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Subject:	COMMISSION STAFF WORKING DOCUMENT Final evaluation of the European Interoperability Framework (EIF) Accompanying the document Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL laying down measures for a high level of public sector interoperability across the Union (Interoperable Europe Act)

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COMMISSION STAFF WORKING DOCUMENT

Final evaluation of the European Interoperability Framework (EIF)

Accompanying the document

Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

laying down measures for a high level of public sector interoperability across the Union (Interoperable Europe Act)

{COM(2022) 720 final} - {SEC(2022) 720 final} - {SWD(2022) 721 final} - {SWD(2022) 722 final}

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EXECUTIVE SUMMARY

Interoperability enables data exchanges and facilitates connections between IT systems and platforms in the delivery of digital services. It covers broader organisational, legal and governance aspects enabling fundamental user-centric principles like the once-only principle.

The EU has been supporting interoperability between public administrations since the 1990s through a series of funding programmes such as IDA, IDABC, ISA, ISA² and now Interoperable Europe. As part of this support, a European interoperability framework (EIF) was first produced in 2004 and then updated in 2010 and 2017. With the introduction of the EIF for the first time in 2004, there was a first agreement on a common vision and non-binding guidelines to support data exchanges and digitalisation in public administrations in Europe. The implementation of a new EIF, adopted in 2017 as COM(2017) 134, was recognised as a **key element in enhancing interoperable public services, especially in a cross-border context.** It contains a set of principles, models and recommendations to guide public administrations across the EU and at all levels of administration in the design and provision of key digital and interoperable public services.

The EIF recognises the importance of cross-border interoperability as a means of implementing EU-wide policies. It provides guidance to public administrations on the design and update of national interoperability frameworks (NIFs), or national policies, strategies and guidelines promoting interoperability.

The evaluation shows that the EIF has certainly helped inspire European public administrations, on a strategic level, to design and deliver digital public services, and in the design and updating of (NIFs) or digital strategies. Quite a lot of Member States have aligned their digitalisation policies and plans with the EIF, or at least with its guiding principles. The framework has provided high-level advice through concepts and models to help guide the creation of interoperable digital public services. However, there is a disconnect between high-level guidance and actual execution or operational implementation, particularly at regional and local level.

The concepts, layered interoperability architecture, and conceptual model for integrated public service delivery set out in the EIF are generally synergic, and the suggestions mutually reinforce each other.

The significance of the EIF is attested to by the direct references to it in EU policy and strategy documents, but it is less often cited in EU legal acts like directives and regulations. Furthermore, the EIF is found to be consistent with initiatives such as Single Digital Gateway Regulation, the digital single market strategy, and the data strategy.

The voluntary nature of the framework is reflected in its uneven and ad hoc uptake at EU and Member State level. As a result, the availability of comparable data is limited, making comparisons between countries and sound cost-benefit analysis difficult.

Several steps for improving the EIF can be derived from experience with implementation:

- clarify the recommendations with a better structure, clarity, granularity, and implementation guidance, reducing some overlaps between them;
- promote the framework across polices and Member States, encouraging best-practice sharing and awareness-raising activities;
- reinforce the EIF's role as a strategic guide by:
    - enhancing EU interoperability governance and its fundamental role;
    - increasing the references to it in related EU legal acts;

    - fostering coordination across EU and national polices through common interoperability rules;
    - reinforcing EU policy for interoperability with more binding requirements;
    - using conditionality in EU funding instruments supporting digitalisation, enforcing interoperability by design and reuse of interoperability solutions;
- promote sound monitoring of progress in the field of interoperability and of the EIF's effects.

A future enhanced EU policy for public administration interoperability could address those issues by:

    - creating binding interoperability rules;
    - establishing a system of governance that supports a more practical and actionable EIF;
    - identifying common reusable specifications and standards, tools, and solutions to support digital checks for new EU policies.

1. INTRODUCTION

Digitalisation holds significant promise for **improving public service delivery in Europe** and generating benefits for public administrations, individuals, and businesses alike, such as time savings. Reforming internal processes, transforming the design and delivery of services, boosting data sharing and collaboration, adopting a user-centric approach, and adopting timely policies that keep up with technological changes are all part of the path to digital government[1]. All these changes and digital transformation are highly dependent on the level of interoperability of the underlying IT systems and platforms supporting digital services and data exchanges. If services are digitised in silos, data cannot be reused, shared and exchanged.

Interoperability can be defined as 'the ability of organisations to interact towards mutually beneficial goals, involving the sharing of information and knowledge between these organisations, through the business processes they support, by means of the exchange of data between their ICT systems'[2]. **Legal, organisational, semantic and technical interoperability** is crucial in the implementation of digital government policies. It enables the design of reusable specifications for data exchanges, or the agreement to use existing ones, and facilitates connections between IT systems. Both are key in the delivery of digital services. It goes beyond the design of IT systems, also covering broader organisational, legal and governance aspects. Interoperability is the foundation for the digitalisation of services, helping to put fundamental user-centric principles such as the once-only principle into practice. The once-only-principle is an e-government concept that aims to ensure that citizens, institutions, and companies only have to provide certain standard information to the authorities and administrations once[3]. The once-only principle is part of the European Union's plans to further develop the Digital Single Market by reducing the administrative burden on citizens and businesses.

As emphasised in various EU-level initiatives in recent years, ensuring the interoperability of digital government has become a top priority, to maximise the potential of **digital solutions for the single market.** The European interoperability framework (EIF) adopted in 2017 as COM(2017) 134[4] ('the EIF Communication'), was recognised as a **key element in enhancing interoperable public services, especially across borders.** It contains a set of principles, models and recommendations to guide public administrations across the EU and at all levels of administration in the design and provision of key digital and interoperable public services. Ultimately, it supports the free movement of goods, people, services and data throughout the EU.

The EIF is a set of guidelines – principles – similar to the better regulation guidelines, aimed at guiding and enhancing interoperability of digital public services at all levels across borders in the EU and within countries (at national, regional, local level). It is meant to be used by administrations at every level from EU-wide to local, to design and deliver seamless, integrated digital public services to be used by other public administrations, individuals and businesses. Furthermore, the EIF Communication was accompanied by support for implementation of the framework from 2016 to 2020, drawing on the ISA² and the Connecting Europe Facility programmes. Through the ISA² Programme, the Commission

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1 OECD (2016), Digital Government Strategies for Transforming Public Services in the Welfare Areas, p. 10, http://www.oecd.org/gov/digital-government/Digital-Government-Strategies-Welfare-Service.pdf.

2 COM(2017) 134 final, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, European Interoperability Framework - Implementation Strategy.

3 https://en.wikipedia.org/wiki/Once-only_principle

4 See footnote 2.

created and promoted interoperability solutions that support implementation of the EIF by the Member States, as described in the ISA² final evaluation report[5].

According to the 2017 Communication on the new EIF[6], its implementation needs to be evaluated to assess whether relevant recommendations should become part of a mandatory instrument. This need for a back-to-back evaluation and impact assessment was reaffirmed in a series of Communications in 2020, stating the need for a reinforced interoperability strategy for EU governments to foster coordination and the adoption of common standards for public services and data flows[7].

Following the 'evaluate first' principle, this evaluation focuses on the new EIF introduced in 2017 and assesses its implementation, seeking to understand the achievements of the framework and the lessons that can be learnt to support the overarching goals of enhancing interoperability to support the digital transformation of the EU's public sector.

The evaluation was based on five evaluation criteria stemming from the Commission's better regulation requirements and nine evaluation questions in Annex III. A **mix of data collection and desk research** was used to gather both primary and secondary data (for further details on the methodology, see Annex II). In this, the Commission was assisted by a team of researchers led by the Centre for European Policy Studies (CEPS), which summarised its findings in an independent evaluation study[8].

The collected data were validated via triangulation to ensure the robustness of the evidence[9]. Data were collected from **multiple sources**, and several **different tools** were used to analyse the data according to the evaluation criteria. Data were also used from the EIF monitoring mechanism exercise that takes place annually as part of the National Interoperability Observatory (NIFO). The monitoring mechanism is meant to provide a macro-level view of how Member States are implementing the framework. More specifically, as the evaluation relies on both qualitative and quantitative data, a variety of analysis methods was used. Qualitative information was aggregated, compared and summarised to substantiate the evidence resulting from the evaluation criteria. To analyse the data collected during the consultation activities, descriptive statistics were applied. Finally, to complement the findings, other quantitative analyses, including a standard cost model, an econometric model and text mining, were carried out when evaluating the effectiveness, efficiency and coherence criteria.

The mix of data sources and methods provided for solid conclusions. Nevertheless, several limitations may have affected the findings. These include the **scarcity of data for assessing** the costs and benefits of implementing the EIF at national level, the **need for more time to be able to discern the longer-term results**, and **potential consultation fatigue** among respondents.

