European Commission

State-of-play report on digital public administration and interoperability 2023

Directorate-General for Informatics

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European Commission

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This study was carried out for the European Commission by WAVESTONE

State-of-play report on digital public administration and interoperability 2023

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Foreword

"NIFO – the main hub for information on matters related to digital transformation and interoperability in Europe – becomes a prominent online community of practice and an evidence-based source for policy makers and implementors in the public sector."

Leontina Sandu
Head of Interoperability Unit

Interoperability and the digitalisation of public administrations play a pivotal role in the work of the European Commission and its Directorate-General for Informatics (DG DIGIT). These are the main themes of this State-of-Play report, which are closely aligned with the broader policy objectives of the European Union, namely the Digital Decade policy agenda. The latter recognises that seamless interoperability of digital public services across Member States is essential to foster a cohesive and efficient Digital Single Market. By promoting standards, protocols, and frameworks that enable different systems to communicate and exchange data seamlessly, the Commission aims to break down digital barriers and enhance cross-border access to public services. The digitalisation of public administrations streamlines bureaucratic processes, enhances citizen engagement, and increases the effectiveness of government services. As outlined in the 2030 Digital Compass, these efforts are in line with the broader mission of ensuring Europe's digital sovereignty, boosting digital skills, and achieving ambitious digital transformation goals. As part of these efforts, the National Interoperability Framework Observatory (NIFO) represents a monitoring tool to regularly gather information on the state of play of digital public administrations and interoperability activities within the EU Member States and other European countries.

Published yearly since 2020, the State-of-Play report on Digital Public Administration and interoperability is a fundamental part of NIFO, offering more visibility to both national and European initiatives. In contrast to previous editions, the 2023 State-of-Play report adopts a thematic approach and focuses on three main themes: interoperability and interoperable digital public services, the innovative use of technologies by the public sector and data sharing in Europe. These three specific areas have been selected as they are expected to be influenced by a new key initiative of the European Commission and DG DIGIT, the Interoperable Europe Act. Currently under negotiation, the proposed Interoperable Europe Act will introduce a new framework for cooperation between Member States and EU institutions to ensure the cross-border exchange of data and agree on shared digital solutions to further promote interoperability and the digitisation of public administrations.

In conclusion, the report is the result of a close collaboration with dedicated national contact points in 31 European countries. Additionally, three experts were interviewed to complement the report's findings and offer additional insights. We thank them for their support and their valuable contributions and unwavering support.

Executive Summary

The 2023 edition of the State-of-Play report on digital public administration and interoperability deep dives into three key policy areas which are at the heart of the current policy landscape: interoperability and interoperable digital public services, the innovative use of technologies by the public sector and data sharing in Europe. To do so, it showcases digital initiatives around these topics implemented by 31 European countries, as well as undertaken at EU level. Building on a comprehensive overview and analysis, the report identifies frameworks of reference, noteworthy best practices, and potential areas of improvement for European countries. The first chapter delves into cross-border interoperability, digital-ready policymaking and the reuse of solutions; the second chapter focuses on AI and GovTech; and the last chapter addresses the development of data spaces and smart data platforms, as well as data exchanges between public administrations. In addition, the latest results of the European Interoperability Framework (EIF) monitoring mechanism further complement the analysis provided.

The report shows that European countries have adopted a wide range of initiatives to facilitate their journey toward more a digitised public sector — further confirming a trend that has been already observable since some years, especially following the COVID-19 pandemic. Likewise, it emerges from the report that public administrations are still pursuing a "shift of mindset" when it comes to the use of digital tools and the conception of digital public services, putting user-centricity, usability and interoperability at the centre. Regarding **interoperability**, notable progress has been made in the field of cross-border interoperability, digital-ready policymaking, and the reuse of solutions at national or international level. However, common challenges remain, such as raising awareness on the importance of interoperability and the need to break down silos, in addition to technical interoperability challenges. For the **innovative use of technologies** by public administrations, approaches to AI and GovTech are quite diverse and heterogeneous. This often depends on the digital maturity of European countries, especially for GovTech which is still at early stage of adoption. When it comes to **data sharing**, public administrations have developed innovative ways to share data, mostly through the creation of new advanced data infrastructures, such as data platforms and data spaces. Despite that, the main challenge remains the difficulty to actually share and use data due to multiple factors, such as the lack of interoperability, stakeholders' fear to provide or open data, the lack of efficiency in data collections, the absence of a data governance framework and different data qualities.

1 Introduction

In the context of the monitoring and reporting activities of the National Interoperability Framework Observatory (NIFO) project, the fourth edition of the study on the State-of-Play (SoP) provides an overview of the activities aimed at promoting digital public administration and interoperability at the national and European level.

The fourth edition of the study builds on the Commission proposal for an Interoperable Europe Act and its accompanying Communication to strengthen cross-border interoperability and cooperation in the public sector across the EU. While it is currently being discussed by the Council and the European Parliament, the Interoperable Europe Act proposal aims to introduce a framework of cooperation between EU Member States and EU Institutions to secure cross-border exchange of data and agree on shared digital solutions, such as open-source software, guidelines and frameworks. The new cooperation framework intends to address several new policy developments that affect one way or another digital services by the public sector. Against this background, this edition of the SoP focuses on three specific areas expected to be influenced by the Act, including:

- **Interoperability and interoperable digital public services**: Key policy initiatives adopted by the European Commission such as the Open Data Directive, the Data Governance Act and the Digital Europe Programme increased the need for stronger coordination to produce interoperable digital public services. Further attention should be paid to cross-border interoperability, digital ready policymaking, and reuse of solutions, as

these topics relate to increased efficiency in the interconnections between public authorities of different EU countries, strengthened capacity for policy making and higher uptake of the most recent solutions in a cost-effective way.

- **The innovative use of technologies by the public sector**: The public sphere is expected to be largely influenced by new applications of innovative technologies such as Artificial Intelligence, Blockchain and Internet of Things. One point of interest is Artificial Intelligence that has the potential to improve the functioning of governments, by increasing the quality of policy decisions and multiplying the delivery of personalised and human-centred services through human-centric interfaces. In this line, it is also important to examine the new forms of partnerships of public sector organisations with innovative start-ups and SMEs to solve societal problems, in the fast-growing GovTech approach.

- **Data sharing**: Data flows are critical for global economic and social activities, being crucial for daily business operations, logistics, supply chains and international communication. At the same time, the use of data raises several challenges such as privacy and data protection, intellectual property protection, digital security, regulatory reach, trade, competition, and industrial policy. In this context, it is important to assess the state of current initiatives at the level of EU countries and Member States related to the development of data spaces and smart data platforms, as well as specific questions dealing with data exchange within public administrations.

To shed light on these three topics, the State-of-Play report on digital public administration and interoperability will contain the following chapters:

- CHAPTER 1 – Interoperability and interoperable digital public services;

- CHAPTER 2 – Innovative use of digital technologies by public administrations;

- CHAPTER 3 – Data sharing in Europe; and

- CHAPTER 4 - Conclusion

Two annexes have been included at the end of this report. **Annex 1** includes an overview of the main trends in digital public administrations identified through the 2023 Digital Public Administration factsheets. **Annex 2** presents a high-level overview of the performance of the 35 European countries included in the assessment of the implementation of the European Interoperability Framework (EIF). More specifically, the 2022 level of implementation of the EIF in Europe is analysed to identify potential trends across Europe and the results compared with the ones from 2021.

Scope and methodology

The report covers the recent developments on interoperability, innovative use of technologies and data sharing in the 27 EU Member States, the members of the European Free Trade Association (Iceland, Liechtenstein and Norway) as well as Ukraine, hereafter the "EU/European countries". Furthermore, the report presents information concerning the best practices undertaken and challenges experienced at national level on the abovementioned topics. In this regard, the report considers the initiatives put forward by the European countries since the last decade, focusing on the initiatives established between 2021 and 2023.

The report relies upon primary and secondary data collection activities. Particularly, the Study Team leveraged on content provided by national contact points in the context of the data collection activities for the annual update of the 2023 Digital Public Administration factsheets, the 2022 European Interoperability Framework (EIF) monitoring mechanism, and the 2022 Berlin Declaration monitoring (BDM). Moreover, the report was further enriched with three interviews, one for each thematic chapter, with Policy Officers from the European Commission which are experts in their respective fields. The Study Team complemented, whenever necessary, the primary data collection activities with desk

2 Interoperability and interoperable digital public services

[Interoperability](#)[1], defined as the ability of information systems to exchange data and enable sharing of information, is fundamental to the successful creation of the [EU Digital Single Market](#) as it improves both the efficiency and effectiveness of information-sharing tools across the European Union[2]. In this regard, the creation of interoperable digital public services as part of the digitalisation process of public administrations represents a key priority of European countries. This is expected to benefit not only governments, increasing efficiency and reducing administrative burdens, but also citizens and businesses through more direct, improved interaction with public administrations, which should in turn bring time and financial efficiency gains[3]. Furthermore,

common interoperability specifications and standards, shared and reusable solutions, as well as an 'interoperability-by-default' or 'digital-ready' approach in the design and implementation of policies can improve the alignment of National Interoperability Frameworks (NIFs) with the European Interoperability Framework (EIF) and enhance the adoption of other interoperability solutions within EU countries, allowing them to take advantage of it numerous benefits[4].

To shed some more light on this topic, this first chapter will describe the stateof-the-art on three key aspects of interoperability: cross-border interoperability, digital-ready policymaking, and the reuse of solutions.

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1   Joinup Glossary (Undated). Interoperability. Available at: https://joinup.ec.europa.eu/collection/joinup/glossary/term/interoperability

2   European Commission (2017). Interoperability of EU information systems for security, border and migration management.

3   Tallinn Declaration on eGovernment at the ministerial meeting during Estonian Presidency of the Council of the EU on 6 October 2017

4   European Commission (2020). Exploring Digital Government Transformation in the EU - Understanding public sector innovation in a data-driven society. Available at : https://publications.jrc.ec.europa.eu/repository/handle/JRC121548

2.1 Cross-border interoperability

Cross-border interoperability is a key element of the overall digitalisation of European public administrations and can be defined as the ability of public sector organisations in different countries to share data, collaborate effectively, and provide services to citizens and businesses[5]. As shown by the cross-border online availability indicator of the eGovernment Benchmark, over the last few years, EU public administrations have focused on increasing the availability of public services at cross-border level. As a matter of fact, providing access to digital public services across borders facilitates the daily life of European citizens in terms of living, studying and working abroad as well as the operations of businesses which are active in different European countries, notably regarding the access to relevant information, such as competition laws, and the administrative burden on businesses[6]. Moreover, cross-border interoperability is also beneficial for public administrations as it allows them to optimise operational costs and reduce duplication of effort by enabling a faster, seamless and more systemic access to and exchange of information.

In November 2022, the European Commission adopted the proposal for an Interoperable Europe Act to support the creation of a network of interconnected digital public administrations and more generally, to accelerate the digital transformation of Europe's public sector, representing an additional step forward in the creation of a Digital Single Market7. It would represent the first legally binding initiative aimed at strengthening cross-border interoperability and cooperation in the public sector across the EU. As a matter of fact, prior to the adoption of the Act, cross-border interoperability was addressed exclusively by the voluntary scheme called European Interoperability Framework (EIF), developed under Interoperable Europe, the successor of the ISA2 Programme.

EIF

Box 1. European Interoperability Framework (EIF)

One of the purposes of the EIF is to contribute to the establishment of the Digital Single Market by fostering cross-border and cross-sectoral interoperability for the delivery of European public services. The EIF defines a European cross-border public service as "any public sector service exposed to a cross-border dimension and supplied by public administrations, either to one another or to businesses and citizens in the Union".

In order to monitor the implementation of the EIF, the Commission created an integrated framework for monitoring, evaluating and reporting on the implementation of the EIF within European Countries: the EIF Monitoring Mechanism (EIF MM), further explained in Annex 2. The architecture of the EIF MM is based on three granularity levels: the 25 Thematic Areas (level 1) aggregating 47 Recommendations (level 2) assessed through a set of 91 KPIs (level 3). The results obtained are then clustered under three scoreboards, namely the interoperability principles, the interoperability layers and the EIF conceptual model for integrated public services provision. The 2022 edition of the EIF MM includes an **additional fourth scoreboard on cross-border interoperability**.

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5 Frequently asked questions - Interoperability of EU information systems for security, border and migration management, https://ec.europa.eu/commission/presscorner/detail/de/MEMO_17_5241

6 Krimmer, Robert & Solvak, Mihkel & Alishani, Art & Dedovic, Stefan & Schmidt, Carsten & Castle, Salina. (2022). European Interoperability Landscape Report 2022 Public Report.

7 https://ec.europa.eu/commission/presscorner/detail/en/ip_22_6907

2.1.1 Overview

The European landscape for cross-border interoperability is promising as many initiatives have been implemented, both between two or more EU countries and at EU level.

Over the years, following the increasing mobility of citizens and especially workers across Member States, and in particular between neighbouring countries, many European governments have implemented **bilateral or multilateral agreements** facilitating the provision of cross-border services. For example, Luxembourg contributes to and benefits from numerous cross-border initiatives with Belgium, France and Germany. Similarly, Finland and Estonia, as well as Spain and Portugal, have privileged data exchange services for their citizens.

At European level and to support countries in their digitalisation efforts, in 2014 the Commission launched the Connecting Europe Facility (CEF) programme, which deployed numerous open and reusable solutions, also called Building Blocks, such as the European Blockchain Services Infrastructure, eID, eDelivery and eSignature. Similarly, many cross-border services have also been established **at the EU level** over the years, such as EULIS and ECRIS, among many others. As an example, as a result of these efforts, the vast majority of European countries currently use the Trans European Services for Telematics between Administrations (TESTA) network in their national administrations which is a safe data communication network service that provides a European network for data exchange between different public administrations. Similarly, the European Car and Driving Licence Information System (EUCARIS) is widely used in the EU to share transport related data such as vehicle and driving licence information. These findings are further complemented by the results of the 2022 EIF MM survey presented in Annex 2, in particular from the fourth Scoreboard on cross-border interoperability.

Scoreboard 4 on cross-border interoperability assesses the level of implementation of 35 Recommendations, stipulated by the EIF framework. A visual representation of what it entails is presented in Figure 1 below.

Figure 1 Scoreboard 4 on Cross-border interoperability
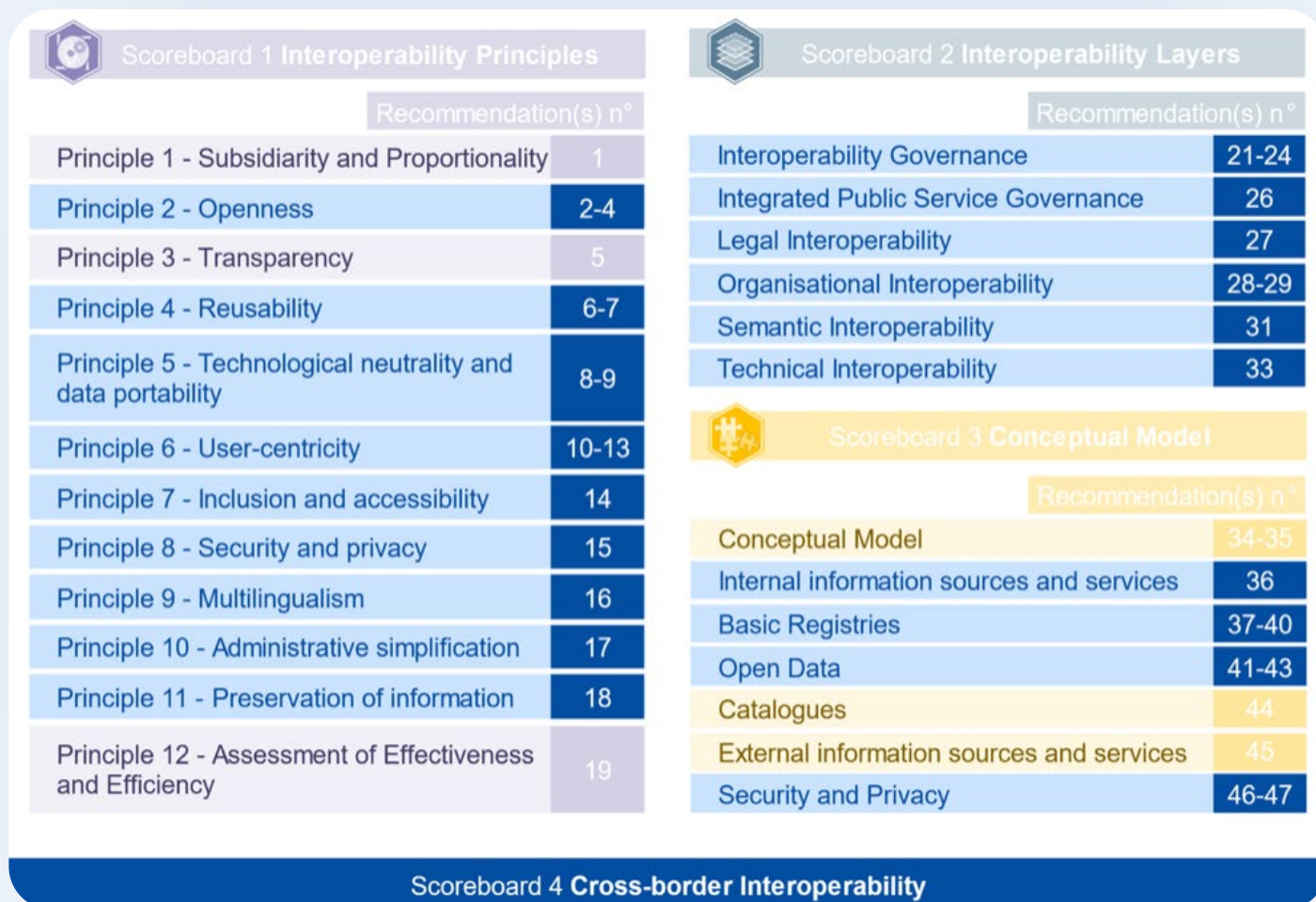
Source: 2022 EIF results

As it appears from the scoreboard, the majority of European countries are already providing public services at the cross-border level with different degree of implementation.

