models. The DCMI Metadata Element Set is the ISO standard 15836.
RDF (Resource Description Framework) Data Cube Vocabulary	This W3C Recommendation supports publishing multi-dimensional data on the web linking to related data sets and concepts using the W3C RDF (Resource Description Framework) standard. The model underpinning the Data Cube vocabulary is compatible with the cube model that underlies SDMX. An example comes from the Example eGov Benchmark.
KPIOnto	Specification that allows the creation of ontologies to describe (Key) Performance Indicators. "KPIOWL" is an Ontology-Driven Approach for KPI Modeling that formally helps conceptualise the KPI selection model. This includes SWRL rules for reasoning on KPI-modelling tasks and enriching Business Intelligence modelling processes.

Annex 9 Indicator registries examples

A registry is an authorised tool that helps users know the updated official list of indicators and their essential data, such as definitions, units and frequency. One of the key characteristics of a registry is the use of a system of persistent identifiers coupled with a versioning system, whereby no element is eliminated. Instead, the indicator would be superseded and replaced by a valid one or invalidated if its use is no longer recommended. The set of registered indicators can serve as a reference and a starting point to locate the data that allows the preparation of analyses, monitoring documents and dashboards, amongst other potential reference data applications. The study has explored the following examples of indicator registries.

Name	Description
ESPON Database	The ESPON database began its development in 2004. It stores several data types, from local to global, tabular to GIS (Geographic Information System) and administrative to gridded data. The database allows free search filtering, sorting by relevance, name, and last update. It provides a faceted filter by type and allows filtering indicators by year, topics, spatial extent, and territorial nomenclature. The indicators' names include the analytical unit. Example: Number of enterprises by size per 1,000 inhabitants. The search gives access to file-based datasets. The Database is also supported by an API giving the indicators list.
World Bank indicator catalogue	This is an alternative entry point to an interactive data platform. The indicator names are short names and units, as in "*Rural population (% of the total population*)." They are displayed and organised alphabetically by thematic area. An additional tab allows access to a shorter list of "featured indicators." Detailed information on the indicator can be found on the data page by clicking "details". The preview of the detailed information includes a concise description, ID, Source, Licence, Aggregation method; Development relevance; Limitations and Exceptions, Long Definition, periodicity, Statistical Concept and Methodology; topic. *A link to the complete metadata is also available*—for example, *"Rural population (% of the total population)*. World Bank is consistent with the Fundamental Principles of Official Statistics and the Principles Governing International Statistical Activities of the United Nations Statistical Division (UNSD)
World Health Organization Indicator Metadata Registry List	Indicator search engine and hierarchical indicator list. Alternative entry point Alphabetised plain list of indicators. Indicators are named with a short name and accompanied by their unit, for example, Alcohol-related crimes (% of all crimes). After clicking the indicator, the user is taken to an interactive data platform with detailed metadata and related indicators. Detailed information on the indicator itself is provided after clicking on it. Detailed information includes short name, Data Type; Rationale; Definition; Method of Measurement; Method of estimation; Preferred data sources; Expected frequency of data dissemination; expected frequency of data collection; Name; Links.
United Nations Office for the Coordination of Humanitarian Affairs (OCHA) Indicator registry	It presents indicators on key clusters. It comes with search, filter and export functions. Among the filtering options, it is interesting to see the possibility of using tagging from across clusters, "Sector cross-tagging", and filtering by the role in the impact pathway: input, output, and outcome indicator. It is designed as a guidance tool for countries to select indicators and, where possible, to seek standard definitions and applications of those indicators. The indicator appears named with a short name. Their analytical unit accompanies it, for example, "Number and percentage of displacement sites where all IDPs have access to shelter". Detailed information includes Description, Unit Description, Numerator, Denominator, Disaggregation, Indicator used for response monitoring, Types, Guidance on phases and Phase applicability. More details on the OCHA registry are available here.

UNAIDS indicator registry	Launched in 2008, it is the result of a multiagency effort. It has become the central point for comprehensive definitions of key indicators used to track the HIV (Human Immunodeficiency Virus) epidemic for professionals who need to use them in monitoring and evaluation activities. The indicators displayed are agreed upon and harmonised across organisations. It can be navigated through *Browse Indicators*, by the *Keywords* or by a *free search. Includes functionalities to export in different formats.*

Annex 10 List of interviewees

Interviewee perspective	DEPARTMENT
European Commission	DG CONNECT B2
European Commission	DG CONNECT C3
European Commission	DG CONNECT C3
European Commission	DG CONNECT C3
European Commission	DG CONNECT D2
European Commission	DG CONNECT F4
European Commission	DG CONNECT F4
European Commission	DG DIGIT D2
European Commission	DG DIGIT D2
European Commission Consultant	WAVESTONE
Member State - France	INTERMINISTERIAL DIRECTORATE FOR PUBLIC TRANSFORMATION
Member State - Italy	DIGITAL TRANSFORMATION TEAM
Member State - Romania	AUTHORITY FOR DIGITIZATION OF ROMANIA
Member State - Sweden	DIGG - AGENCY FOR DIGITAL GOVERNMENT

Annex 11 List of meetings/workshops carried out

DATE	Meeting	Location
10/05/22	Presentation - Lisbon Council/JRC Meeting on Dashboard Indicators and the UserCentriCities Project	Online Meeting
31/05/22	Inner circle workshop: Study on the monitoring and links to the digital transformation of government	Online Workshop
12/09/22	LORDI/LORDIMAS technical discussion	Online Meeting
15/09/22	Internal meeting with DG REFORM	Online Meeting
21/09/22	Berlin Declaration monitoring with Member States	Online - Workshop
26/09/22	Inner circle workshop: Study on the monitoring and links to the digital transformation of government follow up	Online Workshop
27/09/22	Workshop - NIFO - Cross-border dimension of the EIF Monitoring Mechanism	Online Meeting
11/10/22	Meeting of the expert group on Interoperability of EU Public Services, presenting intermediate findings and discussing the problem space	Brussels, BE
14/10/22	Meeting of the expert group on public administration and governance, presenting intermediate findings and discussing interconnections	Ljubljana, SI
19/10/22	Informative session - EIF Monitoring Mechanism | Cross-border scoreboard.	Online Meeting
21/12/22	Inner circle workshop: Study on the monitoring and links to the digital transformation of government follow up	Online Workshop

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