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5 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2021:965:FIN

6 See footnote 2.

7 COM(2020) 67 final, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, Shaping Europe's digital future.

8 CEPS (2021), Study supporting the evaluation of the implementation of the EIF. Available at: https://op.europa.eu/en/publication-detail/-/publication/29d694d4-4696-11ec-89db-01aa75ed71a1/language-en/format-PDF/source-search.

9 European Commission (2017), Tool #4 Evidence-based better regulation in the Better Regulation Toolbox, available at https://ec.europa.eu/info/files/better-regulation-toolbox-4_en. Last accessed: 10 August 2021.

2. WHAT IS THE EXPECTED OUTCOME OF THE INTERVENTION?

2.1 Introduction to interoperability

Interoperability is defined as 'the ability of organisations to interact towards mutually beneficial goals, involving the sharing of information and knowledge between these organisations, through the business processes they support, by means of the exchange of data between their ICT systems.'[10] L**egal, organisational, semantic and technical interoperability is crucial in the implementation of digital government policies**.

Interoperability is what makes digitalisation of government services efficient, enables the seamless and trusted exchange of data and connectivity of services across levels of administration, borders and sectors. It is a foundational element of all modern digitalisation strategies.

Digitalisation of government services without interoperability is possible, however, and unfortunately still very much the norm. Governments can certainly be digitalises in a way that does not allow for data exchange across borders or even inside the same country. However, this means foregoing the benefits of learning from best practices, and of reusing existing tools and solutions for lower development and maintenance costs; the wheel must be reinvented again and again.

For example, a well-designed online website for a national tax-return system may not be able to connect to the population registry, which means that taxpayers need to fill in the same data every year. And, possibly, if their signature is not valid in an electronic format, they will have to print out the declaration and go in person to the tax office to file it. And, if the tax database is not connected to a separate VAT database, businesses will need to enter the same information yet again, losing precious time and money.

But there are also digitally transformed systems where interoperability is built in by default, as in Estonia[11]. Individuals and businesses there spend an average of 3 minutes a year on their tax declaration. All the necessary information is already available, reused and exchanged between systems seamlessly thanks to the interoperability of data and systems.

Another example are the national mobile contact tracing and warning applications, which were set up in record time and work seamlessly for citizens thanks to a European interoperability gateway. At its peak, 19 European countries out of 22 that deployed national contact tracing and warning applications were connected to this gateway and were able to exchange information[12].

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10 COM(2017) 134 final, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, European Interoperability Framework - Implementation Strategy.

11 https://joinup.ec.europa.eu/collection/nifo-national-interoperability-framework-observatory/digital-public-administration-factsheets-2021

12 https://health.ec.europa.eu/ehealth-digital-health-and-care/ehealth-and-covid-19_en

The EU Digital COVID Certificate is also an outstanding example. It is based on common interoperability data models to enable a common reading, interpretation and verification of the data inside. It enables the verification of data originating from different national/regional health systems; semantic alignment (first, second, third dose, type of vaccine, types of tests); as well as organisational and legal cooperation certainty (authorised entities, business rules related to the acceptance of certificates). The system has been a global success, as in addition to EU/EEA Member States, also many third countries from five continents have joined it.

Interoperability enhances to the design of reusable specifications, the quality of seamless data exchanges, and facilitates connections between IT systems. All three are key in the delivery of digital services. Interoperability goes beyond the design of IT systems; it also covers broader organisational, legal and governance aspects. Interoperability is the foundation for the digitalisation of services, upholds fundamental digital rights and principles (like the once-only principle), and supports the design, interconnection, and delivery of digital services in a coordinated way so that data can flow across different domains and across borders. However, this requires strong interoperability foundations. Sound interoperability governance at both national and European level is a fundamental part of the legal, organisational and technical specifications towards those common goals.

The ambitious Communication on a **digital single market strategy**, put forward by the Juncker Commission in 2015[13], the interoperability agenda needed to be revised and brought into line with the **emerging challenges in the field of ICT** and European public services. Among other relevant digital initiatives to interoperability, there is the Directive on reuse of Public Sector Information[14] (subsequently revised and renamed as the Open Data Directive in 2019), the INSPIRE directive[15], the eIDAS Regulation[16], the EU eGovernment action plan 2016-2020, the single digital gateway (proposed in 2017 and subsequently adopted as a Regulation in 2019)[17], and the European Cloud initiative.

2.2 Introduction to the EIF

The EU has been supporting interoperability between public administrations since the 1990s through a series of funding programmes such as IDA, IDABC, ISA[18], ISA², and now Interoperable Europe. As part of this support, the first EIF was produced in 2004 and then updated in 2010 and 2017. With the introduction of the EIF in 2004, there was for the first time an agreement on a common vision and non-binding guidelines to support data exchanges and digitalisation in Public Administrations in Europe.

Responding to the call for a revised framework for interoperability in the EU, a new EIF was adopted in 2017 as part of the Communication from the European Commission adopted on **23 March 2017**[19]. The new 2017 EIF expanded on the previous 2004 version adopted by the PEGSCO committee of the IDABC programme and the 2010 version adopted by the Commission[20]. It brought more targeted recommendations, taking new technological and

13 COM(2015) 192 final.
14 Directive 2013/37/EU.
15 Directive 2007/2/EC.
16 Regulation (EU) No 910/2014 on electronic identification and trust services for electronic transactions in the internal market.
17 See the Staff Working Document accompanying the 2017 EIF Communication: https://eur-lex.europa.eu/legal-content/ES/TXT/?uri=CELEX:52017SC0112.
18 IDA – interchange of data between administrations; IDABC - interoperable delivery of pan-European eGovernment services to public administrations, businesses and citizens; ISA – Interoperability Solutions for Public Administrations.
19 COM(2017) 134 final.
20 COM(2010) 744 final.

policy developments into account. The number of recommendations increased from 25 to 47 in the 2017 EIF and several recommendations were updated or newly developed to support relevant EU policies and initiatives.

The EIF establishes a set of guidelines and principles, similar to the better regulation guidelines. It aims to guide and enhance the interoperability of digital public services at all levels across borders in the EU and within countries (at national, regional and local level). The framework has three goals:

- **to inspire and guide European public administrations** in designing and delivering seamless European public services to other public administrations, individuals and businesses in a way that is digital, cross-border by default (i.e. accessible to the public in the EU) and open by default;
- **provide guidance to public administrations** on the design and update of national interoperability frameworks (NIFs), or national policies, strategies and guidelines promoting interoperability;
- **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 Communication was accompanied by an interoperability action plan to support the implementation of the EIF from 2016 to 2020, with a series of solutions supported by the ISA² and the Connecting Europe facility (CEF). Through the ISA² programme, the Commission created and promoted interoperability solutions that support implementation of the EIF by the Member States as described in the ISA² final evaluation report[21].

The EIF focuses on cross-border interoperability between governments needing support to implement EU-wide policies. Given that digitalisation applies to all public administrations in all domains and at all levels, it is also applied directly in the countries for their own digital services and serves as inspiration for the creation of national interoperability frameworks (NIFs). Positive spillover effects were anticipated from providing Member States with common guidance to start working on interoperable services within their borders. Common interoperable governance structures, tools, specifications and services support seamless interactions across the various administrative levels in the country (central, regional, local levels), but also across some domains (justice, education, health and taxation). Most of all, the framework is a step towards developing interaction and cooperation required in a cross-border setting. Having a proper interoperability set-up within each Member State will help mitigate the complexities of coordinating interactions across borders that involve several domains and competent authorities.

The EIF helps remove barriers to the exchange of data, connect digital services across the various administrative levels of the country and across borders and sectors in the EU.

The framework is focused on supporting public organisations in working together on defining, designing and implementing digital services in a coordinated and efficient manner – starting by commonly designing and aligning back-office protocols, specifications, infrastructures, platforms and IT tools. However, it also covers fundamental issues for individual and corporate end users, such as accessibility, user-centric design and the once-only principle.

At EU level, relevant stakeholders are the EU institutions and policy units responsible for formulating, designing and implementing EU policies with digital implications. This includes units in DG GROW, DG CONNECT and the Joint Research Centre (JRC). As an example of EU policies, the Single Digital Gateway Regulation led by DG GROW implements a pan-European technical system using the principles of the EIF and some solutions from the

[21] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2021:965:FIN.

interoperability action plan, like eDelivery and common vocabularies for cross-border and cross-sector evidence exchanges.