2.1.2 Best practices

Adopting new cross-border digital public services can greatly vary depending on the national context and the IT systems already available in EU countries. Following the analysis of the Digital Public Administration factsheets, two main best practices were identified.

Adopting a need-driven long-term approach

Most of the current application of bilateral or multilateral cross-border agreements respond to specific and localised needs, such as a high level of cross-border workers or urgent political issues (e.g., healthcare). Clear objectives on issues of concern help to build constituencies and strengthen political commitment, which in turn contributes to the provision of effective cross-border services. These objectives need to be supported by a clear understanding of roles and responsibilities during implementation.

In August 2023, **Ukraine and Poland** will launch new cross-border public services to facilitate the cross-border exchange and mutual recognition of specific electronic documents and electronic files. Driver's licenses and technical licenses from the Ukrainian Diia mobile application will be displayed in the Polish mObywatel. Ukrainians in Poland will be able to upload their driver's licenses and vehicle registration certificates to mObywatel application. Therefore, citizens of Ukraine will receive electronic documents that will be valid on the territory of Poland.

Luxembourg is one of the first countries to have successfully implemented the eIDAS regulation mainly driven by the high number of cross-border workers (218 000 in 2021). Along the same line, Luxembourg voluntarily participates to diverse cross-border initiatives, such as the e-Justice Communication via Online Data Exchange (e-CODEX) initiative, which is the main European tool providing easy access to cross-border justice for citizens, business and legal professionals across Europe.

Promoting the adoption of interoperability agreements and open standards

The adoption of interoperability agreements and open standards when developing digital public services is essential to ensure that these services are interoperable with initiatives established at EU level.

Portugal promoted MOSAICO, a national initiative that ensures the use of open standards and common platforms when developing digital public services, which in turn promotes cross-border interoperability.

Cyprus put in place a fully integrated and web-enabled customs system called THESEAS Customs System, easily accessible at both national and cross-border level, allowing for the exchange of information at European level.

In June 2017, **Finland and Estonia** formed a jointly managed special-purpose organisation to manage the development of X-Road – the Nordic Institute for Interoperability Solutions (NIIS).
The main data exchange solution for Finnish public sector organisations, Suomi.fi-palveluväylä, is based precisely on the X-Road technology. The latest version, X-Road 7.0.0, was launched in the end of 2021.

2.1.3 Challenges and areas for improvement

Achieving cross-border interoperability is a complex process that involves facing different challenges, often liked to heterogeneous national contexts and legacy systems of the cross-border data exchange infrastructures within EU countries.

Figure 2 Main challenges of cross-border interoperability
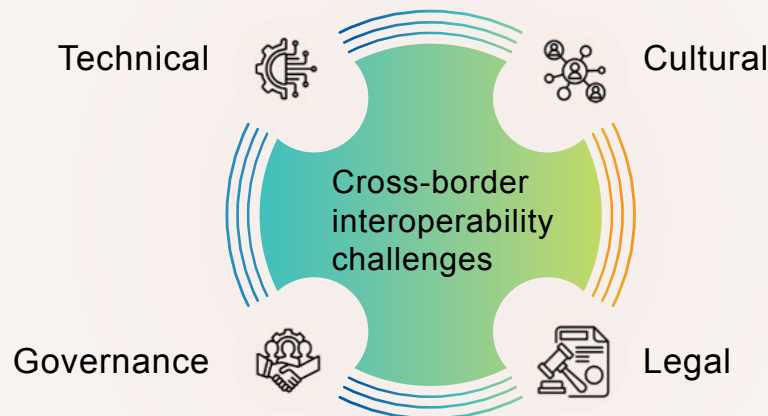
Source: Author's own elaboration

On the **technical** side, the need to implement common technical standards and procedures for data transfer, as well as trusted identity and authentication systems to ensure the creation of secure and reliable systems between different public organisations can be particularly challenging for EU countries. In addition, **interoperability governance** appears as a key challenge due to the lack of implementation of common standards, specifications, and guidelines among the EU countries. Governmental silos, where governmental ecosystems are decentralised and the establishment of cross-border data exchanges require the completion of a wide range of procedures that vary in each Member State, can further complexify the creation of cross-border services. Moreover, **legal challenges** can also hinder the development of cross-border services.

EU countries can be concerned about the privacy and data protection issues and the legality of the data sharing across-borders[8]. Finally, there might be **linguistic and cultural barriers**, which may also pose challenges to a successful cooperation[9].

To respond to these challenges and foster cross-border interoperability, simplifying processes and using digital channels for the delivery of European public services would facilitate the alignment and exchange of data with other EU public administrations, in alignment with Principle 10 on administrative simplification of the EIF. In addition, cross-border interoperability could be further fostered by the establishment of interoperability agreements in all layers, complemented by operational agreements and change management procedures[10].

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8 Krimmer, R., Dedovic, S., Schmidt, C., Corici, AA. (2021). Developing Cross-border E-Governance: Exploring Interoperability and Cross-border Integration. In: , et al. Electronic Participation. ePart 2021. Lecture Notes in Computer Science(), vol 12849. Springer, Cham. https://doi.org/10.1007/978-3-030-82824-0_9

9 Leosk, N., Põder, I., Schmidt, C., Kalvet, T., Krimmer, R. (2021). Drivers for and Barriers to the Cross-border Implementation of the Once-Only Principle (2021). Lecture Notes in Computer Science, vol 12621.
R. Hellman, "Organisational barriers to interoperability," (2010), eChallenges e-2010 Conference, Warsaw, Poland.
V. Margariti, T. Stamati, D. Anagnostopoulos, M. Nikolaidou and A. Papastilianou, "A holistic model for assessing organizational interoperability in public administration" (2022), Government Information Quarterly, Volume 39, Issue 3.

10 As recommended by Recommendation 26 of the EIF.

2.2 Digital-ready policymaking

Digital-ready policymaking is a concept developed by the European Commission under the [Better Regulation Agenda](#)[11] and it aims to help policymakers drafting legislation in a way that it conforms to the fast-evolving digital society. In other words, digital-ready policymaking intends to ensure that digital opportunities are considered when designing new policies. According to the [Commission's Digital Strategy](#)[12], policies and legislative acts are digital-ready if they enable smooth and digital-by-default policy implementation through best use of digital technologies and data. Digital-by-default means that the default choice of policymakers is to deliver services digitally via multiple channels. Therefore, a policy is digital-ready if it has been drafted while considering digitalisation and its technological implications since its conception, making it digital, interoperable, future-proof and agile-by-default. By addressing the gap between the policy formulation and its digital implementation, digital-ready legislation aims at creating the basis for a more modern, efficient and user-centric public sector.

Box 2. Digital-ready policymaking in the Better Regulation Toolbox.

The European Commission [Better Regulation Toolbox](#), published in November 2021, describes the components of digital-ready policies. **Tool #28** identifies **six key elements** that make a legislative act digital-ready, as the figure (Figure 2) below presents. In practical terms, the six components are under the umbrella of **one** main **enabler** which requires policymakers to work in **multidisciplinary teams** in all phases of the policy cycle. Indeed, collaboration across policy areas is a must to reconcile different views, priorities and perspectives and to onboard the relevant expertise during the drafting phase, ranging from business analysts to data experts (see Section 1.1.2).

Figure 3 Components and enablers of digital-ready policies

Digital-ready policies: Components and enabler

1. User-centric processes ready for automation
2. Alignment with digital policies
3. Once-only principle and reuse of data
4. Evolving ICT landscape
5. Innovation & Digital technologies
6. Digital-ready drafting

Enabler: Multidisciplinary teams

Source: Better Legislation for Smoother Implementation, Joinup.

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11 European Commission (2021). Better Regulation: Joining forces to make better laws. Available at: https://commission.europa.eu/system/files/2021-04/better_regulation_joining_forces_to_make_better_laws_en_0.pdf

12 European Commission (2022). European Commission digital strategy – Next generation digital Commission. Available at: [https://commission.europa.eu/system/files/2022-06/c_2022_4388_1_en_act.pdf](#)

2.2.1 Overview

As already mentioned, the concept of digital-ready policymaking is mainly addressed in the Better Regulation Agenda which, in line with the European Commission's priority for "a Europe fit for the digital age"[13], aims to adjust policies to satisfy the current technological and digital needs. The Commission's recommendations are not mandatory, thus most European countries have not (yet) adopted political communications or legislations at national level addressing digital-ready solutions. Nevertheless, **few Member States**, such as Denmark and Norway, **have recently established guidelines on such a topic**, acknowledging the importance it is acquiring over time.
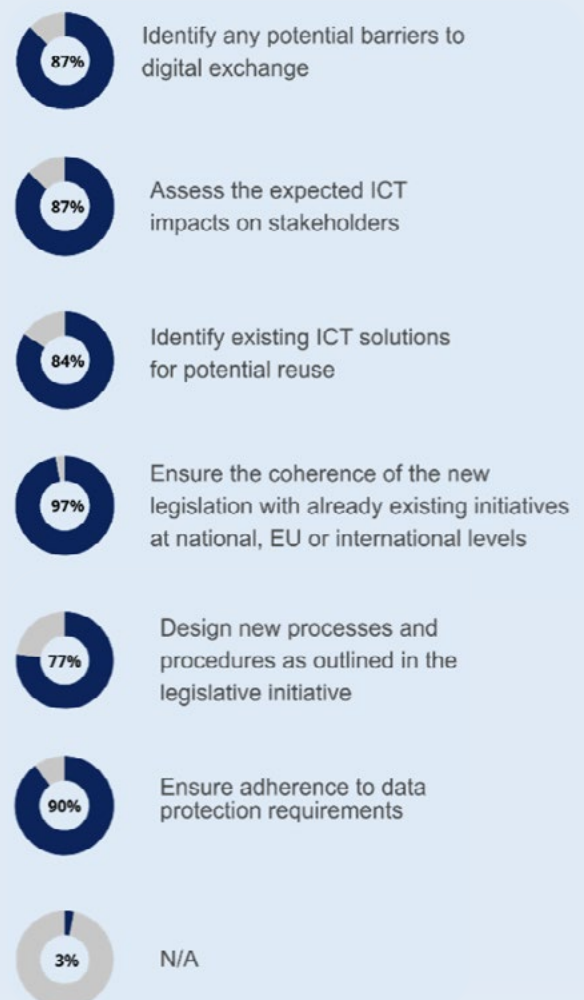
Another trend related to digital-ready policymaking is the **increase of investments in IT expertise**. Producing digital-ready policies not only requires deep subject matter expertise in the workings of government, but also in technologies and IT infrastructures affected by the implementation of such policy[14].

The results of the EIF MM confirm that European governments are increasingly investing more on IT expertise to ensure that ICT is considered when drafting new legislative acts. Indeed, as shown in Figure 4 below, the majority of European countries take into account at least 5 ICT elements when drafting new legislation.

Indeed, as shown in Figure 4, the majority of European countries take into account at least 5 ICT elements when drafting new legislation.

The EIF Monitoring Mechanism (EIF MM) (Annex 2), provides insights on the state-of-play of digital-ready policymaking across Europe. In particular, KPI 48 focuses on legal interoperability and measures the extent to which ICT is taken into account when preparing new legislation, highlighting the importance of considering technological developments and ICT to design digital-ready policies.

Figure 4 KPI 48: Percentages of European countries taking into account different ICT elements when preparing new legislation

- 87% Identify any potential barriers to digital exchange
- 87% Assess the expected ICT impacts on stakeholders
- 84% Identify existing ICT solutions for potential reuse
- 97% Ensure the coherence of the new legislation with already existing initiatives at national, EU or international levels
- 77% Design new processes and procedures as outlined in the legislative initiative
- 90% Ensure adherence to data protection requirements
- 3% N/A

Source: 2022 EIF MM results

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13   European Commission (2020). A Europe Fit for the Digital Age. Available at: https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/europe-fit-digital-age_en

14   Cooke A. (2022) A Collaborative Approach to Digital-Ready Government. The Forum Network. Published on 9 December 2022. Available at: https://www.oecd-forum.org/posts/a-collaborative-approach-to-digital-ready-government?channel_id=partners-thought-leadership

2.2.2 Best practices

Approaches to digital-ready policymaking vary across Europe. The three main trends have been identified:

Establishing national guidelines for policymakers

Some countries have set guidelines for policymakers on how to make sure that the digital component is considered when drafting new legislations.

In **Denmark**, seven principles have been established to drive digital-ready legislation and whose extent in each legislative proposal should be assessed by the responsible ministry in order to ensure that the new law supports public services for citizens and businesses. In support of this effort, a dedicated secretariat has been established, which, since 2018 has been consulted by line ministries on approximately 450 draft bills, resulting in 80 per cent of the recommendations being implemented in legislative proposals subsequently presented before Parliament.

Norway has recently published a national guide on how to draft digital-ready legislations which also include automation. However, it provides recommendations that are not mandatory to follow.

A national guide will soon be available in **Sweden** to support public sector bodies in designing and evaluating digital-ready policies as well as automation-ready ones.

Measuring the digital impact of legislative proposals

Other European countries have decided to measure the digital impact of legislations before these are adopted.

In accordance with the Código de Administración Electrónica, **Spain** issues regulatory impact reports for every legislation draft, which assess the level of digitalisation of a given proposal considering administrative simplification with digital proceedings, among other criteria.

In **Luxembourg**, for each legislative proposal a fiche d'impact describing the impact of the legislation on digital and eGovernment elements has to be filled and provided to the Government Council before the Council can decide whether to adopt the proposal.

Germany has developed the Digitalcheck which comprises five principles aimed at providing policymakers with processes, methods, and skills for producing digital-ready policies. The beta version was published in January 2023.

Embedding digital-ready requirements in national strategies

Some European countries have embedded digital-ready requirements in broader national strategies tackling digital-related issues.

Ireland's Civil Service Renewal 2030 Strategy ensures that "legislation is digitally enabled". This also is support by Connecting Government 2030: A Digital and ICT Strategy for Ireland's Public Service and supervised by the Digital Government Oversight Unit, the responsible body which ensures that digital- and ICT-related initiatives are appropriately aligned with all relevant government policies and the strategies that support them.

2.2.3 Challenges and areas for improvement

Despite the increasing political attention dedicated to the topic, just **few European countries have adopted political communications or legislations at national level addressing digital-ready solutions**. Different interrelated challenges undermine the uptake of digital-ready legislation.

Figure 5 Main challenges of digital-ready policymaking

Awareness rising — Mindset shift — Digital-ready policymaking challenges — Need for multidisciplinary — Need for breaking down silos across sectors and policy levels

Source: Author's own elaboration

First, several Member States have pointed out that there is the **need to raise awareness and educate public sector bodies on the subject**, given the complexity of the topic. The concept of digital-ready policymaking is wide and requires specific technical knowledge under different domains, such as digital policies, ICT expertise and innovative digital technologies, and thus the involvement of numerous stakeholders. In addition, the low level of knowledge on the topic among public sector bodies is considered to be one of the main barriers for the implementation of digital-ready legislation.

To allow for digital-ready policymaking, another challenge is the **need for breaking down silos** across sector and policy levels and to embrace **multidisciplinarity**. Indeed, continuous sectoral and cross-sectoral conversations are needed at all levels of public administration, often leading to the creation of multidisciplinary teams. Finally, adopting a **"digital first" mentality** and considering the **digital-readiness of policies** right from the very beginning of the legislative drafting process, implies a **mindset shift** and a whole new set of methods, processes and competences for policymaking. This kind of transformation of a core political and administrative process necessitates time and an iterative approach based on a long-term vision.

2.3 Reuse of solutions

The reuse of IT solutions (e.g. software components, Application Programming Interfaces and standards) is a key enabler of interoperability which allows for quality improvements and cost reductions. Reuse means that public administrations can 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[15]. In this way, public administrations can reduce costs and increase efficiency while offering public services. The reuse of solutions is therefore a major contributor to the development of a digital single market in the EU.

Box 3. The Sharing and Reuse Framework for IT solutions and the Joinup Community

The Sharing and Reuse Framework for IT solutions has been developed under the umbrella of the EU ISA Programme to give specific guidance on how to promote sharing and reuse of IT solutions in the public sector. Specifically, the framework includes 10 key recommendations for decision makers, legal professionals, IT architects, developers and communication experts, that should be considered when sharing a tool or the provision of a service, reusing existing tools or services and collaborating in the development of a tool or service. The framework also includes 19 supporting measures which specifically target central organisations. The overall aim of applying the recommendations is to tackle the existing barriers for reusability around Europe. Organisational barriers, for instance, prevent coordination between public administrations. Cooperation is also limited by legal barriers such as the uncertainty about the limitations of intellectual property rights (IPR). The lack of awareness of available IT solutions serving common needs, combined with the difficulties of operating in a multilingual environment represent major communication barriers. Finally, reusability is hindered by technical barriers like the limited use of common standards, poor documentation and the prevalence of monolithic IT development. In brief, the aim of the Sharing and Reuse Framework for IT solutions is to help public administrations to overcome these barriers and foster interoperability.

Going beyond the theoretical framework, the European Commission established the Joinup Sharing and Reuse community. Members of the community can learn of best practices around, share common services, or reuse open-source software. Finally, on the platform members can also read about good practices on business and governance models.

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15   https://joinup.ec.europa.eu/collection/nifo-national-interoperability-framework-observatory/2-underlying-principles-european-public-services

2.3.1 Overview

In the past few years, **European countries have progressively acknowledged the relevance of the reusability principle** as key enabler for interoperability. As a matter of fact, numerous countries adopted **technical guidelines** that provide information on how to publish, maintain and modify open-source software and created catalogues or communities to facilitate the exchange of solutions and good practices. This trend is also confirmed by the results of the EIF MM. Indeed, as a key element to foster interoperability, reusability is one of the fundamental principles of the EIF. Recommendation 6 of the EIF explicitly invite Member States to reuse and share solutions and cooperate in the development of joint solutions when implementing European public services. The results of the EIF MM show that Member States are already extensively applying Recommendation 6 on the reuse of solutions. As a matter of fact, 90% of countries reported to have created collaborative platforms that facilitate the reuse, sharing and development of IT solutions.

2.3.2 Best practices

Over the years Member States have adopted different approaches to promote the sharing and reuse of IT solutions. Despite the wide variety of adopted approaches, EU countries seem to agree that an important enabler for the reusability principle is the creation of a common virtual space where solutions and expertise can be shared and retrieved. Two main best practices have been identified in this regard: the creation of national portals to access catalogues and the establishment of communities.

Creation of common catalogues or platforms for the sharing and reuse of IT solutions

To enhance the sharing and reuse of IT solutions is fundamental to have common catalogues or platforms that facilitate the cooperation between different administrations on a practical level. EU countries have already taken action to create such infrastructures.

Slovenia established the NIO Portal, a website dedicated to publishing interoperability solutions and products of the public sector. The portal connects a catalogue of interoperability solutions with best practices for re-using such solutions.

The **French** Interministerial Digital Directorate published an interministerial catalogue of recommended free software, known as Socle interministériel de logiciels libres (SILL). The catalogue lists recommended free software already used by central administrations, hence promoting their reuse.

On the same page**, Hungary** offers a national catalogue of generic and reusable building blocks available for public administration bodies via its national portal contributing to wide reuse of the Hungarian eID (KAÜ), eDelivery (BKSZ), ePayment (EFER) and other building blocks. Additionally, since 2020 the State Application Development Environment

(FLORA) and the State Application Catalogue (LIBRA) were set up to promote standardisation and transparency of the application developments within the Hungarian public administration, to avoid duplication of developments, foster reusability, and reduce supplier/vendor dependencies. The LIBRA Application Catalogue provides a detailed picture of the current state of national software assets, helping to prevent parallel, unjustified state developments, thus fostering reuse.

Establishment of an ad hoc community

Another strategy adopted by EU countries for the promotion of the sharing and reuse of interoperable solutions is the establishment of an ad hoc community which facilitates the exchange of technical knowledge and good practices among public administrations.

Developers Italia, the Italian landmark for the development of digital public services. The Community offers four different catalogues: the catalogue of national and local enabling platforms (which can be used by developers interested in integrating their services in the national and local enabling platforms), the catalogue of open-source software (which can be used by developers to reuse software developed by other Administrations), the catalogue of APIs and the National Data Catalogue for Semantic Interoperability to foster the reuse of IT solutions via data reuse. As of today, only beta versions are available for the last two catalogues as they have been introduced in 2022 using the Next Generation EU funds.

Similarly, the Danish OS2 community is an organisation of public bodies where public code is developed, matured, and maintained. The organisation was initiated by a small group of municipalities in 2012 and has since grown and today there are around 70 public authorities and about as many private IT-vendors in the OS2 network. OS2 has more than 20 open-source solutions relevant to public sector needs and requirements. OS2 uses a governance model, which defines three levels that indicate the maturity of the code, documentation, financing model, and more.

2.3.3 Challenges and areas for improvement

While EU countries are already demonstrating a good performance in the implementation of the reusability principle, several challenges still undermine the full embracement of such principle.

Figure 6 Main challenges of the reuse of solutions
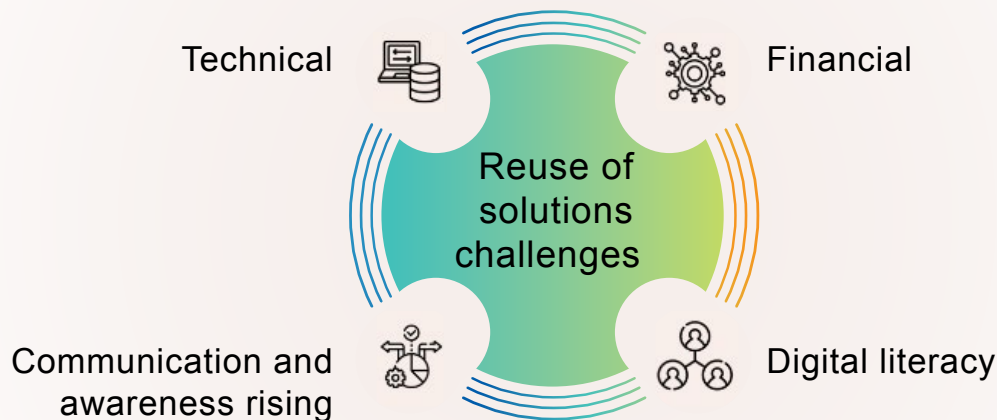
Source: Author's own elaboration

First, **technical challenges** make it hard to fully exploit the possibilities offered by the existence of catalogues with open-source solutions. Several solutions are too domain specific, and projects are rather ad hoc and there is no long-term management. In other words, due to the variety of requirements and correspondingly diverse system architectures, reusability is very challenging. In this sense, new principles and platforms are being launched to address this problem, but cultural change is slow to come.

Additionally, **communication, awareness raising, and training** are additional main challenges which still limit the share and reuse of IT solutions. Indeed, despite the creation of solutions with potential for reuse, matching these solutions with those who face challenges that the solutions might help overcome is often difficult. The main challenges include the task of identifying the right solutions, getting information on the solutions and the terms (e.g. by describing them according to a governance model) and having the technical knowledge required to perform such activities.

Finally, in some Member States**, financial challenges** still limit the development of open-source solutions. Indeed, establishing a funding model for common or shared solutions has proved difficult. It may be difficult to share costs when a solution is first implemented, but it is even more complex to fund the costs of operation, maintenance and development. Increasing or changing usage and new user groups further complicate any model. In this sense, the lack of a framework for financing common and share solutions is an additional barrier to be overcome in order to fully exploit the benefits of the reusability principle.

Although interoperability has been explicitly mentioned as a precondition for numerous EU digital policies and funding programmes, like the Open Data Directive and the Single Digital Gateway, such a topic has not been addressed by binding overarching EU policy provisions so far. For this reason, on 18 November 2022, the European Commission adopted the Interoperable Europe Act proposal which aims to tackle the issues and take advantage of the opportunities arising from the ever-increasing digital transformation of the public sector in Europe. The proposal also wants to introduce a structured and co-owned EU cooperation framework for all public administrations. The purpose of this is to ensure that digital public services work across borders for all European citizens and businesses, by fostering a coherent, human-centric approach to interoperability built in by design from policymaking to policy implementation, establishing a clear governance and an ecosystem of solutions and specifications.

Furthermore, the proposal provides for the review of the European Interoperability Framework (EIF). Indeed, even though it has a non-technical approach and it is based on voluntary participation, the EIF has proven to be a useful instrument to raise awareness on interoperability beyond technical audiences. However, in its current state it is not frequently referenced in EU policies and public administrations across the EU could benefit from a reinforced EIF that is more closely linked to EU sectorial policies and provides more pragmatic and operational guidance. As a consequence, also through the proposal, the Commission is currently discussing how the EIF could be improved.

Strengthening the interoperability of public services in Europe is part of the work on the Commission's priority to create "a Europe fit for the digital age" as well. Moreover, in its Communication 2030 Digital Compass: the European way for the Digital Decade, the Commission pointed out the need to establish a strengthened EU interoperability policy to support the digitalisation of public services. The proposal also follows other political communications from the Commission, such as the Berlin Declaration on Digital Society and Value-Based Digital Government, which point out to the need of ensuring interoperability to support the exchange of data, guarantee digital sovereignty, and strengthen the resilience of the public sector.

"Technical skills and capacity building are needed to implement laws and regulations that have a digital element, and this requires the understanding of interoperability."

Andrea Halmos

The Study Team conducted a semi-structured interview with Andrea Halmos, the Deputy Head of Unit of the Interoperability Unit at DG DIGIT, in order to investigate the novelties introduced by the Interoperable Europe Act proposal in the context of the interoperability of digital public services across Europe. The interview pointed out the main impacts that the Regulation will have on Members States once adopted, as well as underlined how the EIF could be revamped tacking into account European countries' needs and technological advancements in the field.

In November 2022, the European Commission proposed the Interoperable Europe Act to strengthen interoperability in the public sector. In your opinion, why does the EU need such legislation? What are the main benefits that this Regulation could bring to Member States once adopted?

Interoperability has been mentioned as a precondition for several EU policies, but there currently is no binding legislation at the EU level to tackle public sector interoperability in general, in a cross-border context. In fact, a structured framework and a common governance are missing as cross-border interoperability is promoted by sectoral policies, but not as an overarching principle. Despite of the many efforts, the single market still has many barriers that can be reduced by adopting a more structured approach to interoperability. The proposal aims, in fact, to strengthen this at all levels: legal, technical, semantic and organisational. Concretely, Member States will have to consider interoperability from the very beginning when setting out the requirements for new or changing networks and IT systems aimed at providing these services. In more practical terms, some of the benefits of the Act will be administrative burden reduction, seamless cross-border public services as well as better integrated, more user-centric public services for citizens, which will create a change in how citizens perceive public services and may potentially increase trust in governments.

In your view, what are the impacts that the proposal would have on public sector bodies? Do you think that the impacts will differ across Member States? And if so, how do you foresee this?

There are different maturity levels across Member States in terms of digital government transformation as well as interoperability. Looking at data from DESI and the eGovernment Benchmark, it is possible to observe that the level of digitalisation of public services has significantly increased in the past few years, but smaller improvements have been done in relation to making those services also available cross-border. Consequently, the Act will have a different impact across European countries. Member States that are still missing a national interoperability framework will be helped in developing one, to foster interoperability in their own context and facilitate interconnection with other countries. On the other hand, more advanced countries may be more impacted from a governance perspective, depending on their internal structure.

In line with the novelties the Interoperable Europe Act will introduce, how do you think the EIF could be improved in order to provide Member States with more pragmatic and operation guidance?

The obligation to conduct an interoperability assessment following the EIF, emphasises its role. Nonetheless, some recommendations of the EIF are difficult to implement as they are rather high level, and others may be outdated as they have become part of the EU legislative framework over time (e.g., General Data Protection Regulation and Declaration on Digital Principles). For this reason, there is an ongoing discussion on the possible revamp of the EIF, to be performed by the Interoperable Europe Board, in order to make it more easily implementable and up to date with the current needs and technological developments.

In your view, what would be the role of the proposal to further enhance the reuse of IT solutions across European public administrations?

Article 4 of the proposal explicitly refers to the reuse of solutions since it calls for an enhanced sharing and reuse of interoperability solutions. Moreover, specific reusable solutions on national portals, catalogues and repositories will be accessible from the Interoperable Europe portal, thus facilitating the reuse of solutions at the European level. Good practices will be selected to promote their share and reuse methodology. The reuse of interoperability solutions will also be enhanced through the GovTech ecosystem.

3 Innovative use of technologies by the public sector

Emerging technologies have offered increasing opportunities to the public sector to develop innovative approaches to decision and policy making, service delivery and public value creation[16]. Innovative technologies, such as Artificial Intelligence (AI) or blockchain, hold considerable potential to make the public sector more agile, efficient, user-friendly and trustworthy of citizen's trust, while creating better fit-for-purpose public services.[17] Public entities can have various roles to strengthen the national research capacities: act as organisers developing political strategies, as financers providing funds for research, as direct users and co-developers of tailored solutions,

and as regulators establishing the national legal and policy frameworks. Governments can face multiple challenges to procure and incorporate innovative technologies for public purposes, requiring a paradigm shift to the digitalisation of the public sector. Notably, the engagement with the private sector has been identified as a key enabler for the adoption of innovative technologies.[18]

In order to provide insights on this topic, this chapter will dive into the adoption of AI by the public sector and the GovTech approach undertaken by national authorities to accelerate the development of innovative solutions.

16 European Commission. COM(2022). A New European Innovation Agenda. 332 final. {SWD(2022) 187 final}

17 European Investment Bank (2021). Artificial intelligence, blockchain and the future of Europe: How disruptive technologies create opportunities for a green and digital economy.

18 Kuziemski, M., Mergel, I., Ulrich, P. and Martinez, A., GovTech Practices in the EU, EUR 30985 EN, Publications Office of the European Union, Luxembourg, 2022, ISBN 978-92-76-47234-6, doi:10.2760/74735, JRC128247.

3.1 AI

According to the [European AI Strategy](#)[19], Artificial intelligence (AI) refers to systems that *"display intelligent behaviour by analysing their environment and taking actions – with some degree of autonomy – to achieve specific goals".* Whereas AI technologies date back to the 1950s, it is only in the last ten years that other technological developments (e.g. machine learning, big data, cloud computing) set the conditions for major breakthroughs in the usage of AI.[20][21]

For instance, AI can leverage on large amounts of data (i.e. big data) to forecast future scenarios and provide cost-effective solutions to setup innovative public policy measures. In this regard, the AI is currently providing fundamental support for the development of smart cities as it can help national and local policymakers in dealing with the challenges associated to increasing urbanisation (e.g. by increasing the security, reducing carbon emissions, improving the mobility).[22]
Moreover, the use of AI technologies by public administrations can radically improve their internal operating methods, fostering innovative public service delivery models and optimising resource allocation away from tedious and repetitive tasks.[23][24]

While the ever-increasing use of AI within our economy and society at large brings forward unprecedented opportunities for the public sector, it alongside allows for emergence of unknown risks that policymakers need to address, protecting AI's users without hampering innovation and technological developments. For instance, as data access and sharing across sectors and borders is beneficial to the development of AI technologies, national and local policymakers currently channel their efforts to foster data reuse, overcoming siloes approach to data management and fostering stakeholder collaboration.[25][26]

On the other hand, data access and data sharing bring forward new challenges related to the protection of individuals' and organisations' rights as well as the potential misuse of this information.[27]
For this reason, the OECD recommended for the public sector to focus its efforts on quick wins, before addressing structural problems.[28]
In this regard, while looking at the long-term strategies at national level, it is key to assess the successful cases of AI implementation and learn from such experiences.[29]

19 European Commission. COM(2018). Artificial Intelligence For Europe {SWD (2018) EN 137 Final}

20 CUlnicane, I. Knight, W. et al. (2022). The Global Politics of Artificial Intelligence. Chapter 2 – Governance of Artificial Intelligence: Emerging International Trends and Policy Frames. DOI:10.1201/9780429446726-2

21 OECD (2022). Harnessing The Power of AI and Emerging Technologies. Background Paper for the CDEP Ministerial Meeting. OECD Digital Economy Papers. November 2022 No. 340.