Member States' digital government authorities and experts (government chief information officers, practitioners and academic experts) are longstanding close stakeholders, but the public bodies (ministries and agencies) mainly work on digitalisation and interoperability of digital services. In its factsheets on digital public administration and interoperability (Chapter 5), NIFO provides regular and up-to-date information on those authorities[22]. The information is also available in a dedicated section of the NIFO website[23]. Regional and local authorities have recently become more involved, particularly through the definition of an EIF-inspired framework for smart cities and local communities in the context of the Living-in.EU movement. The EIF, through the ISA² programme, has supported and encouraged the take-up of solutions by private companies involved in public sector development. Other important stakeholders are academia, and standard-setting, consulting and other private sector organisations (e.g. GovTech) that work closely with governments providing technical support.

The revised version of the EIF, which is subject of this evaluation, was created in a collaborative way with public administration experts and the national authorities in the Member States that are involved in designing and coordinating implementation of digital service policies or strategies. The text was discussed and agreed upon in several meetings between Member States' representatives for the ISA² programme, from national digitalisation departments, and policy departments (Directorates-General) responsible for single market digitalisation. In addition, academia, standardisation organisations and ICT companies gave their views in several workshops. Finally, a public consultation was held[24].

Their needs were considered and are an integral part of the EIF adopted in 2017.

2.3 Description of the intervention and its objectives

To address the challenges identified, the EIF outlined several key **objectives** together with a set of **inputs** that comprise the main components of the EIF: the underlying interoperability principles of European public services, the layered interoperability model and the conceptual model for integrated public services provision, as well as the recommendations attached to each of the three components. The Communication on the EIF also included an interoperability action plan, detailing a set of key actions to be undertaken between 2017 and 2020 to support implementation of the EIF. As set out in the Communication, the Commission ensured the promotion, support and implementation of the Interoperability Action Plan mainly through the ISA² programme[25]. At the time of its adoption, the framework was **expected to produce a series of outcomes and impacts.**

The logical links between the needs and problems, objectives, inputs, and expected outcomes and impacts are summarised in Figure 1 **(EIF intervention logic)**. The operational objectives

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22 https://joinup.ec.europa.eu/collection/nifo-national-interoperability-framework-observatory/digital-public-administration-factsheets.

23 https://joinup.ec.europa.eu/collection/nifo-national-interoperability-framework-observatory/digital-public-administrations-and-eif-national-responsible-bodies.

24 https://ec.europa.eu/isa2/consultations/results/result_impact-assessment-for-the-revision-of-the-eis-eifl_en.

25 The EIF Communication states that, 'The Commission will support, promote and monitor the implementation of the interoperability action plan, and the European interoperability framework in general, primarily through the ISA² programme.' The Communication also mentions that additional support may come from other instruments such as Horizon 2020, the CEF, the European structural and investment funds and the structural reform support programme (SRSP). See: COM(2017) 134 final, p. 8.

and outputs are not included, as they were assessed during the parallel running evaluation of ISA²[26].

The needs, problems[27] and drivers that the EIF intended to address were identified by analysing the 2017 EIF Communication[28], the accompanying Staff Working Documents[29], and the results of the consultation activities carried out in 2016 to inform the revision process[30]. The EIF was established to address **one key need** experienced by public administrations in the EU:

- the need for **more specific guidance** for public administrations on how to improve the **governance of their interoperability activities**[31].

The Staff Working Document accompanying the 2017 EIF Communication[32] outlined **two main problems** in the field of interoperable digital public services:

- the fragmented delivery of digital public services in the EU and
- fragmentation in the organisation and format of public data in the EU.

These problems were attributable to **five main drivers:**

- incoherent governance of action to implement interoperability;
- cross-organisational barriers;
- resource constraints in relation to interoperability;
- scarcity of tools and solutions for interoperability in the delivery of public services; and
- legal issues affecting interoperability.

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26 See SWD/2021/965 final (Staff working document), COM/2021/965 final (Report), CEPS (2021) Study supporting the final evaluation of the ISA² programme. Available at: https://op.europa.eu/en/publication-detail/-/publication/afa4297a-0acc-11ec-adb1-01aa75ed71a1/language-en/format-PDF/source-229005953.

27 Needs refer to prerequisites for the efficient delivery of European public services, more specifically for interoperability. Problems consist of specific bottlenecks that prevent need from being addressed. The drivers are the underlying causes that lead to the problems identified.

28 COM(2017) 134 final.

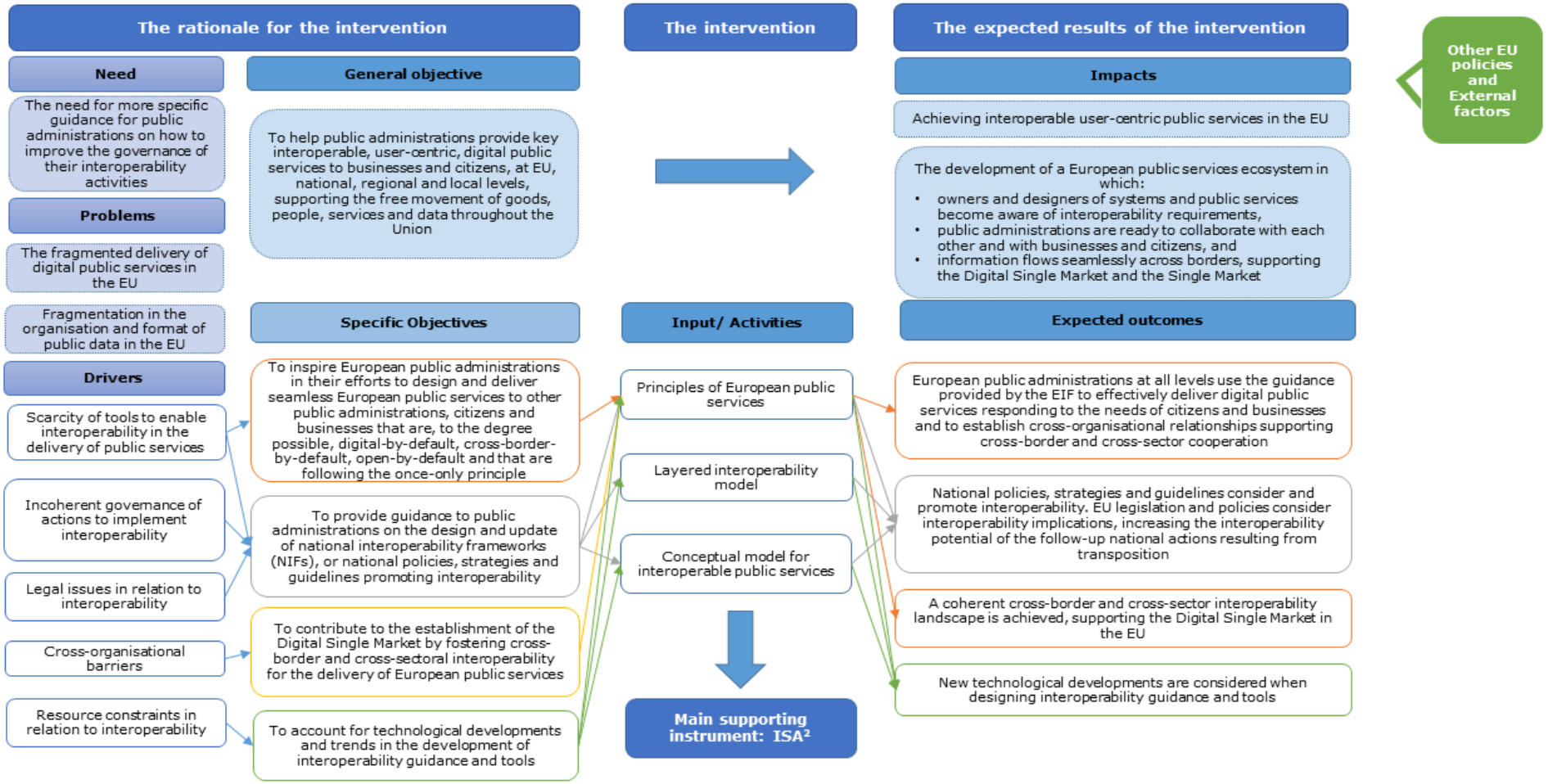
29 SWD(2017) 112 final, Commission Staff Working Document: Revision of the European Interoperability Framework – Analysis; SWD(2017) 113 final, Commission Staff Working Document: Revision of the European Interoperability Framework - Synopsis report of the consultation activities.

30 Factual summary of the contributions received during the public consultation undertaken by the European Commission to assess the impacts of the revision of the European Interoperability Framework And Strategy, available at: https://ec.europa.eu/ISA²/sites/isa/files/eif-public-consultation-factual-summary-en.pdf.

31 COM(2017) 134 final, p. 4.

32 SWD(2017) 112 final.

Figure 1: EIF intervention logic



Source: Study supporting the evaluation of the implementation of the EIF.

The objectives of the EIF were presented in a **hierarchical order**; furthermore, the achievement of specific objectives was seen as a pre-condition for attaining the general objective.

General objective

- To help public administrations provide key interoperable, user-centric, digital public services to businesses and individuals, at EU, national, regional and local levels[33], thus supporting the free movement of goods, people, services and data throughout the EU[34].

Specific objectives[35]

- **Specific objective 1**: to inspire European public administrations at all levels in their efforts to design and deliver seamless European public services to other public administrations, individuals and businesses which, where possible, are digital by default (i.e. providing services and data preferably via digital channels), cross-border by default (i.e. accessible for all in the EU), open by default (i.e. enabling reuse, participation/access and transparency), and which follow the once-only principle.
- **Specific objective 2**: to provide guidance to public administrations on the design and update of NIFs, or national policies, strategies and guidelines promoting interoperability.
- **Specific objective 3**: to contribute to the establishment of the digital single market (DSM) by fostering cross-border and cross-sectoral interoperability for the delivery of European public services.
- **Specific objective 4**: to account for technological developments and trends in the development of interoperability guidance and tools[36].

As mentioned, the intervention logic of the EIF does not cover operational objectives, as they are covered in a parallel evaluation study on ISA²[37].

What activities are supported by the 2017 EIF?

The EIF provides 47 recommendations that are grouped under the three main components of the EIF (an overview of the interrelations between the components is provided in Figure 2):

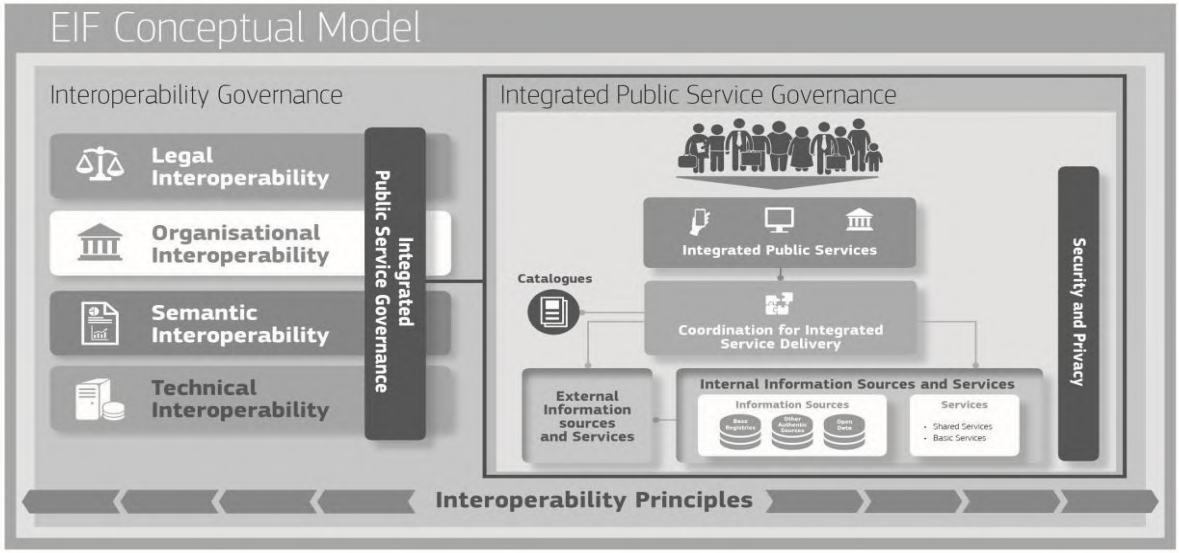
- **Underlying principles of European public services**. The EIF puts forward 12 interoperability principles to guide the design of interoperable European public services. The principles include the following:
    - the principles of subsidiarity and proportionality (a case for EU action has to be made);
    - a set of core interoperability principles: openness, transparency, reusability, technological neutrality, and data portability;
    - principles on user needs and expectations: user-centricity, inclusion and accessibility, security and privacy and multilingualism; and

33 Based on COM(2017) 134 final, Annex 2, p. 6.
34 COM(2017) 134 final, p. 5.
35 Ibid, Annex 2, p. 5.
36 COM(2017) 134 final, p. 3.
37 See SWD/2021/965 final (Staff working document), COM/2021/965 final (Report), CEPS (2021), Study supporting the final evaluation of the ISA² programme. Available at: https://op.europa.eu/en/publication-detail/-/publication/afa4297a-0acc-11ec-adb1-01aa75ed71a1/language-en/format-PDF/source-229005953.

- principles for cooperation among public administrations: administrative simplification, preservation of information and assessment of effectiveness and efficiency.

- **Layered interoperability model**. The layered interoperability model includes the four layers of interoperability (organisational, semantic, legal, and technical interoperability) as well as a crosscutting layer relating to integrated public service governance, brought together into a comprehensive approach through a final and crucial component: interoperability governance.
- **Conceptual model for interoperable public services**. The concept is that European public services should be interoperable by design. The model consists of several basic components: coordination function, internal information sources and services, base registries, open data, catalogues, external information sources and services, and security and privacy protection.

Figure 2: The EIF conceptual model



Source: COM(2017) 134 final, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, European Interoperability Framework - Implementation Strategy, Annex 2.

What was the expected outcome of the 2017 EIF?'

When created, the EIF was meant to deliver short-, medium- and long-term effects for certain categories of stakeholders. While the most immediate and operational results (the 'outputs') of the EIF were expected to emerge from relevant ISA² measures, it was thought that implementation of the EIF should in itself be able to generate results affecting European public administrations at all levels, as well as the public and businesses in the EU. These expected results are summarised below.

Outcomes (expected)[38]

- European public administrations at EU, national, regional and local levels use the guidance provided by the EIF to effectively deliver digital public services responding to the needs of people and businesses, and to establish cross-organisational relationships supporting cross-border and cross-sector cooperation.

[38] The outcomes reflect the specific objectives. The outcomes were derived from: COM(2017) 134 final, Annex 2, pp. 5 and 7.

- National policies, strategies and guidelines consider and promote interoperability. EU legislation and policies consider interoperability implications, increasing the interoperability potential of the national follow-up measures.
- A coherent cross-border and cross-sector interoperability environment is achieved, supporting the digital single market in the EU.
- New technological developments are considered when designing interoperability guidance and tools.

Impacts (expected)

- Available interoperable, user-centric public services in the EU[39].
- Developing a European public services ecosystem in which: owners and designers of systems and public services become aware of interoperability requirements; public administrations are ready to collaborate with each other and with businesses and the public; information flows seamlessly across borders, supporting the single market, particularly the digital single market[40].

2.4 Points of comparison

This evaluation focuses on the achievements and areas for improvement of the 2017 EIF since its adoption. By 2016, there was a relatively good alignment between the Member States' NIFs and the guidance provided by the 2010 EIF. The average EIF-NIF alignment level across the EU in 2016 was estimated at 75%. However, at the level of actual implementation, more work remained to be done. The average NIF implementation level across the Member States in 2016 was estimated at 56%[41].

In the run-up to the revision of the EIF, a public consultation was carried out to gather the views of stakeholders on existing problems and the future of the EIF. Among the key problems identified by stakeholders were[42]:

- lack of a comprehensive overview of existing interoperability initiatives;
- limited uptake of common standards in the development of solutions;
- lack of monitoring of implementation of interoperability initiatives;
- lack of both financial and human resources to support implementation of interoperability initiatives and solutions; and
- no assessment of costs and benefits of interoperability in the process of developing legislation at national level.

In addition, the public consultation brought to light the main expectation of consulted stakeholders for the future EIF: time and cost savings. In the consultation, 49 stakeholders (74% of the respondents) said they expected time savings and 46 (70%) expected cost savings and greater transparency[43].

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39 COM(2017) 134 final, p. 9.

40 COM(2017) 134 final, Annex 2, p. 7.

41 Gatti, R., Carbone L., Mezzapesa, V. (2017), State of Play of Interoperability in Europe - Report 2016, European Commission, pp. 15-22. Available at: https://ec.europa.eu/isa2/sites/default/files/report_2016_rev10_single_pages_0.pdf.

42 Factual summary of the contributions received during the public consultation undertaken by the European Commission to assess the impacts of the revision of the European Interoperability Framework And Strategy, p. 2. Available at: https://ec.europa.eu/ISA²/sites/isa/files/eif-public-consultation-factual-summary-en.pdf.