22 Dash B., Sharma P., (2022) Role of Artificial Intelligence in Smart Cities for Information Gathering and Dissemination - A Review. Academic Journal of Research and Scientific Publishing | Vol 4 | Issue 39. DOI: 10.52132/Ajrsp.e.2022.39.4

23 European Commission – JRC (2020). AI Watch – Artificial Intelligence in public services. doi:10.2760/039619

24 Timan, T. Van Veestra A.F. Bodea, G. (2021). Artificial Intelligence and public services. European Parliamant – Briefing requested by the AIDA committee. PE 662.936 – July 2021

25 OECD (2022). Harnessing The Power of AI and Emerging Technologies. Background Paper for the CDEP Ministerial Meeting. OECD Digital Economy Papers. November 2022 No. 340.

26 European Commission (2018). Artificial Intelligence – A European Perspective.

27 OECD (2022). Harnessing The Power of AI and Emerging Technologies. Background Paper for the CDEP Ministerial Meeting. OECD Digital Economy Papers. November 2022 No. 340.

28 OECD. (2019). Hello, World: Artificial Intelligence and its use in the Public Sector. In OECD Working Papers on Public Governance (Issue 36). https://doi.org/10.1787/726fd39d-en

29 European Commission – JRC (2020). AI Watch – Artificial Intelligence in public services. doi:10.2760/039619

3.1.1 Overview

The proposal for an AI Act seeks to create a common approach to AI regulation at EU level to prevent Member States to put forward pieces of legislation that could hamper the functioning of the single market. It follows that EU national frameworks on AI mainly rely on EU countries' strategies and dedicated national infrastructures. At present, 24 EU Member States published an AI strategy, with four of them having it updated once (i.e. Finland, France, Sweden and Cyprus). Interestingly, while some EU countries (e.g. Greece, Denmark) outline their strategic approach to AI as part of a broader approaches to digital transformation and thus as chapters/sub-chapters of their digital agendas, others (e.g. Italy, Portugal) published these reports as standalone documents. The European Commission has recently published a report[30] including a throughout analysis of the 24 available strategies, identifying six areas of policy initiatives:

Figure 7 Main policy areas of AI strategies

Source: Author's own elaboration

Several strategies highlight the need of further developing national AI infrastructures (e.g., big data and high-performance computing) to foster the development and uptake of this technology (e.g., Estonia and Czechia). It is worth noting that some countries (e.g. Belgium) adopted regional AI strategies that outline practical actions to support companies at the local level through the use of awareness raising measures and training activities.

Within their strategies and related action plans, EU countries put forward complementary efforts to develop their national framework of reference around AI. In this regard, notable initiatives include: the setup of national centres and ethical commissions. For instance, the Croatian Centre for Artificial Intelligence (CAI) contributes to the theoretical foundations of AI, accounting for areas related to AI development, such as machine learning, natural language processing, IoT, bioinformatics and cybersecurity. Concerning partnerships with the private sector, Luxembourg launched an AI partnership with NVIDIA, a global pioneer in AI technology and Graphics Processing Unit (GPU) computing. Lastly, in Spain, the Royal Decree-Law No. 9/2021 on algorithms, artificial intelligence and employees' rights, introduced the right of workers councils to be informed by the company about the parameters, rules, and instructions on which the algorithms and AI systems base their decision-making, influencing the working conditions, access to, and maintenance of employment, including profiling.

The results of the BDM show that Member States mainly use European and national levels to share good practices for the development of successful human-centric AI systems. From KPI 34 presented in Figure 8 below emerges that more than a third of respondents have well-established process at EU or national level (i.e. eight out of 23 at European level and nine out of 27 at national). Conversely, few Member States possess well-established processes at sub-national level (i.e. four out of 24).

Figure 8 KPI 34: Extent to which Member States have processes in place to ensure the sharing of good practices on the development of successful human-centric AI systems at European, National and Sub-national level

Source: 2022 Berlin Declaration Monitoring results

3.1.2 Best practices

For the purpose of this report, three categories of best practices have been identified: (i) applications and use cases; (ii) knowledge creation and sharing; (iii) financing and funding.

Application and use cases

Applications and use cases concern all these initiatives that resulted in the development of AI solutions used by public administrations at national level. In these cases, national and local administrations used the technology in an innovative manner with the objective of providing better services to their relevant stakeholders:

In the **Netherlands,** the municipality of Amsterdam is increasingly using AI and [algorithmic systems](#) to improve the efficiency of public services. For instance, the municipality performs parking checks with scan cars equipped with cameras, allowing to automate the process of license plate identification and verification thanks to the help of an AI-based.

In **Italy,** the National Social Insurance Agency implemented a [AI solution](#) for the automatic transmission of certified e-mail communications (PEC), relying on cognitive analysis techniques of non-structured texts. data they leverage on.

Knowledge creation and sharing

Several EU countries undertook initiatives aimed at fostering knowledge creation and sharing by developing partnerships and network building actions targeting the private sector and academia in order to facilitate information sharing within their stakeholder ecosystem.

Austria launched an [AI marketplace](#) to promote synergies between providers of AI solutions and Austrian companies. This marketplace provides a quick and easy overview of the Austrian AI-provider landscape, thus connecting them with potential customers, and introduces Austrian companies to the topic

Belgium setup [AI4Belgium](#) as the national knowledge community for AI. The community brings together AI actors from the public and private sectors, as well as from academia and civil society.

Financing and funding

While less common than other types of initiatives, some EU countries put forward funding initiatives with the objective of increasing the development of AI solutions at national level.

Aiming to assess the challenges and opportunities in the context of AI and human right, the Technology Agency of the **Czechia** has funded an [interdisciplinary research project](#) involving a team of international law and human rights law experts, AI and IT experts, as well as Czech and EU law specialists named "AI and human rights: risks, opportunities and regulation".

The Agency for Digital Government, Local Government **Denmark** and Danish Regions established an investment fund to foster the uptake of new technologies at national level for the period of 2019 – 2022. The fund supported 40 "Signature Projects" using AI. The projects were conducted locally in different public sector entities that for a large part procured AI-solutions from private suppliers. Two evaluations assessed the progress of the projects, namely (i) [Knowledge Assessment of Projects of the Danish National Artificial Intelligence Uptake Fund;](#) and (ii) [Status on the Signature Projects 2022.](#)

3.1.3 Challenges and areas for improvement

Following the abundant literature on the matter[31], it is possible to broadly identify four groups of challenges linked to use of AI in the public sector: (i) ethical, concerning discriminatory behaviours and different values of the technology; (ii) regulatory, attaining to liability and privacy; (iii) societal, regarding the acceptance by the workforce of the organisation as well as the public; and (iv) technological, linking AI with the organisational settings (i.e. technology in use, skills of the employees).

Figure 9 Overview of AI challenges
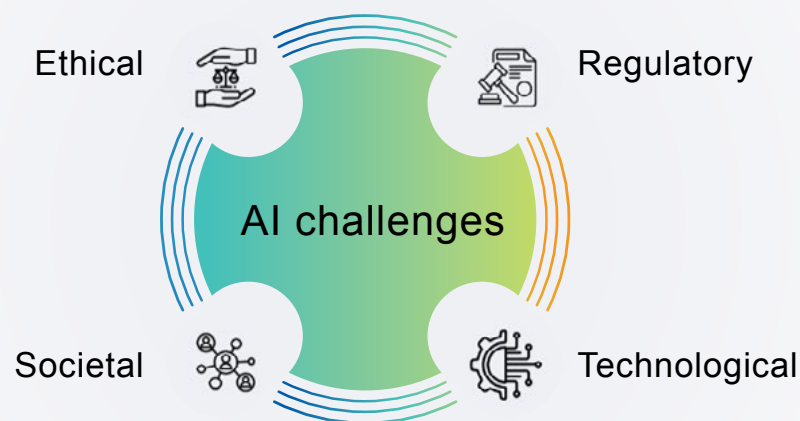
Source: Author's own elaboration

Ethical and regulatory concerns become particularly relevant in public sector settings where the inherent characterising of AI (e.g. opacity, complexity, data dependency) are under closers citizen' scrutiny compared to the private sector. In turn, administrations at all levels are more reluctant to initiate AI-related projects due the uncertainty of socially desirable outcomes [32] [33]. **Societal challenges** are equally relevant in public settings. For instance, an obstacle is often found in the low organisational commitment of administrations towards the adoption of AI technologies. Particularly, research on AI adoption at municipal level highlighted that the development of AI has more to do with 'human processes' than 'technical processes[34]. Particularly, the re-engineering of organisational processes and structures together with scarce acceptance and lack of skills among the staff represent primary concerns in public administration settings. In this regard, the role of the governments becomes of critical importance in funding and incentivising innovation through ad-hoc trainings and knowledge sharing that can foster organization-wide readiness in AI deployment[35].

31   Here adopting the classification based on: Wirtz, W. et al (2019). Artificial Intelligence and the Public Sector—Applications and Challenges. Volume: 42, Issue: 7, Pages: 596 - 615

32   European Commission (2022). AI Watch – European Landscape on the Use of Artificial Intelligence by the Public Sector. doi:10.2760/39336

33   Engin, Z. Treleaven, P. (2018). Algorithmic Government: Automating Public Services and Supporting Civil Servants in using Data Science Technologies. The British Computer Society. doi:10.1093/comjnl/bxy082

34   Andreasson, U. and Stende, T. (2019). Nordic municipalities' work with artificial intelligence. Nordic Council of Ministers. http://doi.org/10.6027/NO2019-062

35   Mikalef, P., Lemmer, K., Schaefer, C., Ylinen, M., Fjørtoft, S. O., Torvatn, H. Y., Gupta, M., & Niehaves, B. (2021). Enabling AI capabilities in government agencies: A study of determinants for European municipalities. Government Information Quarterly,

Following the stakeholder consultation activities, EU countries consider **technological challenges** such as the lack of competences and skills within and outside the public administration as the main issue related to the uptake of AI solutions in the public sector. In fact, while the human resources currently working in national administrations lack of the technical expertise to enable a smoother update of AI technologies, public administrations struggle fill in this gap as they cannot find the necessary skills on the job market. Furthermore, public administrations find themselves in dealing with technological challenges. Particularly, whereas some of these challenges are common to the uptake of other digital technologies, others are specific to the characteristics of AI. Regarding the former, national representatives highlight the absence of knowledge-sharing platforms, channels, and solutions where to find up-to-date information that can foster the information spill overs across administrations. The AI-specific challenges concern, for instance, the underdevelopment of language recognition and synthesis technologies. The language barrier represents a significant obstacle to exploiting AI's benefits. In this regard, some EU countries (e.g. Lithuania) are planning to invest to allow scientific and business organizations to improve the Lithuanian language AI-systems and services and adapt to, among others, scientific, cultural, and educational needs, optimising language research.

Moreover, other challenges pointed out by EU countries attain: (i) the relatively low 'success rate' of AI projects leading to public administrations' reluctance to take excessive risks; (ii) the scarce engagement of relevant stakeholders for the designing human-centric and ethical AI solutions; and (iii) the bureaucratic barriers in data collection and processing.

The European Union is one of the key players in AI regulation. Starting with the EP's Resolution on Civil Law Rules on Robotics and the more recent EU's Ethics Guidelines for Trustworthy AI, the EU adopted a proactive and innovative approach when regulating AI. Within these two initiatives, the EC put forward the European AI Strategy which sought to make the EU a hub for AI while guaranteeing a human-centric and trustworthy approach to the technology. Particularly, the strategy aimed to: (i) develop the technological and industrial capacity of the EU, while fostering the uptake of AI by the private and public sectors; (ii) modernize the education and training systems, ultimately supporting labour market transition; and (iii) define the ethical and legal framework on the basis of EU values and in line with the Charter of Fundamental Rights.

Within this context, the EC appointed a group of experts to provide technical and policy advice on its strategy. The High-level expert group on AI (AI HLEG) became a pillar for the development of EC approach to AI and contributed to the shaping of all the most recent initiatives. Particularly, the EC recently proposed a 'first of a kind' piece of legislation on AI (i.e. AI Act), addressing the risks brought forward by the use of this technology through a risk-based approach that introduces requirements for developers, deployers and users. While recognising that most AI applications pose limited or no risk to their users, the AI Act aims to limit the risks posed by other application that generate considerable danger not only to the individual using them but rather to the EU economy and society at large. It follows, that the objective of AI Act is to ensure that Europeans can trust the technology regardless of the level of risk associated to its use. The AI Act represents only a component of the broader Coordinated Plan on AI. The plan aims at guaranteeing the safety and the respect of fundamental rights of people and businesses using AI, while fostering the development and uptake of this technology across the EU.

3.2 GovTech

The increasing use and development of innovative technologies like AI offers great opportunities to transform and modernise public administrations' processes and the delivery of public services, as well as their interactions with citizens. However, to grasp all potential opportunities of the adoption of these technologies, a profound digital transformation of the public sector is required and comes with challenges and risks. In addition to mastering the technology, public administrations need to work on transforming organisational culture, improving processes, and stakeholder engagement to create public value. To do so, governments are looking towards the world of start-ups and SMEs for providing products and services for new, creative and innovative solutions, more agile ways of working, and for having more choices beyond the offers of established large IT (service) providers.[36] This specific approach, named GovTech, is gaining traction among EU Member States, with a wave of new programmes and accelerators launched at national, regional, and local levels in the last few years.

In the scope of this report, the term GovTech refers to the use of emerging technologies and digital products and services by government from start-ups and SMEs - instead of relying on large system integrators – to innovate and improve public services and their delivery.[37]

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36   Kuziemski, M., Mergel, I., Ulrich, P. and Martinez, A., GovTech Practices in the EU, EUR 30985 EN, Publications Office of the European Union, Luxembourg, 2022, ISBN 978-92-76-47234-6, doi:10.2760/74735, JRC128247.

37 Kuziemski, M., Mergel, I., Ulrich, P. and Martinez, A., GovTech Practices in the EU, EUR 30985 EN, Publications Office of the European Union, Luxembourg, 2022, ISBN 978-92-76-47234-6, doi:10.2760/74735, JRC128247.

3.2.1   Overview

In Europe, the GovTech ecosystem includes a wide variety of public and private organisations: incubators and accelerators, Digital Innovation Labs, public sector organisations, national, regional and local communities, think tanks, academia and research centres, SMEs and start-ups, as well as public sector ICT providers.[38] To develop their use of GovTech, several European countries included GovTech within their national AI or digitalisation strategies (such as France and Hungary), while others established specific GovTech strategies and programmes.[39] These programmes can include various activities (Figure 10). Among these activities, multiple pilot projects, often taking the form of GovTech Labs, have been established by EU countries.