43 Ibid., p. 3.

3. HOW HAS THE SITUATION EVOLVED OVER THE EVALUATION PERIOD?

This chapter gives an overview of how the interoperability landscape has changed since the new EIF was adopted, both in terms of legislation and in terms of monitoring. This Chapter examines the policy context surrounding the adoption of the EIF before addressing the level of implementation.

3.1 Policy context

The policy context of the EIF has been very dynamic since the adoption of the 2017 version. In recent years, digitalisation of public administrations and services has risen up the political agenda at EU and national level, as demonstrated by the Resilience and Recovery Funds and the national plans: EU Member States are planning to invest more in the digitalisation of their public administrations.

Back in 2017, the priorities for interoperability were reinforced through the Tallinn Declaration on eGovernment[44]. The high-level Ministerial Declaration emphasised the role of interoperability as a strategic component for ensuring the effective delivery of public services in the EU. A similar emphasis on interoperability is seen in a European Parliament resolution of 2017[45]. It underlines that the digitisation of public administrations should aim to 'promote the better exercise of citizenship, improve the quality of life for citizens and the social and economic development of the regions, enhance citizens' understanding of and involvement in public services', while improving their efficiency and cost-effectiveness.

The digitalisation of public services has been progressing relentlessly, gaining even more momentum due to the pandemic. The digital economy and society (DESI) index and eGovernment benchmark report show that all EU Member States have made progress in the area of digitalisation, but the overall picture across Member States is mixed, and despite some convergence, the gap between the EU's frontrunners and those with the lowest DESI scores remains large.

In 2019, the Council underlined in its conclusions on the future of a highly digitised Europe beyond 2020[46] that interoperability will continue to play a key role in the EU's digital policy. The Von der Leyen Commission has set strong ambitions for digital transformation in the EU, as emphasised in the following Communications published in 2020 and 2021.

- **Shaping Europe's digital future**, which sets out the Commission's vision for the next five years on harnessing the potential of the digital transformation for the EU and its citizens, underpinned by European values. One of the key actions in the Communication is the development of a '**reinforced EU governments interoperability strategy**' to foster coordination and the adoption of common standards for public services and data flows by 2021[47].
- A **European strategy for data**, which proposes nine European data spaces that rely on interoperability to enable seamless data exchange[48].
- The **white Paper on artificial intelligence (AI)[49] and the subsequent proposal for a regulation laying down harmonised rules on AI**[50].

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

45 European Parliament resolution of 16 May 2017 on the EU eGovernment Action Plan 2016-2020.

46 Council conclusions on the future of a highly digitised Europe beyond 2020: 'Boosting digital and economic competitiveness across the Union and digital cohesion', Brussels, 7 June 2019.

47 COM(2020) 67 final.

48 COM(2020) 66 final.

49 COM(2020) 65 final.

- A **new industrial strategy for Europe** for innovation and a greener and more digital industry, for which building EU leadership in key areas including data applications is essential[51].
- The **SME strategy for a sustainable and digital Europe**, which identifies the opportunities that digitalisation holds for small and medium-sized enterprises (SMEs) in the EU; wider access to data and the reusability of data can support the development of innovative SMEs[52].
- The **long-term action plan for better implementation and enforcement of single market rules**, focusing on better using digital tools to improve access to information, fostering cooperation between the Member States, and testing and applying advanced digital tools for public services[53].
- The **2030 Digital Compass: the European way for the digital decade**[54], setting key priorities and targets for the digital transition in the EU over the next decade. When it comes to delivering digital public services, the Communication emphasises the need to 'ensure interoperability across all levels of government and public services'[55].

In 2020, the Member States built on the Tallinn Declaration with the Berlin Declaration on digital society and value-based digital government[56]. The Member States and the EU institutions committed themselves to developing a more vigorous and more interoperability-focused digital transformation policy for government and to supporting the digital transformation of public administrations. In achieving these ambitions, interoperability plays a key enabling role, ensuring a level of coordination, common processes and models for the achievement of further goals.

The commitments included in these documents are also reflected in the budgetary allocations for the next several years. In particular, the new Multiannual Financial Framework includes a new programme to bolster the digital agenda in the EU called the **Digital Europe Programme**. With a planned budget of EUR 7.5 billion (at current prices) from 2021 to 2027, this new financial instrument will support five key areas of the digital transition: supercomputing, artificial intelligence, cybersecurity, advanced digital skills and European digital innovation hubs (EDIHs)[57]. The Digital Europe programme will ensure **continued of funding for measures to increase interoperability in the EU**.

3.2 State of play

To understand the current state of play in the implementation of the EIF, it is important to note that the EIF is a non-binding instrument providing guidance that can be followed voluntarily by the Member States without a precise timeline. Therefore, delays in the implementation of the EIF are difficult to identify, given the lack of a specific timeframe (for more details, see Annex VI, Supporting evidence from desk research). Most of the Member States (15) have created an NIF based on the EIF, namely Belgium, Bulgaria, Estonia,

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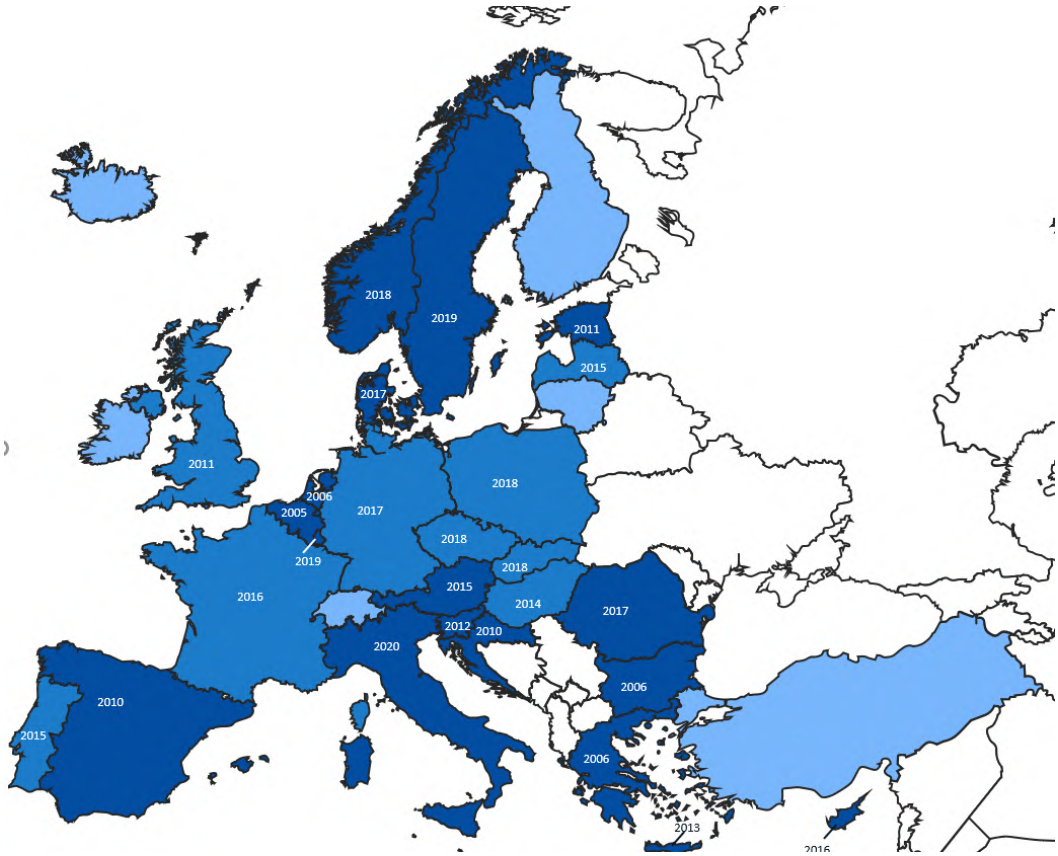
50 COM/2021/206 final.
51 COM(2020) 102 final.
52 COM(2020) 103 final.
53 COM(2020) 94 final.
54 COM(2021) 118 final.
55 Ibid., p. 11.
56 Berlin Declaration on digital society and value-based digital government at the ministerial meeting during the German Presidency of the Council of the European Union on 8 December 2020.
57 The reported sum allocated to the Digital Europe programme is based on the European Council agreement on the 2021–2027 Multiannual Financial Framework and Next Generation EU. See: https://www.ceps.eu/ceps-publications/reading-between-the-lines-of-council-agreement-on-the-mff-and-next-generation-eu/.

Greece, Spain, Croatia, Italy, Cyprus, Luxembourg, Malta, Netherlands, Austria, Romania, Slovenia and Sweden. The others have an NIF or similar strategic documents partially inspired by the EIF. Only three countries, Ireland, Lithuania and Finland, have not implemented an EIF-inspired NIF.

Figure 3 reflects the extent to which the EIF has been taken up, at least conceptually, across the EU, based on data collected in January 2022.

Figure 3: Implementation of the EIF across Europe



Note: The legend corresponds to the extent to which EU countries have adopted NIFs that are fully or partly based on the EIF, as follows: (0) Light blue: countries that have not adopted an EIF-inspired NIF; (1) Middle blue: countries that have adopted NIFs or similar strategic documents partly inspired by the EIF; and (2) Dark blue: countries that have adopted NIFs based on the EIF. For each country, the year of the first adoption is displayed.
Source: *Study supporting the evaluation of the implementation of the EIF*.

The EIF monitoring mechanism (NIFO) delivers a high-level assessment of the progress in implementing the three main components of the EIF. It examines how the components have been adopted as guidance principles in the national strategies and polices.

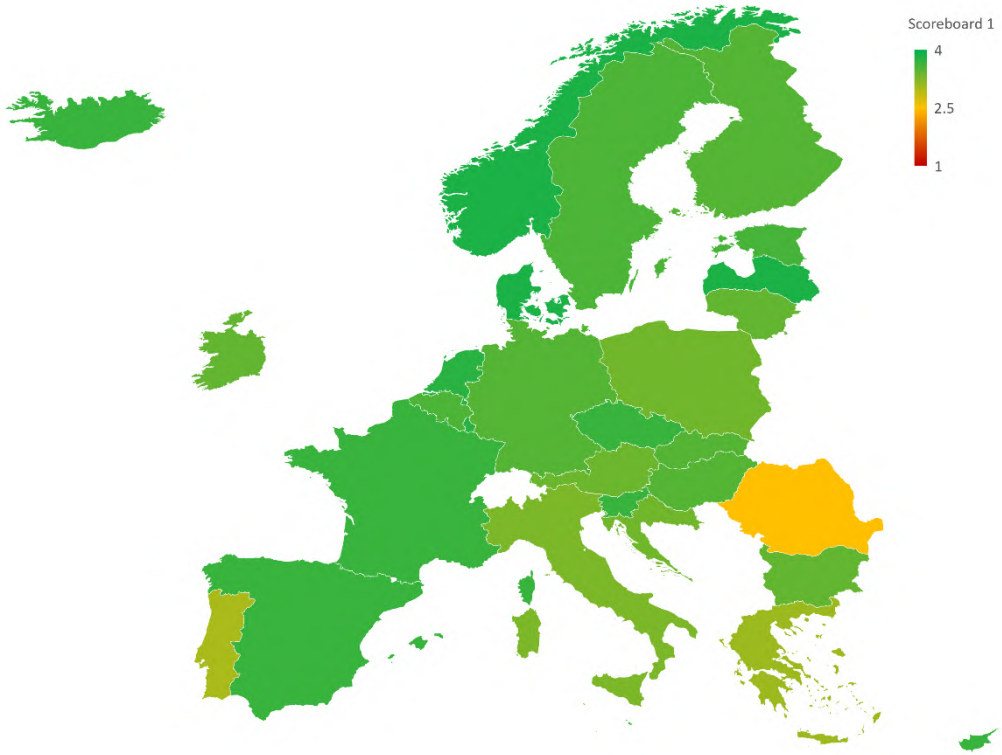
Three scoreboards have been developed: the principles of interoperability, the interoperability layers, and the conceptual model for integrated public services provision. A set of 68 key performance indicators (KPIs) is used in compiling the scoreboards. The final output (see Annex VI.2) consists of a 'traffic light' assessment whereby the relevant KPIs are aggregated for each component of the scoreboard as follows:

[1] for the first scoreboard, the aggregation is done for each of the 12 principles;
[2] for the second scoreboard, the relevant KPIs are aggregated for each layer of the EIF interoperability model; and
[3] for the third scoreboard, the aggregation of the KPIs is carried out for each component of the conceptual model for integrated public services provision.

The 'traffic light' assessment produces a score value scale between 1 and 4, based on the aggregation of the KPIs mentioned above. The first results of the EIF monitoring mechanism are based on data collected in 2019. The results are presented in the 2020 digital public administration factsheets for each Member State[58].

To gain an overview of **the implementation of the EIF at EU level**, the results of the monitoring mechanism exercise can be presented based on the progress in each scoreboard for all EU Member States (the full overview is presented in Annex VI.2)**. Overall averages per Member State per scoreboard** were calculated, to provide a panoramic overview of those areas of the EIF in which most Member States score well and the areas where further efforts would be needed (see Figure 4, Figure 5 and Figure 6).

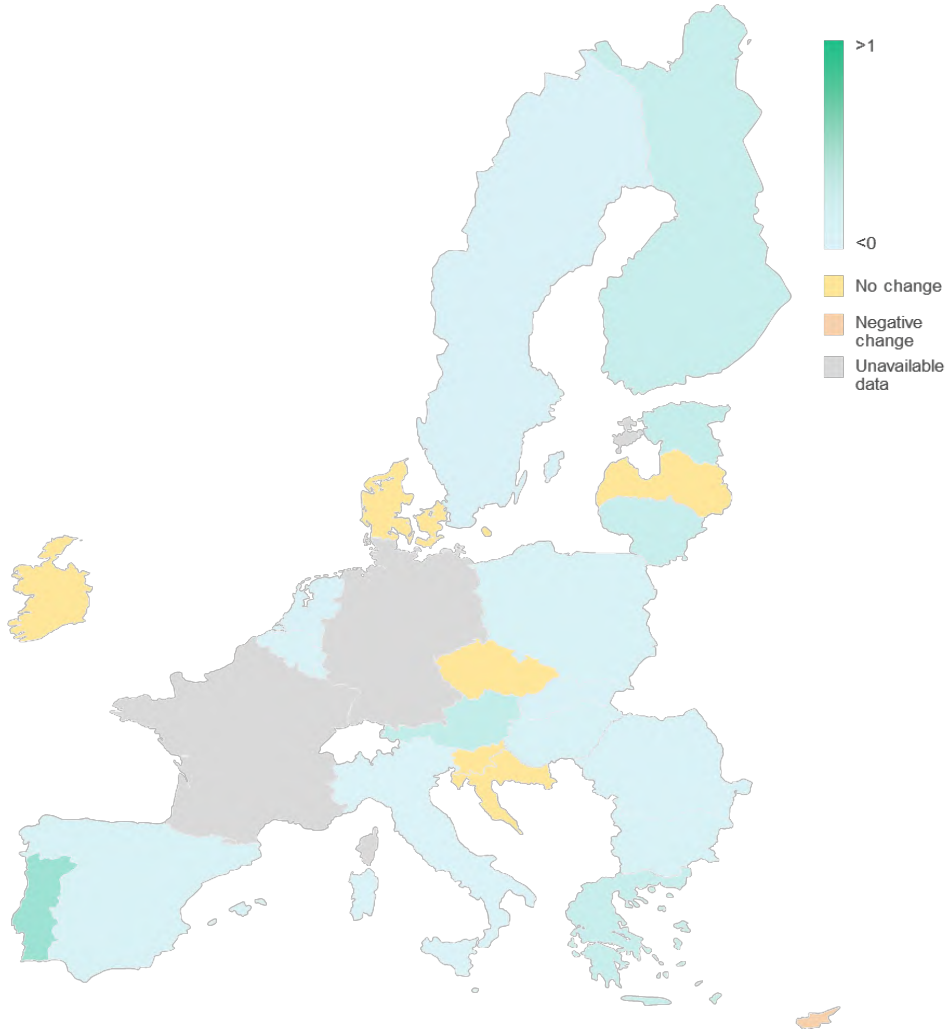
Figure 4.a: Average scores in 2020 for Scoreboard 1: Principles of interoperability



Note: For a full description of the principles, see Annex 2 to the 2017 EIF Communication.
Source: Study supporting the evaluation of the implementation of the EIF based on the data available on Joinup concerning the EIF monitoring mechanism and the underlying database provided by DIGIT.D2.