Figure 10 Activities included in GovTech programmes
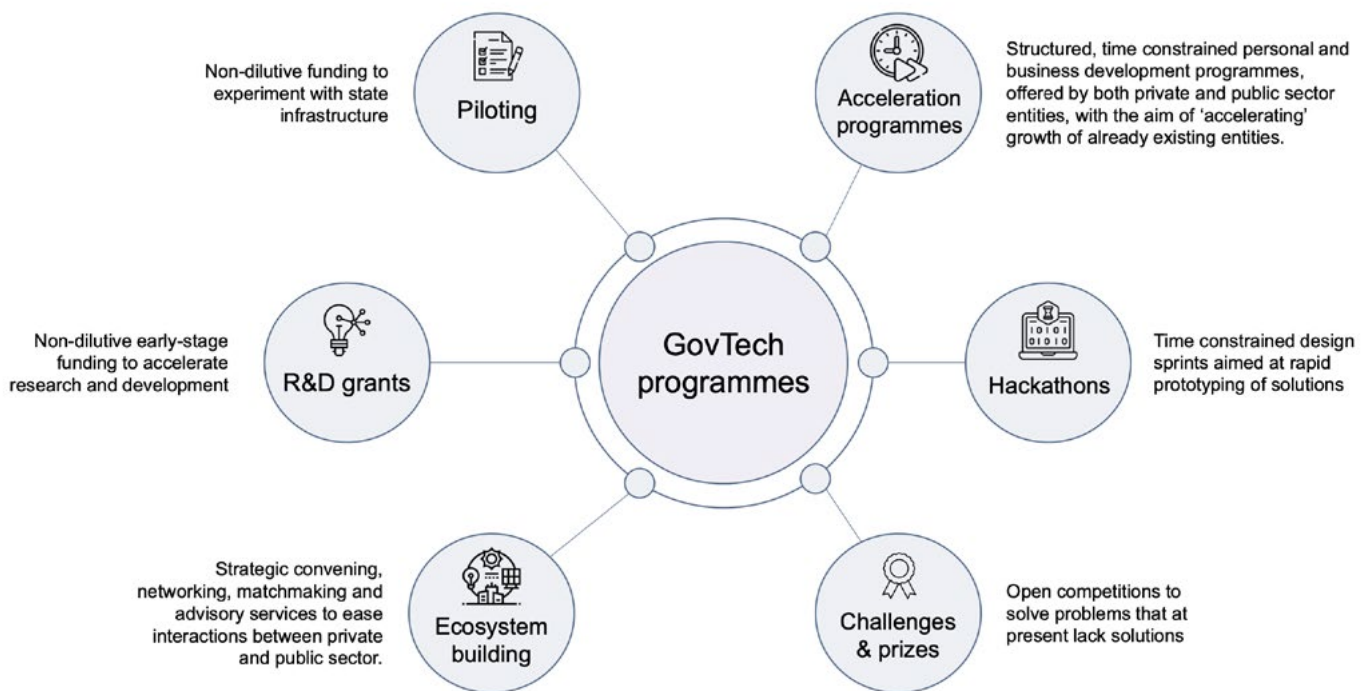
Source: Based on the 'GovTech Practices in the EU' report

In addition, more targeted measures can be adopted, fostering GovTech through procurement or focusing on specific sectors (e.g., the Portuguese Justice Govtech Strategy).

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38 https://joinup.ec.europa.eu/collection/govtechconnect/catalogue-govtech-initiatives

39 Ibid.

3.2.2 Best practices

The European GovTech ecosystem varies in its maturity level and adopts a wide range of tools and practices that may be shared, transformed, and reused or adapted in other countries or at different levels of government. When developing new support mechanisms and programmes, it is important to recognise existing practices and focus resources on areas where Member States have strategic advantages in providing access to infrastructure, covering regulatory risks at an early stage, incorporating incentives into their funding mechanisms, or fostering peer learning networks.[40] Based on the analysis of the DPA factsheets, two main best practices have been identified:

Adopting agile procurement models

New procurement models or methods are adopted by public administrations to improve innovation in procurement and to strengthen market opportunities for SMEs to better use tech solutions to improve public services.

In **Iceland**, technical solutions are not defined within public tenders, which only define strict quality and technical requirements for the members of the bidding teams. Instead of financing the development of specific solutions, Digital Iceland is financing teams to solve digital challenges using an agile methodology.

In **France**, the "Public Startups" model allows public administrations to take entrepreneurial risks when developing new digital services, while mitigating financial risks. This model allows public administrations to build ICT products in collaboration with private business stakeholders, by iterating rapidly and asking for direct feedback from stakeholders after each iteration. The cost of developing digital services using this methodology has proved to be considerably lower than using traditional methodologies (such as the waterfall methodology).

Building a GovTech ecosystem and community

Specific infrastructures such as GovTech Labs, hubs, campus and sandboxes are being set up at national, regional and local level to foster innovation, experimentation and the development of a GovTech ecosystem within EU countries. Building a GovTech ecosystem is essential to increase co-creation and develop a strong community of start-ups and the public sector eager to cooperate.

In **Belgium**, the Flanders region created Sandbox Flanders to provide an environment where civil servants can experiment safely with digital products and technologies. Their goal is to embed a sustainable innovation culture within the Flemish government by collaborating with start-ups and SMEs, and to create a GovTech ecosystem of Flemish start-ups and SMEs that can design and build innovative digital solutions for public services.

In **Lithuania**, the GovTech Lab was established in 2019 to identify challenges and to engage startups and SMEs to find innovative digital solutions. The initiative strengthens public-private collaboration and promotes the use of innovative services in the public sector.

3.2.3 Challenges and areas for improvement

Engaging with GovTech comes with its own set of unique challenges for public administrations. Among those challenges are the **divergence between the organisational culture of the public and private sector**, **complex procurement processes** that can discourage smaller stakeholders from engaging with the public sector, and **unique market dynamics** that differ significantly from other innovative areas such as FinTech. In addition to these challenges, the **lack of digital skills and literacy of public servants** and the difficulty to create an active and participative GovTech community also appears as limiting factors.

Figure 11 Main GovTech challenges
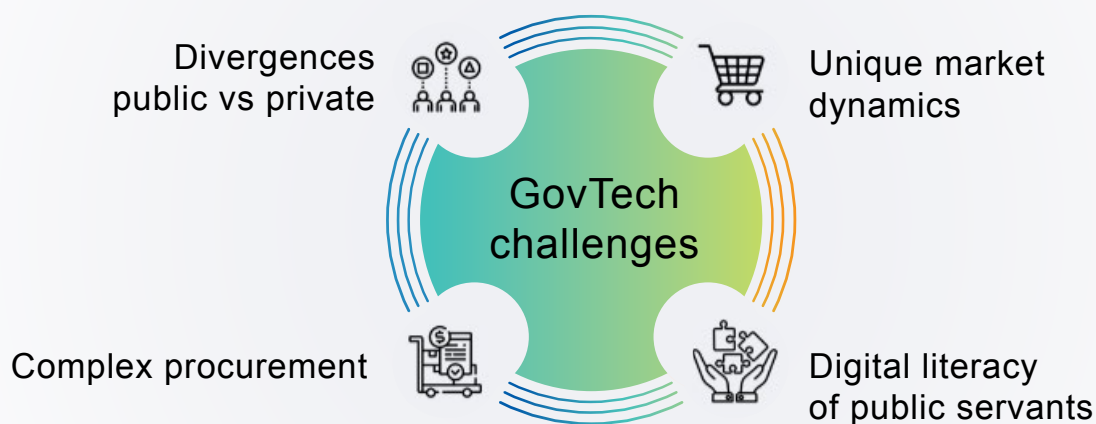
Source: Author's own elaboration

With regard to public procurement in particular, the current process is not designed to enable innovation in public procurement, or to include the creation of innovations resulting from procurement processes. At the same time, the modernisation of government organisations requires innovative technologies and risky innovations, for which little or no expertise is often available within public institutions or on the market.[41]

To address those challenges and to reap the benefits of engaging with smaller and innovative tech providers, governments have started setting up dedicated **GovTech programmes**[42]. However, the emerging landscape of European GovTech programmes is quite heterogeneous. As mentioned in the previous section, the growing number of national and local GovTech programmes are coming in different shapes and sizes, but sharing common problems related vendor lock-in, procurement, and legacy IT infrastructure[43]. To counter these common challenges, public administrations should encourage interregional and international cooperation, the sharing of experiences and the reuse of digital solutions.

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41   Mergel, I., Ulrich, P., Kuziemski, M. and Martinez, A., Scoping GovTech dynamics in the EU, EUR 30979 EN, Publications Office of the European Union, Luxembourg, 2022, ISBN 978-92-76-47059-5, doi:10.2760/700544, JRC128093.

42   Kuziemski, M., Mergel, I., Ulrich, P. and Martinez, A., GovTech Practices in the EU, EUR 30985 EN, Publications Office of the European Union, Luxembourg, 2022, ISBN 978-92-76-47234-6, doi:10.2760/74735, JRC128247.

43   Kuziemski, M., Mergel, I., Ulrich, P. and Martinez, A., GovTech Practices in the EU, EUR 30985 EN, Publications Office of the European Union, Luxembourg, 2022, ISBN 978-92-76-47234-6, doi:10.2760/74735, JRC128247.

As part of the Digital Europe Work Programme for 2021-2022, the European Commission launched a pilot project "Govtech4all", introducing the GovTech ecosystem to the European public sector. The pilot project includes the creation of an European GovTech Incubator, which will foster the deployment of a cross-border collaboration between actors of the GovTech. This new initiative, which is still in development, will promote the deployment of new human-centric digital public services, promote innovative digital governments reusable solutions (preferably open-source) and interoperability by default, increase the collaboration through piloting activities in a variable scale geometry and encourage the participation of European SMEs/startups.

In addition, the proposal for an Interoperable Europe Act also places strong emphasis on fostering a GovTech ecosystem to support public sector innovation and promote use of interoperability tools across private and public sector partners. The Act recognises the pivotal role of GovTech in achieving a digital public sector that is effective and strategic.

"Innovative technologies represent core pillars for the digital transformation of the public sector, but context remains key!"

Marina Manzoni

The Study Team performed a semi-structured interview with Marina Manzoni, Policy Officer at the Joint Research Center of the European Commission, with the objective of investigating the state of the art in relation to the **innovative use of technologies** by the public sector (i.e. Artificial Intelligence and GovTech) within the EU, understanding their main benefits and challenges linked with their uptake in public sector settings. The interview highlighted the importance of AI and GovTech as key drivers for the digitalisation path of national public administrations across the EU.

What are the main benefits and challenges related to the development and uptake of AI applications in the public sector?

When assessing the benefits and the challenges linked with the use of AI solutions, particularly in public sector settings, the context of adoption and the intended purpose are of paramount importance. In fact, the ultimate objective of the public sector is "create value" for society as a whole and thus, it would be wrong to automatically apply the same instruments, methodologies and principles that fostered the uptake of AI in private/business contexts. Among the key benefits, AI helps public administration tot: (i) increase the capacity for information gathering and processing (e.g. data collection and elaboration in urban mobility and planning); (ii) contribute to the efficiency of digital public services (e.g. time reduction for similar tasks); (iii) manage bureaucratic, low-added value activities entailing repetitive operations while requiring a certain level of autonomy. On the other hand, the development and uptake of AI presents several challenges, such as the possibility of algorithmic bias, the risks privacy breaches and/or infringements, algorithm opacity and lack of transparency, possible job loss, and damage to the environment. Regarding the bias of algorithm, it becomes particularly relevant in law enforcement and taxation settings. For instance, in 2013, applications for childcare allowance submitted by Dutch families to the tax administration were checked by a self-learning machine algorithm. The algorithm was intended, among others, to flag the relative risk of fraud for an individual application. However, the algorithm was disproportionately flagging foreign-born individuals' and ethnic minority applications as fraudulent. The pace of the misfiring fraud classification was so fast that the human overseers were quickly swamped and resorted to simply accepting a fraud risk flag as a fraud flag. More than 20 000 families were charged with fraud and forced to pay back benefits, without appeal.

How do you envisage the impact that the AI Act will have regarding the development of AI in the EU in the coming years? And what is the EU level currently doing to further complement it?

The AI Act represents a major change in the EU approach to artificial intelligence, but the national implementation of this new EU piece of legislation will be of paramount importance to ensure its effectiveness. In this regard, EU Member States will need to transpose the law into their national legislative framework accounting for their national, regional, local specificities. Against this background, the European Commission is currently developing an EU AI package which goes beyond the AI act and that foresees the use of regulatory sandboxing to create environments to test regulations into real world simulated conditions to assess the applicability, the impacts, the challenges, and areas for improvement related to legislative initiatives. On the other hand, to simplify the adoption of new regulations, Member States should foster digital-ready policymaking by leveraging, for instance, on the network of Digital Innovation Hubs dedicated to the public sector which would help local authorities (e.g., municipalities), to transpose EU regulations into the local level by considering their specific needs. In this sense, the AI Act cannot act as a stand-alone solution and for it to achieve its objectives and the desired impact it should rather considered together with several supporting measures.

What are the main benefits and challenges related to the development and uptake of GovTech approaches to the public sector modernisation?

The SMEs/Start-ups are often more agile, adaptive, and innovative than bigger companies in answering procurers' needs, including in terms of interoperability requirements. Nevertheless, they struggle to cope with the costs associated with bureaucratic and time-consuming procurement processes set up by public administration. For this reason, public administrations streamline their public procurement processes to render them more attractive and sustainable for SMEs and start-ups with guarantying the continuity and coherence of their public procurement systems). In this regard, AI can be applied to improve public procurement processes to the benefit of both SMEs and public administrations. For instance, AI can be applied to GovTech processes and activities for the alignment of EU/National to local Regulation (IOA, AI Act, Data Act, GDPR, etc.), for the use of automated text management (writing, checking, searching, etc.) and multiple language texts and guidelines (multilingual ontologies), for the identification of funding applications/solutions and to detect frauds.

What would be the right GovTech approach (i.e. national vs local level) to intervene in the market, experimenting successful collaborations with the private sector?

The interventions should happen first at national level. However, all national, regional and local levels should be involved to create a cascade impact, with references to the alignment of regulations through experimentation and contextualisation. This is the only way to implement measures in a coherent, consistent and sustainable way. In addition, clear guidelines on the uptake of regulations as well as for the implementation of GovTech activities need to be developed at EU level which are user-friendly and relevant to all GovTech actor's needs (e.g. public administrations business and citizens needs). As for the deployment of AI in GovTech processes, mutual learning initiatives should be promoted through regulatory sandboxes initiatives and the use of Digital Innovation hubs dedicated to the public sectors.

The European GovTech incubator, by adapting existing solutions to comply with cross-border interoperability requirements, will make a difference and the results stemming from their Pilots will represent examples to be followed. For this to happen, there is a need to work around common requirements and technical specifications identified through and with Member States and experiment with GovTech stakeholders in the respective countries. In this respect, the main role of the incubator is to develop, test and disseminate the common requirements and technical specifications put forward by the MSs. By carrying out these underpinning activities the incubator will indeed bear a positively impact on interoperability uptake and the reuse of innovative solutions in Europe.

4 Data sharing
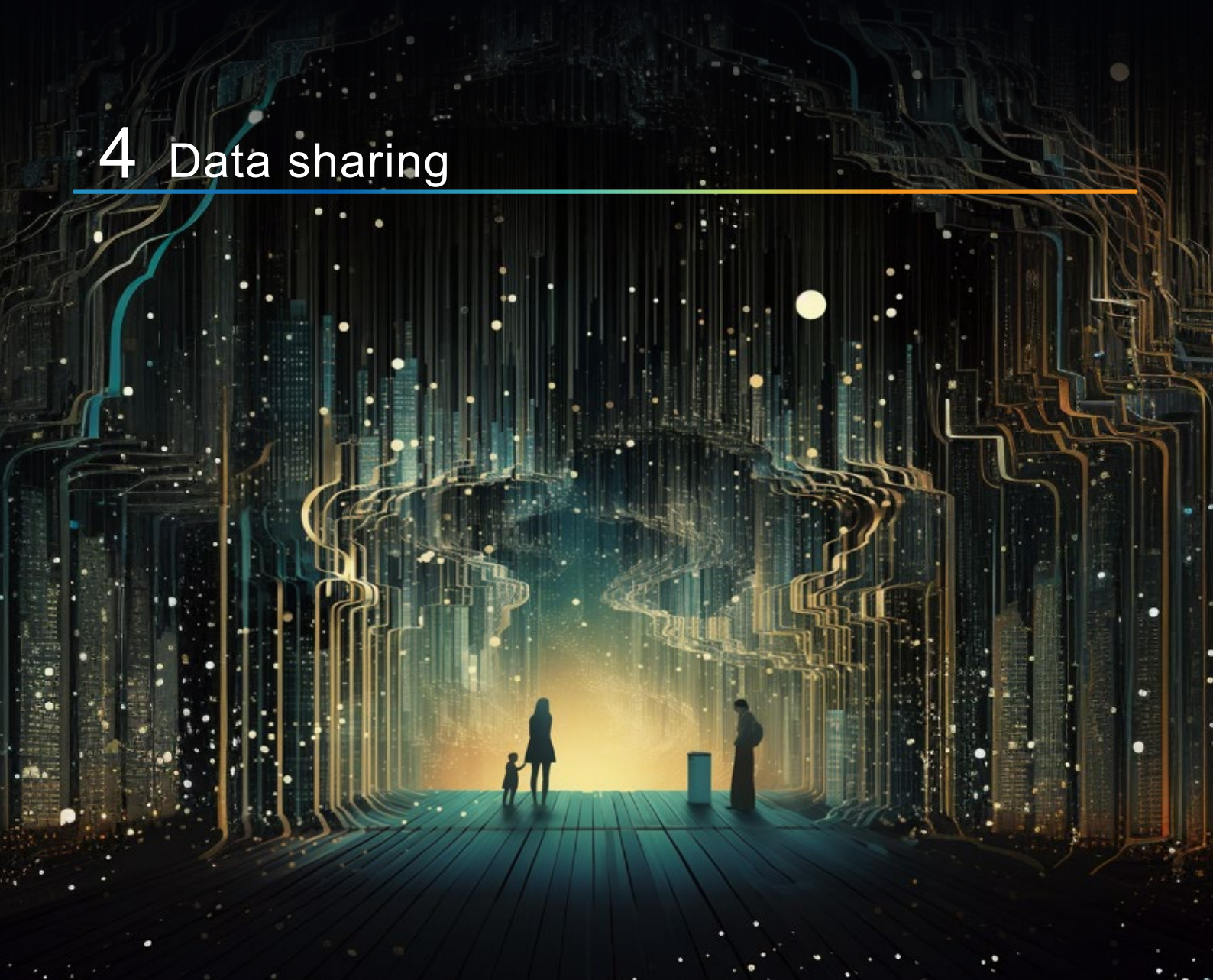
Over the last few years, digital technologies have transformed the economy and society, affecting all sectors of activity and the daily lives of all Europeans. Data and data-driven innovation is at the centre of this transformation. Indeed, data is an essential resource for economic growth, competitiveness, innovation, job creation and societal progress.[44] As ever-increasing amounts of data are generated, the way data is collected, shared and used by the public sector should be citizen-centred and respect European values, fundamental rights and rules. According to the [European Strategy for data](#), citizens will only trust and embrace data-driven innovations if personal data sharing in the EU is subject to full compliance with strict data protection rules.[45] Effective and appropriate data sharing will improve services to citizens and data quality, support research and development and assist data driven decision-making. Whilst data sharing can bring benefits in terms of efficiency in the public services delivery, it must be done in a way that assures individuals that their personal data is treated with respect, only shared where necessary and in accordance with law.