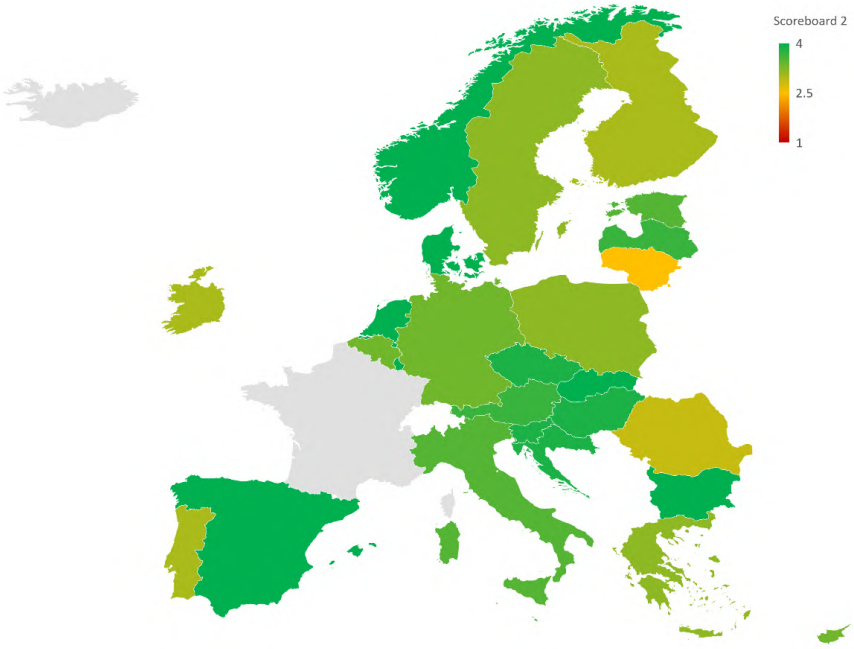
58 For further details please see: Joinup, 'Digital Public Administration Factsheets', https://joinup.ec.europa.eu/collection/nifo-national-interoperability-framework-observatory/digital-public-administration-factsheets.

Figure 4.b: Change in average scores 2019-2020 for Scoreboard 1: Principles of interoperability



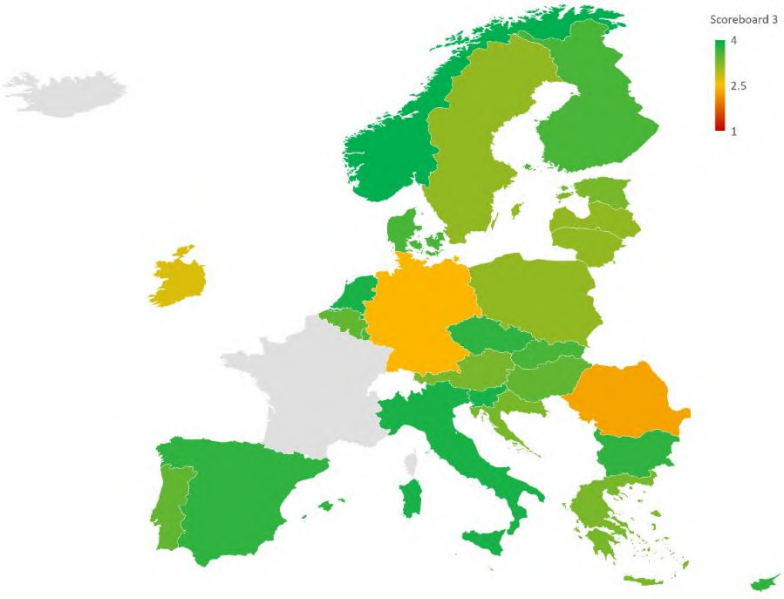
Source: Study conducted by Wavestone, 2022

Figure 5: Average scores in 2020 for Scoreboard 2: Interoperability layers



Note: Countries are marked in grey where missing data for some sub-indicators make it impossible to calculate an overall average (see Annex VI.1 for a full overview).
Source: Study supporting the evaluation of the implementation of the EIF based *on the data available on Joinup concerning the EIF monitoring mechanism and the underlying database provided by DIGIT.D2.*

Figure 6: Average scores in 2020 for Scoreboard 3: Conceptual model



Note: Countries are marked in grey where missing data for some sub-indicators make it impossible to calculate an overall average (see Annex VI.1 for a full overview).
Source: Study supporting the evaluation of the implementation of the EIF on Joinup concerning the EIF monitoring mechanism and the underlying database provided by DIGIT.D2.

Implementation of the 2017 EIF over time

The pre-2017 EIF version was much more theoretical, with narrower scope. At that time, the monitoring[59]mainly involved checking how well aligned the main principles in the national interoperability strategies were. Under the 2017 EIF, the level of implementation is also assessed. This is one of the reasons why it is not possible to make a direct comparison of progress in the Member States' performance under the previous framework with their progress under the current one.

Nevertheless, small and positive improvements are apparent from a high-level comparative analysis of results from the EIF monitoring mechanism for 2019 and 2020.

Figure 4.b presents the improvements made by the Member States in implementing the recommendations linked to the principles of interoperability.

Several countries have improved their implementation of the principles. Portugal has seen the biggest improvement. Implementation is assessed by gauging how well aligned NIFs and interoperability strategies are with the EIF and, if needed, tailored and extended to address the national context and needs. Along with Portugal, the number of countries reporting a high level of alignment increased from 14 in 2019 to 16 in 2020.

With regards to interoperability layers, Greece and Poland have made most progress in implementing the recommendations, through increased efforts on governance. Results show significant improvements, particularly on holistic governance across all administrative levels and sectors, and the implementation of well-defined processes for selecting and adopting standards and specifications.

In the implementation of the recommendations related to the conceptual model, Sweden and Lithuania have made particular efforts to increase their level of alignment with the EIF conceptual model for integrated public services provision. They both increased their score by an average of 0.57 points, by putting in place catalogues of public services, open data and interoperability solutions.

Several external factors can affect the overall performance and implementation of the EIF, either positively, supporting the overall goals of the framework, or negatively, hindering the achievement of expected results. The factors were selected based on findings from the relevant literature and analyses of key trends relevant for interoperability initiatives in the EU. The following external factors were found to have a potential **positive impact** on the implementation of the EIF:

- technological advances bringing new opportunities to improve and foster the delivery of public services, which can make the need for interoperability more salient and thus provide a further incentive to ensure that interoperability principles and models are taken into account;
- the development of national initiatives on interoperability in the public sector, which can show the commitment to making progress on interoperability; and
- the deployment of cross-sectoral initiatives such as smart city initiatives, showcasing the relevance of interoperability at the intersection of different sectors.

Other external factors were found to have a potential **negative impact and thus jeopardise** implementation of the EIF[60]. These factors were:

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59 https://joinup.ec.europa.eu/collection/nifo-national-interoperability-framework-observatory/past-nifo-analytical-models-and-factsheets.

60 Interoperability initiatives are faced with a variety of challenges. The key factors were selected taking into account the relevant literature, including, for instance: Leosk N., Põder I., Schmidt C., Kalvet T.,

- technical challenges, such as legacy systems;
- limited resources, reflecting, for example, difficulties in accessing funding and attracting skilled workers in the field of interoperability;
- institutional complexity, referring to the complex system of roles distributed between the different levels of public administration and of complexity stemming from legal requirements; and
- changing political priorities, which may impact measures to improve interoperability in a given country.

The impact of these factors on the performance of the EIF was tested through consultations with targeted stakeholders as described in Annex V.

EIF supporting instruments

The EIF is a theoretical framework, not a set of solutions. However, as a result of the associated interoperability action plan, a set of EU reusable IT solutions have been developed under the ISA² and CEF funding programmes to support the EIF implementation. Furthermore, the EIF toolbox[61] published on Joinup provides a catalogue of reusable solutions linked to the main areas, principles and recommendations of the EIF. Moreover, any interested stakeholder can take them up as they are based on open source specifications.

In fact, the EIF Communication was accompanied by action to support the implementation of the European interoperability framework over 2016-2020, through a series of solutions supported by the ISA² and CEF programmes. The Commission, through the ISA² programme, then created and promoted interoperability solutions that support implementation of the EIF by the Member States as described in the ISA² final evaluation report[62].

Up to the end of 2020, the ISA² programme supported a total of 54 actions, grouped in nine packages, which were devised on a yearly basis through an annual rolling work programme. The nine packages are:

1. key and generic interoperability enablers;
2. semantic interoperability;
3. access to data / data sharing / open data;
4. geospatial solutions;
5. eProcurement / eInvoicing;
6. decision-making and legislation;
7. EU policies – supporting instruments;
8. supporting instruments for public administrations; and
9. accompanying measures.

ISA² managed 39 actions in its first year of operation, 43 actions in 2017, 53 actions in 2018, and 54 actions under both the 2019 and 2020 rolling work programmes.

In its digital policy hub, the National Interoperability Framework Observatory provides examples and case studies of national IT solutions and services implemented in public

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Krimmer R. (2021), Drivers for and Barriers to the Cross-border Implementation of the Once-Only Principle. In: Krimmer R., Prentza A., Mamrot S. (eds) The Once-Only Principle. Lecture Notes in Computer Science, vol 12621. Springer, Cham. https://doi.org/10.1007/978-3-030-79851-2_3; Kalvet, T., Toots, M., & Krimmer, R. (2018), Contributing to a digital single market for Europe: barriers and drivers of an EU-wide once-only principle. In Proceedings of the 19th Annual International Conference on Digital Government Research: Governance in the Data Age (pp. 1-8). https://dl.acm.org/doi/10.1145/3209281.3209344.