To pursue this objective, EU public administrations have developed innovative ways to share data, mostly through the creation of new advanced data infrastructures, in alignment with national (open) data strategies and their digitalisation efforts. To provide insights on this topic, this third chapter will look into two specific facets of data sharing, appearing as key aspects of this topic: the creation of data spaces and smart data platforms, and the exchange of information within public administrations.

44 European strategy for data
45 European strategy for data

4.1   Data spaces and smart/urban data platforms

Through various policy and funding instruments such as, among others, the [Digital Decade Policy Programme 2030](#) and the [Digital Europe Programme](#), the EU is supporting the digital transformation of local, regional and national public entities to fully leverage the benefits that digital tools and data sharing can bring to society. More specifically, two types of initiatives are gaining traction within EU counties with the common objective of fostering data sharing: the establishment of **data spaces** and **smart data platforms**. Their development takes place against a backdrop of emerging governance challenges and opportunities in response to the rise of data-driven services, including the open government agenda and the notion of 'government as a platform[46], the rise of smart cities, which emphasises data-driven approaches to city challenges, and the growing importance of real time, data-driven performance metrics.[47]

First, **data spaces** bring together relevant data infrastructures and governance frameworks to facilitate data pooling and sharing, and consequently have the potential to improve the transparency and accountability of public authorities by making data more readily available and accessible to the public. The development

of data spaces can enable public authorities to reap the benefits of the digital transformation and leverage the full potential of data. Data spaces are shared digital tools and infrastructures aiming at overcoming legal and technical barriers to data sharing and addressing issues of trust by way of common rules.[48] More concretely, by providing a centralised and standardised platform for the collection, storage, and analysis of data, data spaces can help improve the quality and timeliness of regulatory reporting and support better decision-making for public services delivery.

In addition to data spaces, **smart and urban data platforms**[49] have multiplied in recent years, as governments explore new approaches to the visualisation and use of data in multiple formats.[50] Urban data platforms can reveal data relevant to a city or region's operation via simple data visualisation, widgets and analytics. Some can also provide dynamic and interactive graphics, maps, and 3D models to display information about the performance, structure, pattern and trends of cities and regions. The way these platforms are designed by public administrations to make data available to users can also vary considerably, as illustrated in the next section.[51]

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46 Government as a Platform' models of digital era governance, sometimes known as 'Government 2.0′, encourage external users, whether citizens, software developers, or other businesses, to co-design government digital services. Governments, facilitating access to government data in open, machine-readable formats, can in turn encourage wider digital innovation.

47 Barns, S. (2018). Smart cities and urban data platforms: Designing interfaces for smart governance. City, Culture and Society, 12, 5–12. doi:10.1016/j.ccs.2017.09.006

48 European Strategy for Data, Available here: https://digital-strategy.ec.europa.eu/en/policies/strategy-data

49 These platforms can also be named "smart data platforms". The urban data platforms refer to smart data platforms established at local or regional level.

50 Barns, S. (2018). Smart cities and urban data platforms: Designing interfaces for smart governance. City, Culture and Society, 12, 5–12. doi:10.1016/j.ccs.2017.09.006
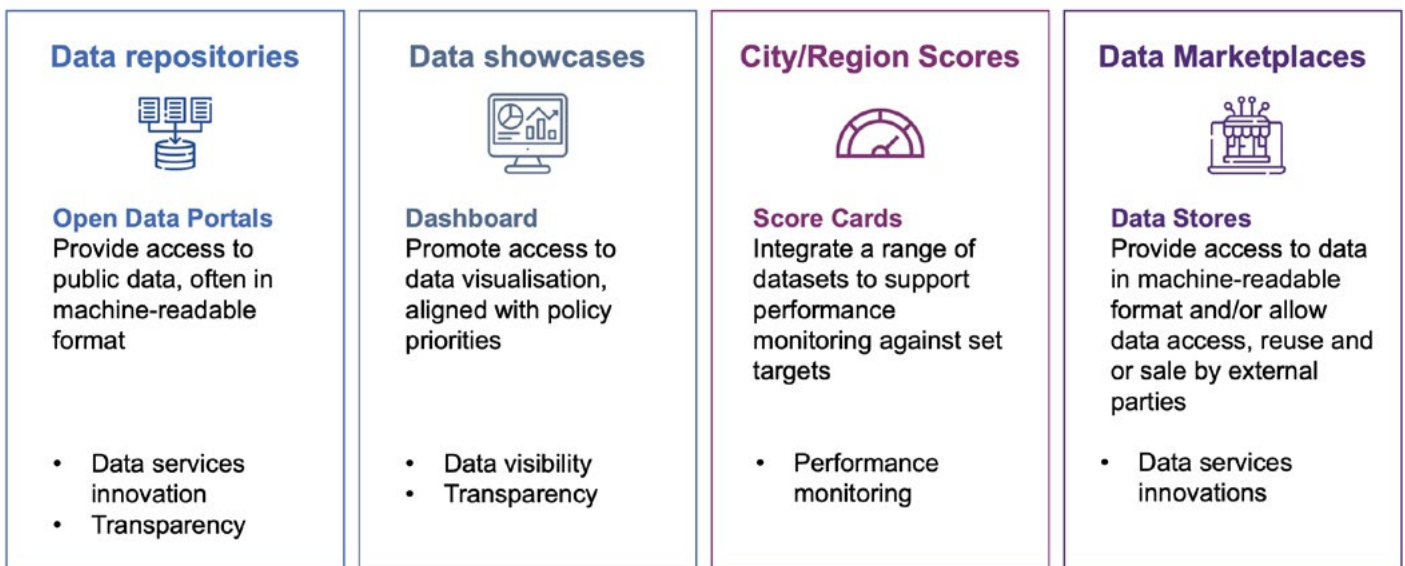
51 Ibid.

4.1.1 Overview

In the last five years, multiple EU countries have started developing or are still currently developing data spaces and smart or urban data platforms, mostly at sub-national level in the context of local, regional and national smart city or/and digital strategies.

Most of the current applications of **data spaces** includes the creation of **regional or local data spaces** (e.g., Spain, Belgium) focused either on urban data, often linked to mobility or natural resources and energy consumption or on personal data, with the creation of decentralised data spaces based on the SOLID specification or other forms of human-centric use of personal data (MyData). In addition to the data spaces established at national or sub-national level, EU countries are also supporting the establishment of **European Common Data Spaces** through multi-countries European collaboration to establish common roadmaps and develop communities of practice around their development, as well as pilot projects and use cases.

Regarding **smart data platforms (SDP)**, diverse applications have been put in place by EU countries, including **data repositories** (e.g., open data portal), **data showcase** (e.g., city dashboard), **city scores** and **data marketplaces/stores** (cf. Figure 13). The most common type of initiatives adopted by EU countries are open data portals, both at national and sub-national level.

Figure 12 Key features of urban data platforms

Data repositories	Data showcases	City/Region Scores	Data Marketplaces
Open Data Portals Provide access to public data, often in machine-readable format	**Dashboard** Promote access to data visualisation, aligned with policy priorities	**Score Cards** Integrate a range of datasets to support performance monitoring against set targets	**Data Stores** Provide access to data in machine-readable format and/or allow data access, reuse and or sale by external parties
• Data services innovation • Transparency	• Data visibility • Transparency	• Performance monitoring	• Data services innovations

Source: Key applications of urban data platforms[52]

52 Barns, S. (2018). Smart cities and urban data platforms: Designing interfaces for smart governance. City, Culture and Society, 12, 5–12. doi:10.1016/j.ccs.2017.09.006

4.1.2 Best practices

The establishment of successful data spaces and smart data platforms is often led by similar good practices, including a level of interoperability (e.g., principles, solutions) and the adoption of strict data sharing rules. As outlined in the section above, European countries seem to be focusing on strategic sectors, such as mobility, with the broader goal of overcoming possible technical barriers to data sharing and underlining the importance of data-driven innovation. As the development of such initiatives is still ongoing, the section will include good examples, rather than best practices, on both types of data infrastructures.

Data spaces

Several European countries are developing data spaces at national level, often in the context of pilot projects within the European Common Data Spaces development. These data spaces focus on specific sectors, with the aim to bring together companies, organisations and institutions in the creation of these new innovative infrastructures. Furthermore, other data spaces have emerged at the local and regional level across Europe.

Germany has put emphasis on mobility by creating a Mobility Data Space (MDS), which is funded by the Federal Ministry of Digital and Transport and is organised on private enterprise lines and used for the voluntary exchange and trading of data. The goal of the MDS is to make mobility more eco- and user-friendly, safer, and fairer.

Slovenia has been involved in the Data Space for Skills (DS4Skills) which, in the framework of the Digital Europe programme, aims to prepare the ground for the development of an open and trusted European Data Space for Skills that supports sharing and accessing skills data. Indeed, Germany's MDS and Slovenia's DS4Skills are among the first important implementation projects in Gaia-X, the European data infrastructure.

The city of Valencia in **Spain**, for example, has put forward an initiative to manage public space and urban mobility for specific groups. More specifically, through the use of sensors installed on public roads, the project wants to inform stakeholders about the real-time status of each free-occupied space; from the municipal level, an analysis tool has been developed to identify improvements in the global mobility and inappropriate use of public space, thus facilitating activities for these groups.

Smart data platforms

According to the Living-in.EU, EU countries are benefitting most from smart data platforms when those are 'open', meaning that these platforms use open standards and interfaces to guarantee compatibility and interoperability with other systems and platforms. In fact, open smart data platforms enable public administrations to customise the platform according to their needs, to avoid vendor lock-in, to share data with third parties and connect services and data more easily as well as provide better digital services to their citizens at lesser costs.[53] Indeed, interoperability is a crucial feature of the underlying data platforms, as only linking the data from a wide range of different open and closed sources can lead to a valid, comprehensive and consistent database that is suitable for the development of various applications.[54]

The **Italian** Yucca Smart Data Platform is an open and collaborative platform available to private and public entities, providing tools to experiment and create innovative data-related technology solutions. The system aggregates data from the Internet of Things (e.g. cameras, sensors, weather stations), the Internet of People (e.g., tweets). It provides for selective sharing of collected information, enables self-service processing of data in real-time and advanced data analysis tools, and supports the exposure of information (data and metadata) via APIs. The platform provides functionality to

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53 Living-in.EU (Undated). Available at : https://living-in.eu/groups/solutions/urban-data-platform

54 Towards Interoperability of Smart City Data Platforms, available online: https://pdfs.semanticscholar.org/7a8d/7a15df4cf3545c52a57f1ea48816086e3e09.pdf?_gl=1*1wty0ap*_ga*NTUwMDc4NDIyLjE2Nzc3NTU0MjY.*_

create new value-added information and enables the creation of end-to-end solutions on a variety of topics. It is currently adopted by five public administrations namely the Piemonte Region, the Metropolitan City of Turin, Turin, ARPA Piemonte and CSP.

Czechia's Hradec Králové Region has deployed a data portal which represents an information point for the public from publicly available and open data. The data is processed into user-friendly formats and transmitted transparently to the public in the form of infographics, overviews, statistical as well as map outputs and data cards. The city of Prague also has developed the Golemio Prague Data Platform which focuses on city data processing and analysis, data-based web creation and open data community development.

Estonia and Finland launched the X-Road platform which is based on an automated data exchange between the two countries' national population registers. Relevant information that can be accessed include name changes, deaths and changes of address, among others. The platform aims to improve information accuracy and timeliness as well as increase the efficiency and security of the data exchange process.

4.1.3 Challenges and areas for improvement

Establishing data spaces and smart data platforms can encompass multiple challenges, linked to the development of these infrastructures and the necessity to share and manage data.

Figure 13 Main challenges of the establishment of data spaces and smart data platforms

Source: Author's own

Public administrations can encounter difficulties to **share and use data** due to multiple factors, including stakeholders' fear to provide or open data, the lack of efficiency in data collections, the absence of a data governance framework and different data qualities. In addition, EU countries can also face **insufficient awareness on data-driven decision making** and the benefits of implementing smart city projects, as well as **difficulties to engage stakeholders** (e.g., motivation to open data), which can be accentuated by a decentralised management of public sector organisations. Indeed, the willingness to exchange data requires an understanding of its added value for all, political will and trust between the different parties involved. In addition, the lack of skills or resources within public administrations (e.g., efforts, time, budget) can hinder the development of data spaces and smart data platforms. Finally, the **lack of interoperability** also appears as a key challenge to develop these infrastructures for public authorities.

Regarding data spaces specifically, EU countries can also have a hard time defining and scaling data spaces.

Through the European Strategy for Data, the Commission aims at creating a single market for data that will ensure Europe's global competitiveness and data sovereignty. These objectives also are in line with the Digital Europe Programme which is designed to bridge the gap between digital technology research and market deployment. As part of its data strategy, the Commission also has proposed a Regulation on European Data Governance, whose objective is to foster the availability of data for use by increasing trust in data intermediaries and by strengthening data-sharing mechanisms across the EU. The proposal is designed to help individuals exercise their rights under the General Data Protection Regulation as well as the ePrivacy Directive. Furthermore, the data strategy is reinforced by the proposal for the Data Act, which represents a key measure for making more data available for use in line with EU rules and values.

In this context, the data strategy sees the establishment of European Common Data Spaces which will guarantee that more data becomes available for use in the economy and society, while leaving control to businesses and citizens over the data they produce. European Data Spaces will also be central to enabling AI techniques and supporting the marketplace for cloud and edge-based services. Nine different spaces have been established: health; industrial & manufacturing; agriculture; finance; mobility; green deal; energy; public administration; and skills.

There can be found several pilot projects at the EU level aimed at promoting the creation of data spaces and platforms. For instance, Gaia-X develops, based on EU values, a digital governance that can be applied to any existing cloud/edge technology stack to obtain transparency, controllability, portability and interoperability across data and services. Similarly, Open DEI focuses on creating platforms and pilots to support the implementation of digital platforms in manufacturing, agriculture, energy, and healthcare. Some networks also exist. Another example is the Living-in.EU which promotes efforts through a 'European Way' to create digital solutions accessible to everyone.

4.2 Data exchange within public administrations

Public administrations are constantly facing new challenges to deliver more efficient and effective digital public services, driven by the evolving technologies and new digital strategies. To face these challenges, improving the flow of information between public administrations can be ensured by the implementation of an interoperability framework, a clear data governance and secure data exchanges and the interconnection of public registries and repositories. The interoperability of base registries is also key for the development of the Single Digital Gateway, a system that aims to be the single point of access for public services, facilitating digital public services among public administrations and citizens. Parallelly, public administrations are adopting customer-centric approaches and readjusting their ways of working to provide quick and user-friendly public services. One way to achieve efficiency and increase user-friendliness is through the 'Once-Only Principle' (OOP), meaning that public administrations will reuse the information they already have instead of asking the citizen for information that they have already provided.[55]

55 https://ec.europa.eu/isa2/sites/isa/files/publications/access-to-base-registries-good-practices-on-building-successful-interconnections-

4.2.1 Overview

To foster Government-to-Government (G2G) data exchanges, EU countries developed a wide variety of initiatives, including policies, legislations, and IT infrastructures. At policy level, EU countries have adopted general or sectorial guidelines on G2G data exchanges within their digital transformation or data strategies, with the aim to align them with the European strategies and directives (such as the European Data Strategy). In addition, multiple EU countries adopted a national interoperability framework and additional measures to facilitate the reuse of information, such as the enforcement of the Once-Only principle and the creation of new base registries.

Figure 14 show that the majority of European countries have established multiple base registries to make data accessible by public services.

Figure 14 KPI 26: Percentages of European countries making the five majors Base Registries available for reuse in digital public services
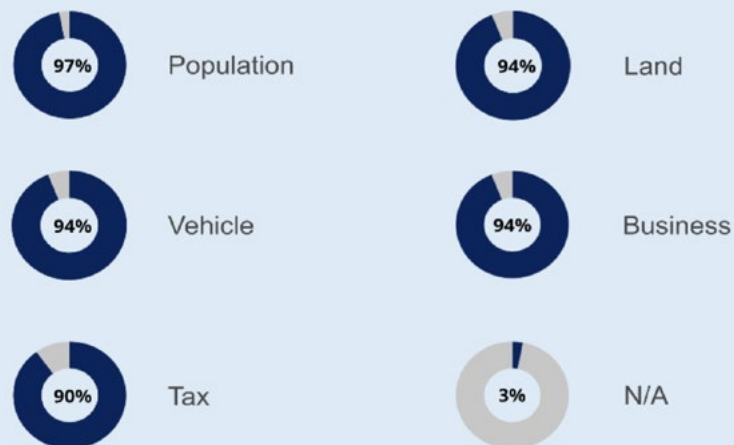
Source: 2022 EIF MM results

Furthermore, G2G data exchange is defined and facilitated by legislations on open data and data reuse, on the free access to information, on interoperability, and on the interconnection of state information systems and other digital infrastructures, which can include base registries and public repositories.

EU countries have put efforts to develop IT infrastructures to develop secure and efficient data ecosystems, allowing them to exchange data between departments and public organisations. These infrastructures can be of diverse natures: **national data (semantic) catalogues**, aiming to standardise shared data models and ensure that the format and meaning of the information exchanged is preserved and understood across exchanges, as well as **interoperability platforms**, **Government Service Bus (GSB)** and **central information/data exchange systems** to establish service-oriented and standardised connection between national base registries and different public administration information systems, through the unification of the communication methods. The implementation of these infrastructures can be accompanied by supporting measures to increase connectivity and data management, such as the establishment of Government clouds.

4.2.2 Best practices

While developing the initiatives mentioned in the previous section already constitutes essential steps in the right direction, some EU countries go even further to facilitate G2G data sharing. Two best practices have been identified through the analysis of the DPA factsheets:

Creation of playbook, toolbox and agreement templates on G2G data sharing

To support data sharing between public administrations, several EU countries created playbooks, toolbox and other guiding documents, such as data sharing agreement template, to guide public administrations when sharing data within the public sector.

In 2021, **Ireland** published the Data Sharing Playbook, a flowchart that navigates the stages of data sharing along with the definition of the roles and responsibilities. The stages are sequential and must be followed to adhere to the Data Sharing Governance Framework. A draft Data Sharing Agreement Template was piloted and is now in its Model format in accordance with the Data Sharing and Governance Act 2019 (DSGA). The format will be adapted again in the future to improve data flow and the use of Plain English.

The **Norwegian** Resource Centre for Sharing and Use of Data was established in September 2020, as part of the Norwegian Digitalisation Agency. It promotes data sharing and reuse by disseminating knowledge about relevant regulations, contributing to an efficient and user-oriented public sector. One key resource of the centre is the toolbox for data sharing, launched in January 2021. The toolbox provides an overview of all agreements, solutions, standards, architectures, regulatory support and guidelines for roles and responsibilities that are relevant when sharing data within the public sector and beyond.

Fostering the interconnexion of base registries

Multiple EU countries, such as Hungary, Ukraine and Spain, have established infrastructures allowing the interconnexion of different base registries at national level[56].

The **Hungarian** Central Governmental Service Bus (KKSZB) was established to ensure a service-oriented and standardized connection between the national base registries and the different specific public administration information systems. As an interoperability platform, the KKSZB connects systems with different technological, operational and integration levels and reduce redundant data storage and data-integrity errors resulting from this practice. In addition, it ensures secure data exchange of authentic data among the public administrative authorities.

In **Spain**, base registries developed at local, regional and national level are interconnected via the Intermediation Platform. In constant expansion, the platform allows any administration to consult 130 certificates offered by more than 45 data providers. The software libraries developed by the platform can be used as part of the integration software to facilitate the connection of base registries to the platform.

Based on the Estonian interaction system X-Road, **Ukraine** launched its National Interaction system TREMBITA in 2020, providing access to the information contained in national base registries. As of March 2023, 185 public authorities and organisations have joined the TREMBITA system and 79 state electronic information resources have been registered.

4.2.3 Challenges and areas for improvement

Improving data flows between public administrations comes with a series of challenges, which can be both similar to the challenges on data sharing mentioned in the previous section on data spaces and smart data platforms, and more specific to the data exchanges between public administrations.

Figure 15 Main challenges of data sharing within public administrations
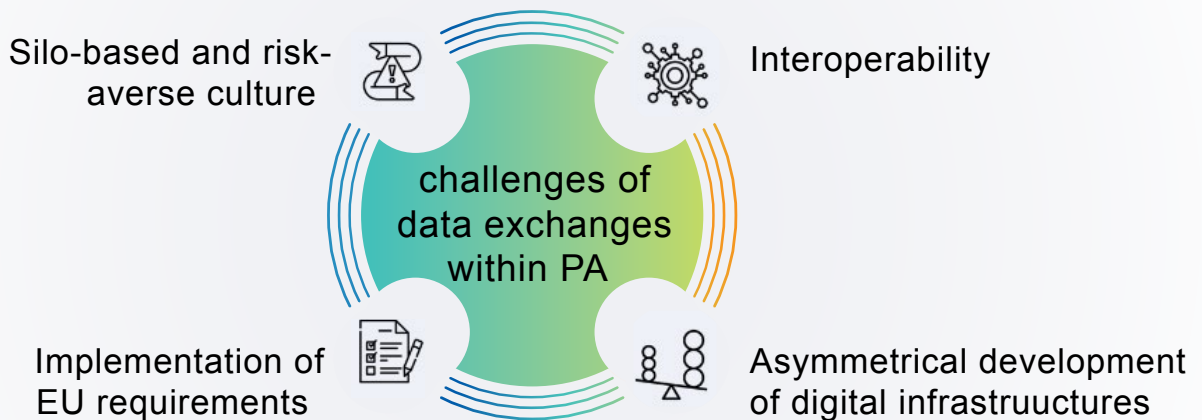
Source: Author's own

Challenges can be found at all levels of **interoperability** (legal, technical, semantic, etc.), as well as in the adoption of commonly agreed interoperability frameworks. Additionally, the **implementation of EU requirements** stemming from the transposition of the European Data Governance Act and the Directive on open data and the re-use of public sector information can be challenging for some EU countries, creating administrative complexity or the necessity to transform their internal data governance. G2G data exchanges can be hampered by a **silo-based and risk-averse culture**, where the incentive structure does not take into account that the gains accrue to data consumers, and the costs fall on data providers in the short term. Data sharing is also characterised by a large degree of voluntarism and soft law, often missing a holistic approach. Furthermore, the **asymmetrical development of digital systems and infrastructures** pertaining to different

departments or ministries, as well as digital maturity, can pose difficulties to interconnecting them. Linked to this last challenge, the need for cross-cutting testing data to be used when developing new digital solutions was also identified as a challenge for public authorities. Individual agencies may be able to create duplicates or synthetic versions of their own data, but it can be difficult to test the interaction effects that can arise when data from other sources comes into play.

Regarding the **interconnection of base registries**, the main challenges, among others, include data duplications, differences in definitions and data models, the existence of data silos not connected to each other (resulting in shadow registers), and flaws in data management. In addition, building successful interconnections of base registries requires to ensure that the solutions in place are flexible and capable of

adapting to changes, whether planned, organised or deriving by exogenous factors connected to changes in the legal or political framework or in the available budget.[57]

To **face these challenges**, public administrations can strive to ensure that data are provided together with any required meta-data, documentation, data models and algorithms in a transparent and timely manner, supported by appropriate data access control mechanisms, including application programming interfaces (APIs). In addition, public administrations should assess and, whenever possible, promote the development and adoption of interoperable specifications for all public organisations for effective data access, sharing, and use, including common standards for data formats and models as well as open source implementations.[58]

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57 More information on challenges linked to the interconnection of base registries can be found here.

58 https://legalinstruments.oecd.org/en/instruments/OECD-LEGAL-0463

In the last eight years, the European Commission adopted a series of initiatives to improve data sharing within public administrations, both at national and sub-national level.

Following the path created by the Digital Single Market Strategy, the Tallinn Declaration, the Single Digital Gateway, the Open Data Directive and the European Interoperability Framework, interoperable data sharing has been at the centre of the European strategies, focusing on the adoption of the Once-Only Principle, the reuse of information, the interconnexion of base registries and open data.

More recently, the European Commission adopted the Data Act in February 2022 to develop legislative measures on data governance, access and reuse and make data more widely available by opening up high-value publicly held datasets across the EU. In addition, the European Governance Act, which entered into force in June 2023 and will be applicable from September 2023, will facilitate the reuse of certain public sector data that cannot be made available as open data. In more practical terms, the Act will, for instance, introduce technical requirements for the public sector on security and confidentiality for reused data. By promoting a higher level of public sector interoperability, the Interoperable Europe Act will also positively impact the establishment of a solid public sector connection and G2G data flows. Interoperability across different sectors is crucial, as many public services use data from different policy domains. In this sense, integrated public services will lead to more personalised and proactive public services.

Seth van Hooland

The Study Team performed a semi-structured interview with Seth van Hooland, Programme Manager at the Interoperability Unit (DG DIGIT), to investigating the state of the art on data sharing within the EU, diving into the impact of the European Data Act and the Governance Act on national public administrations and the creation of data spaces. The interview highlighted the importance of data sharing and semantic interoperability, considered as key drivers of the establishment of the future European Data Market.

How will the European Data Act impact public administrations processes and the delivery of public services in Europe?

On one hand, the Data Governance Act defines how the public sector should publish data through data spaces. On the other, the European Data Act builds on top of Data Governance Act, focusing on what value can be derived out of those data and how this value will be defined and produced. A good example is regulatory reporting. On this topic, the act will facilitate and regulate business-to-government (B2G) data sharing, by clarifying under which conditions data from citizens and the public sector can be reused.

How will the creation of European Common Data Spaces impact data sharing and data interoperability in Europe in the coming years?

The creation of a space for data will steer data sharing towards that space. In practice, the exchange of data will happen in a "many-to-one" modality, meaning that instead of having more parties agreeing on what becoming interoperable entails, these parties will be able to speak through a single reference point: the space in which they are contributing. The data space, acting as a single point of contact, will reduce the public administration's workload to become interoperable by facilitating the exchange among the contributing parties. In this sense, a common European Common data space will be functional to interoperability. The provision of data will be on a voluntary basis. Indeed, it will be on the national authorities to decide whether they see contributing to the European Common Data Space as a priority and whether it should be included in the national agenda or not.

What are the current main challenges faced by public authorities when fostering interoperability?

The main challenge is that there is no common semantics. When describing data and trying to give them meaning, public entities use names and properties attached to the interpretation of the data. Different entities use different semantics, meaning that the overlap of semantics, when making comparisons, is only partial as they have been developed independently over time. To counter this challenge, different public entities should align themselves to become semantically interoperable.

What would be your main recommendations for Member States willing to implement interoperable and human-centred data spaces?

My main recommendation would be to foster the adoption of common standards based on the domain of the data, or in other words, to be semantically aligned. Then, legal and technical agreements should be achieved to better foster interoperability. From a long-term perspective, re-modelling the data is much more difficult than changing standards and starting from scratch. It is therefore a priority to invest more in the present with a long-term vision in mind, for instance in the education of the public sector based on success stories.

5 Conclusion: Charting the path ahead

By providing a snapshot of the developments and achievements of European countries and the European Commission in the fields of interoperability and interoperable digital public services, the innovative use of technologies by the public sector and data sharing in Europe, the report shows that, the adoption of specific initiatives has effectively supported progress in these policy areas. This overview is further complemented by the results of the 2022 data collection on the implementation of the European Interoperability Framework (EIF) by the 31 European countries under the scope of the study.

Looking at the main findings emerging from the report, a symbiotic relationship is discernible between interoperability, innovative technologies and data sharing, forming a dynamic ecosystem that fuels the progress of digital public administration in Europe, and in turns its digital transition. Interoperability acts as the backbone of such an ecosystem, facilitating seamless connectivity and collaboration between diverse systems and services within and across national borders. By doing so, it lays the foundations for the integration of innovative technologies, such as AI, and the establishment and development of GovTech ecosystems, which enable public sectors to innovate, improve service delivery and streamline operations while encouraging citizen engagement. The use and implementation of these technologies is further enhanced by effective data sharing practices and infrastructures, which enable public administrations to harness the power of shared knowledge while ensuring data privacy and security. Consequently, it appears that fostering interoperability, while championing innovative technologies and data sharing allows European countries to boost their digital governance strategies, paving the way for a new era of efficient, citizen-centric and data-driven public services.

At the European level, the European Commission is also consistently playing a crucial role to promote interoperability, data sharing and the innovative use of technologies within EU countries. The EU's approach to these topics involves comprehensive frameworks, regulations, funding programmes, and collaboration initiatives. As mentioned in the previous sections of this report, the European Commission has proposed a new regulation, the Interoperable Europe Act (IEA), designed to address the challenges of interoperability in the public sector, such as the lack of common standards, the fragmentation of systems and the lack of trust between public administrations. The IEA would support Member States to ensure that public administrations across the EU can exchange data and services seamlessly, which would improve the efficiency and effectiveness of public services. The IEA would not only establish a common set of principles for interoperability, such as openness, security, privacy and accessibility, but it would require public administrations to use interoperable solutions whenever possible, creating a new framework for the exchange of data and services between public administrations.

Annex 1 Most recent initiatives at national level on digital public administration throughout Europe

This section provides a high-level overview of the main thematic trends emerging from the analysis of the initiatives (from 2022-2023) put in place by European countries to address various aspects of digital public administrations. More specifically, the 2023 edition of the Digital Public Administration factsheets has been leveraged to identify the most recurrent themes among the new initiatives put in place at national level, considered as common trends on interoperability and digital public services across Europe. An overview of the most recurrent thematic trends is available in the figure below (Figure 16).

Figure 16 - Main thematic trends per category identified in the 2023 Digital Public Administration factsheets

Digital transformation of public administrations

Digital strategies, action plans, legislations and other initiatives aiming to modernise and digitalise public administrations

/ Data management

/ Modernisation/digitalisation of internal processes

/ Transparency and access to information

Digital public services and digital inclusion

Initiatives that provide digital services which respond and meet citizens' digital preferences and needs

/ eHealth, eJustice and eTax

/ Digitalisation of social security and welfare

/ Digital skills and digital education

Trust and security

Initiatives ensuring that citizens and businessesare able to rely on trustworthy and verifiable digital government applications and services, conforming to European standards

/ Cybersecurity

/ eID

Digital sovereignty and interoperability

Initiatives that create the right conditions in Europe to develop and deploy secure and interoperable digital capacities

/ Open data

/ Reuse of information andOnce-Only principle

/ Data sharing between public administrations

Innovative technologies in the public sector

Emerging Disruptive Technologies (EDT) initiatives and opportunities that Member States are promoting and investing on.

/ AI (inc. sandboxing)

/ GovTech

/ HPC and quantum technologies

/ Cloud

Source: 2023 Digital Public Administration factsheets, analysed by Wavestone, July 2023.

Annex 2 Most recent results regarding the implementation of interoperability throughout Europe

This section provides a high-level overview of the performance of the 35 European countries included in the assessment of the implementation of the European Interoperability Framework (EIF). More specifically, the 2022 level of implementation of the EIF in Europe is analysed to identify potential trends across Europe and the results compared with the ones from 2021.

5.1 EIF and its monitoring mechanism

In March 2017, a revised EIF was adopted as part of the European Commission's Communication on Interoperability. This revised version of the EIF was accompanied by the Interoperability Action Plan (IAP) supporting its implementation. As mentioned in Section 1.1, the EIF is designed as a generic and non-binding framework applicable to all public administrations in the EU. Its objective is to spur and guide European public administrations in their efforts to design and deliver seamless European public services through 47 recommendations, organised in three pillars:

- The 12 interoperability principles, which are fundamental behavioural aspects aimed at guiding European policymakers in their pursuit of interoperability.

- The 4+2 layers of interoperability, which present the different aspects of interoperability that should be addressed in the design of European public services and are considered an integral element of the interoperability-by-design paradigm.

- The conceptual model, which is aligned with the interoperability principles and is meant to set a common standard and approach to the design and delivery of integrated public services. This model is modular and comprises loosely coupled service components interconnected through shared infrastructure.

The monitoring, evaluation and reporting of the implementation of the 47 recommendations of the EIF are ensured by an integrated framework created by the European Commission: the EIF Monitoring Mechanism (EIF MM).

This mechanism was developed and is maintained within the remit of the National Interoperability Framework Observatory (NIFO) action, which is part of Interoperable Europe, the successor of the ISA² programme. This mechanism provides each European country with its level of implementation of the EIF based on a recommendation-by-recommendation basis. The resulting level of implementation is derived from the aggregation of the data of one or more key performance indicators (KPIs). This data helps European countries identify the areas in which their performance could be improved, as well as the areas in which they are performing well, with the results at the EU level as a benchmark. The results obtained for each of the 47 recommendations are then clustered under three scoreboards, based on the three abovementioned pillars, namely the interoperability principles, the interoperability layers and the EIF conceptual model for integrated public services provision.

Considering the 2021 edition of the EIF Monitoring Mechanism and the willingness to improve it, Member States have expressed the need to collect insights on the cross-border dimension.

The EIF does not directly cover this aspect within its recommendations, thus, the European Commission aimed at expanding the scope of the EIF MM to take into consideration the needs and expectations of the Member States. The additional cross-border interoperability scoreboard follows the structure of the other scoreboards, namely by mirroring the thematic areas and recommendations described by the EIF framework and attributing specific KPIs to each of them to assess their level of implementation. The cross-border interoperability scoreboard is a fourth, additional and transversal scoreboard to the "initial" ones. The scoring mechanism, for all scoreboards, is based on a scale from 1 to 4, the latter being the highest score[59].

This assessment relies on a data collection exercise which depends, on the one hand, on primary indicators, collected through an online survey disseminated to national contact points and, on the other hand, on secondary indicators, collected from external data sources, such as the Open Data Portal, Digital Economy and Society Index (DESI) and other EU initiatives.

59 More information on the EIF monitoring mechanism is available here.

5.2 Overview of the performance of European countries in the field of interoperability

This section provides a global overview of the 2022 European countries' performance for each pillar of the EIF and compares it to the 2021 results. Additionally, the results of the EIF monitoring mechanism of 2022 are analysed by looking at the distribution of scores at recommendation level.

The implementation of the interoperability principles in Europe – Scoreboard 1

Figure 17 presents the 2022 and 2021 results of the implementation of the interoperability principles at the EU level.

Figure 17 European results of the implementation of the interoperability principles, 2022 vs 2021
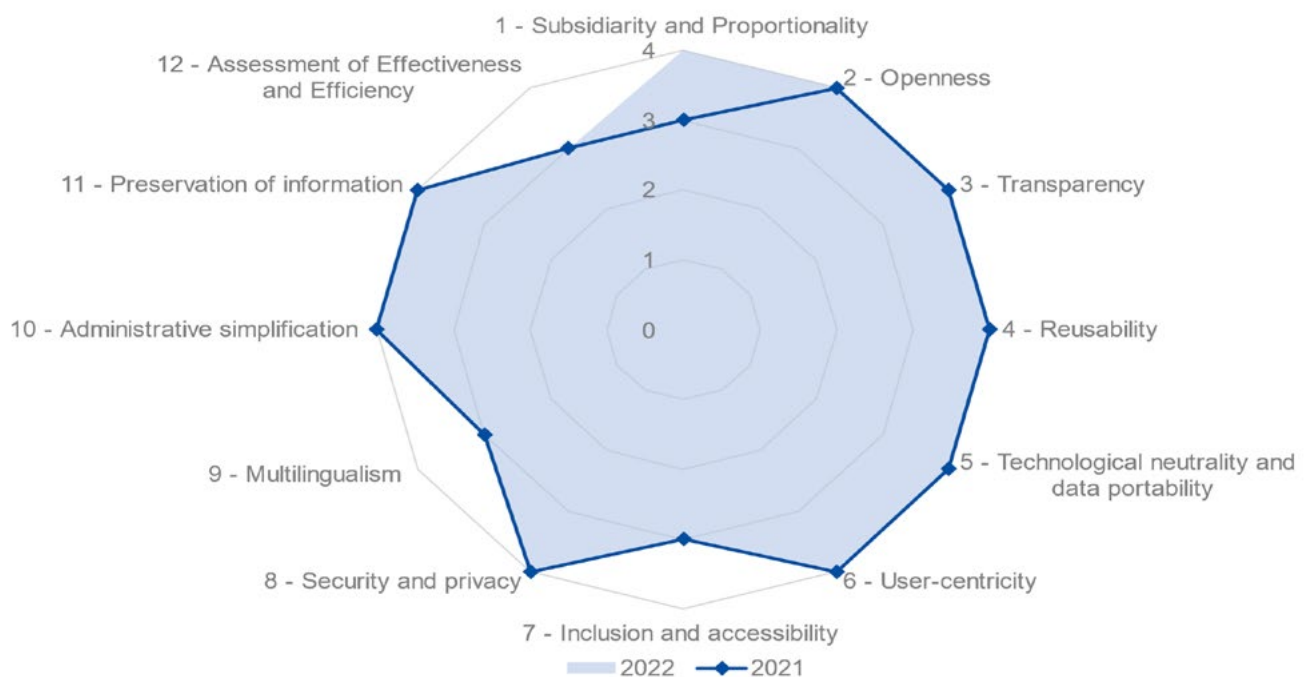
Source: Analysis performed by Wavestone, 2022

For the first pillar of the EIF, the overall results for 2022 show that, on average, European countries have improved their level of implementation of the Interoperability Principle 1 – Subsidiarity and Proportionality, compared to 2021, reaching the maximum score of 4. Instead, the results regarding the interoperability principles of Inclusion and Accessibility (Principle 7), Multilingualism (Principle 9) and Assessment of effectiveness and efficiency (Principle 12), are the same as for the previous edition of the EIF monitoring mechanism, therefore still representing potential areas for improvement.

Figure 18 Distribution of the results of the implementation of the interoperability principles of European countries, 2022

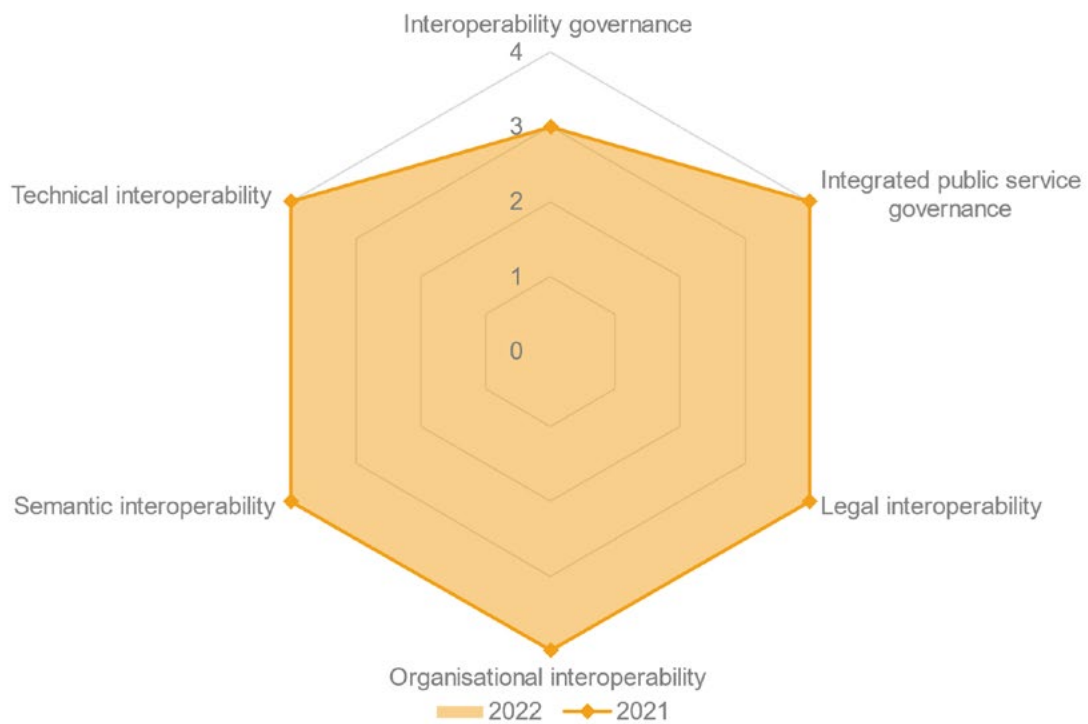*Source: Analysis performed by Wavestone, 2022*

To present a clearer picture of the specific areas countries could focus on to improve their performance, Figure 18 provides an overview of the distribution of the results at recommendation level for the first scoreboard. It can be noticed that, as anticipated above, the main areas for improvement are under the principles where the EU average is 3. In particular, these concern (1) ensuring that all European public services are accessible to all citizens (Recommendation 14), (2) the use of information systems and technical architectures that cater for multilingualism when establishing a European public service (Recommendation 16) and (3) the evaluation of the effectiveness and efficiency of different interoperability solutions and technological options considering user needs, proportionality and balance between costs and benefits (Recommendation 19).

Moreover, additional areas for improvement could also be identified under those principles that have 4 as EU average. As a matter of fact, there are cases in which different recommendations are embedded in one principle and can therefore influence the median value used as aggregated score. For instance, the majority of European countries still show potential improvement in ensuring data portability (Recommendation 9), scoring 3 out of 4, yet the average score at EU level of principle 5 is 4. This is due to the counterbalance effect of recommendation 8 where 29 countries have reached the maximum score of 4.

The implementation of the interoperability layers in Europe – Scoreboard 2

Figure 19 presents the 2022 and 2021 results of the monitoring of the implementation for the **interoperability layers** of the EIF.

Figure 19 European results of the implementation of the interoperability layers, 2022 vs 2021

Source: Analysis performed by Wavestone, 2022

For this second pillar, the 2022 results show that, on average, European countries are scoring maximum points in all interoperability layers except for the "interoperability governance" one. These scores are similar to those of 2021.

Figure 20 Distribution of the results of the implementation of the interoperability layers of European countries, 2022
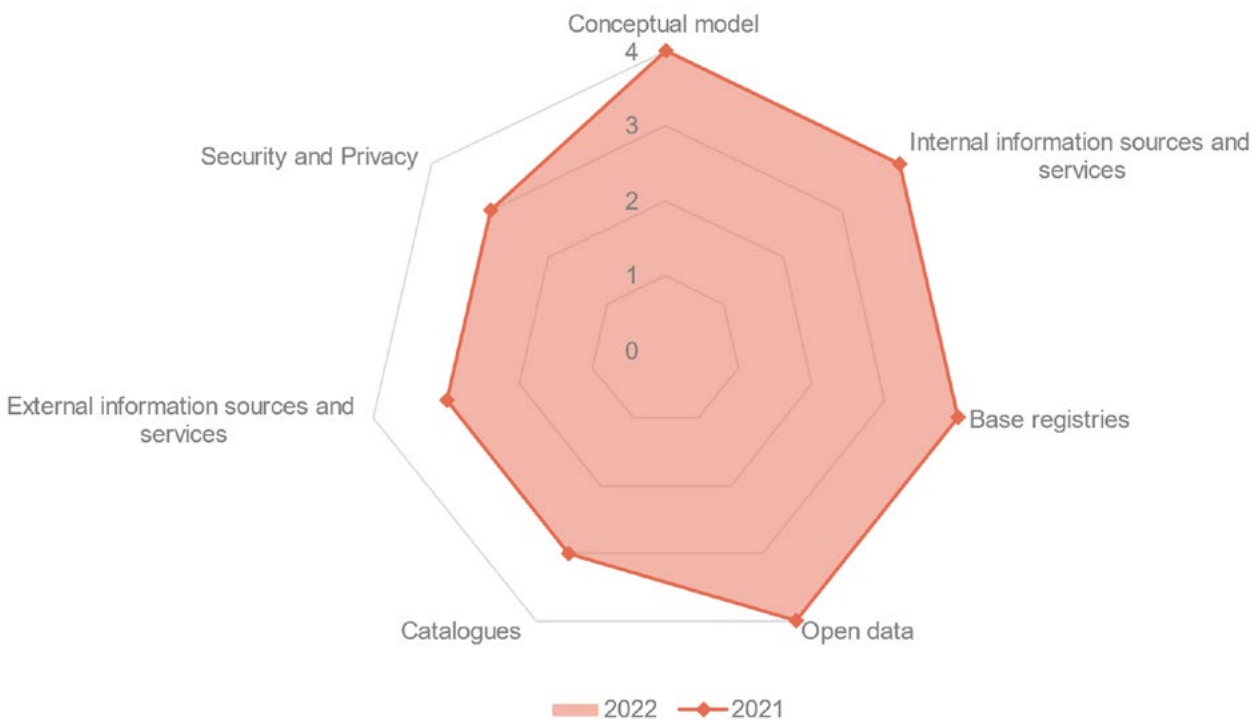
Source: Analysis performed by Wavestone, 2022

Figure 20 shows European countries' level of implementation of each EIF recommendation, for the second scoreboard. Consulting relevant catalogues of standards, specifications and guidelines at national and EU level when procuring and developing ICT solutions (Recommendation 23), participating in standardisation works (Recommendation 24), and clarifying the organisational relationships for establishing and operating European public services (Recommendation 29) are the areas in which Member States should keep focusing their efforts to improve their respective scores.

Figure 21 depicts the 2022 and 2021 results of the monitoring of the implementation for the conceptual model pillar of the EIF.

Figure 21 Conceptual model European results, 2022 vs 2021

Source: Analysis performed by Wavestone, 2022

For this third pillar, similarly to 2021, the 2022 results show that, on average, European countries are scoring maximum points in four of the EIF conceptual model's components. These results demonstrate the countries' dedication to further enhance data reuse, access, and openness, which are fundamental drivers for interoperability. Instead, there is still room for improvement concerning (1) the setting up of catalogues for European public services, (2) the use of external information sources and services while developing public services and ultimately, (3) the assurance that security and privacy matters are adequately considered when providing public services. Overall, compared to the first two scoreboards, scoreboard 3 show lower results. This is due to the fact that scoreboards 1 and 2 are more theoretical while the third one encompasses more concrete elements to be deployed.

Source: Analysis performed by Wavestone, 2022

When looking more particularly at the distribution of the 2022 results for the third scoreboard, see Figure 22, it appears that three recommendations of the EIF conceptual model would require additional improvements, namely the extent to which countries (1) put in place catalogues of public services, public data, and interoperability solutions and use common models for describing them (Recommendation 44), (2) use external information sources and services while developing European public services (Recommendation 45) and (3) use trust services according to the Regulation on eID and Trust Services as mechanisms that ensure secure and protected data exchange in public services (Recommendation 47). On the latter, it is worth noticing that ten countries have a score of 1, which is the highest number of countries with such score. the highest number of countries with such score.

Cross-border interoperability in Europe – Scoreboard 4

Figure 23 presents the 2022 results of the fourth scoreboard of the EIF monitoring mechanism, on the European level of cross-border interoperability.

Figure 23 European results of the level of Cross-border Interoperability, 2022

Source: Analysis performed by Wavestone, 2022

The overall 2022 results of the fourth scoreboard show that European countries could improve their level of cross-border interoperability by focusing on initiatives concerning (1) Inclusion and accessibility (Principle 7), (2) Multilingualism (Principle 9), (3) Administrative simplification (Principle 10), (4) Interoperability governance and (6) Security and Privacy.

Figure 24 Distribution of results of the level of Cross-border Interoperability in European countries, 2022[60]

Source: Analysis performed by Wavestone, 2022

Figure 22 Conceptual model distribution of results, 2022

Figure 24 shows European countries' level of implementation of the EIF recommendations that have an implicit or explicit cross-border reference. In addition to the areas for improvement already identified by the analysis of the first three scoreboards, European countries could also perform better when it comes to (1) the availability at cross-border level of authoritative sources of information (Recommendation 37), (2) the development of interfaces with base registries and authoritative sources of information, the publishment of the semantic and technical means and documentation needed for others to connect and reuse available information (Recommendation 38) and finally, and (3) the use of trust services according to the Regulation on eID and Trust Services as mechanisms that ensure secure and protected data exchange in public services (Recommendation 47).

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60 Please note that Figure 24 includes the following three charts.

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