61 https://joinup.ec.europa.eu/collection/national-interoperability-framework-observatory/eif-toolbox.

62 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2021:965:FIN.

administration following the EIF principles. EU solutions that follow the EIF principles can be found in the EIF toolbox, which is now also starting to include national solutions.

Annex VII gives a comprehensive overview of solutions supporting EIF implementation that are available to Member States, as part of the interoperability action plan described above. Most of them are also accessible through the EIF toolbox[63]created to that end.

4. EVALUATION FINDINGS (ANALYSIS)

4.1 To what extent was the 2017 EIF successful and why?

To assess whether the EIF has been successful, this chapter assesses how well it meets the following three criteria: i) effectiveness; ii) efficiency; and iii) coherence. The assessment draws on desk research, stakeholder and public consultations, and data collected from annual EIF monitoring across the 27 Member States.

The EIF has certainly **helped to inspire European public administrations** at all levels to design and deliver digital public services, as well as providing guidance to public administrations on the design and updating of NIFs or digital strategies.

Figure 3 in Chapter 3 shows that most Member States have drawn up a NIF or a similar national strategic or policy document that incorporates, at least in part, the EIF's recommendations, principles, and models for delivering digital services[64].

However, the EIF's final achievement in helping to provide interoperable, user-centric public services in the EU and the development of a European public services ecosystem were limited, highlighting the need for more action and practical insights.

EIF Monitoring mechanism

The EIF monitoring mechanism, used for the annual monitoring exercise by the National Interoperability Framework Observatory[65], is one of the Commission's most important data sources for tracking roll-out of the EIF across the Member States. It provides an overview of NIFs (see Figure 3 in Section 3), which currently present a positive picture of EIF implementation progress. However, there is an important caveat: the EIF monitoring mechanism focuses on the higher level of conceptual take-up of the guidance and commitment to the framework's principles, recommendations, layers, and high-level components.

The depth and breadth of EIF monitoring is limited by the cross-cutting nature of interoperability, deeply embedded in broader digitalisation efforts, and by the fact that public services are implemented and delivered by hundreds, or even thousands, of different authorities in some countries. Monitoring[66] is mainly done by gathering data directly from Member States through an online questionnaire and transforming the replies into score values for the various KPIs. The methodology for this is established under the guidance of the JRC's Composite Indicator Unit. For some few KPIs only, the data are collected directly from other EU observatories that target specific domains or areas overlapping with the EIF, such as

63 https://joinup.ec.europa.eu/collection/nifo-national-interoperability-framework-observatory/solution/eif-toolbox/eif-toolbox.

64 https://joinup.ec.europa.eu/collection/nifo-national-interoperability-framework-observatory/national-interoperability-initiatives.

65 https://joinup.ec.europa.eu/collection/nifo-national-interoperability-framework-observatory/eif-monitoring.

66 https://joinup.ec.europa.eu/collection/nifo-national-interoperability-framework-observatory/eif-monitoring.

DESI, the eGovernment Benchmark report, the open data portal, or the Accessibility Directive.

Similarly, the overview of NIFs captures only the conceptual commitment, while stakeholders' expectations are focused on the implementation level – implementing interoperability guidance at the service level. This is where a gap is apparent: between the conceptual level, where progress is generally positive, and practical implementation, where there is room for improvement in specific areas and where additional efforts are deemed necessary.

Evaluation of EIF's main components

The EIF's main components – **the conceptual model, the layered interoperability model and the recommendations** – are all useful, but are perceived as difficult to implement. As a result, more assistance appears to be needed for Member States in the form of guidance and systematic steps toward implementing the EIF's recommendations. The risk is that the lack of granularity will allow for multiple interpretations.

There is undoubtedly a divide between acceptance of the EIF's conceptual aspects and the need for more **practical guidance in implementing interoperability requirements**. There is also a need to **raise awareness**, particularly at local level. National public authorities are relatively confident in the EIF's ability to provide public administrations with guidance on the design and updating of NIFs or strategies. However, they report that the framework's voluntary nature and the scope of its recommendations restrict its ability to foster cross-border and cross-sector interoperability or take technological developments into account. This limits its contribution to the establishment of the digital single market.

Two factors can explain the **limited success** in achieving the objectives.

1. The EIF's **objectives are extremely broad** and the recommendations **usually high-level. Further clarity and guidance would be required to ensure** that they are implemented by Member States.
2. In some sectors, a lack of **collaboration between the private and public sectors** impedes the growth of synergies.

To begin, the EIF's principles are applicable to the development of interoperable digital public services in general. On the plus side, the principles of **openness, technology neutrality, and data portability, as well as the reusability of IT solutions, transparency, and administrative simplification** are deemed particularly critical, based on input from both targeted and open consultations, and are crucial for enhancing interoperable digital services.

Indeed, the EIF monitoring mechanism's findings suggest that progress has been made toward implementing several of the principles identified as beneficial by stakeholders consulted. Most Member States are particularly aligned with the EIF in areas such as **principle 2: 'Openness', principle 8: 'Security and privacy' and principle 10: 'Administrative simplicity**' (see Annex VI.2).

However, several concepts are either **too abstract (information preservation, effectiveness and efficiency assessment, and subsidiarity and proportionality**), or they require additional clarification and practical focus to maximise their usefulness (transparency, technological neutrality and user-centricity). Further guidance is needed for a number of principles (including the assessment of effectiveness and efficiency, multilingualism, and subsidiarity and proportionality), as demonstrated by monitoring mechanism finding that better implementation is called for at Member State level.

There are also principles from the EIF that require further development[67], **such as multilingualism, information preservation, effectiveness and efficiency assessment, and subsidiarity and proportionality.** This feedback is also corroborated by the EIF monitoring mechanism's results, particularly in relation to principle 1: 'Subsidiarity and proportionality', principle 9: 'Multilingualism', principle 12: 'Effectiveness and efficiency assessment', and principle 7: 'Inclusion and accessibility.' Numerous countries have scores on the scale's lower limit, (1 or 2), indicating the need for additional efforts to comply with the EIF's principles and recommendations in their particular areas (see Annex VI.2).

While layered interoperability and the conceptual model are deemed beneficial for enhancing interoperable digital public services and are adequately addressed by the EIF, additional guidance could make them more actionable, as confirmed by both consulted stakeholders and EIF monitoring mechanism findings.

Layered interoperability could be further enhanced by applying the **recommendations on the governance, organisational, and legal levels of interoperability**. The evaluation study[68] demonstrates that greater emphasis should be placed on the non-technical aspects of interoperability, acknowledging that interoperability is a multifaceted notion, not limited to technical difficulties. Certain features of the semantic layer could also be addressed, such as the low rate of semantic adoption due to a lack of awareness or knowledge about the services end consumers.

Moreover, it emerged from the evaluation study that some stakeholders judged the **organisational and legal layers** to be incomplete and under-implemented. The organisational layer, in particular, requires clarification because it is believed to be too **basic for practical applications in its current state**. Finally, the layered model could be improved by elaborating on the interactions between the technological, organisational, and legal layers.

The monitoring mechanism's findings corroborate these observations. The scorecard for the **EIF's layered model of interoperability** demonstrates that Member States have made significant efforts to implement the EIF and its recommendations in this area, most notably technological interoperability at EU level. However, the scoreboard identifies a need to improve implementation of suggestions relating to the governance levels of interoperability, organisational interoperability, and legal interoperability.

Stakeholders contacted about **the conceptual model** confirm that it has helped to enhance interoperable digital public services to some extent. However, the conceptual paradigm is regarded as overly abstract and inoperative. As a result, Member States may interpret and hence implement it inconsistently, jeopardising the goal of interoperability. As such, experts and representatives from public administrations call for the establishment of an end-to-end operational approach to assist Member States in implementing interoperability by design in order to develop a comprehensive interoperability approach.

As regards the **EIF's coherence**, the EIF's principles, layered interoperability model, and conceptual model for integrated public service delivery are **generally synergic**. To improve

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67 Interestingly, the scores given to these principles show disparities between the consulted groups of stakeholders. Overall, EU and non-EU citizens are relatively unenthusiastic about the usefulness of these principles in enhancing interoperable digital public services (average scores of 3.47, 3.24, 3.29 and 3.13 out of 5 respectively, based on 17 responses to the targeted and the public consultations). By contrast, these principles are generally deemed more useful by companies and business associations (average scores of 3.80, 3.53, 3.73 and 3.38 out of 5 respectively, based on 15 responses to the targeted and the public consultations), and by experts and academia (average scores of 4.00, 3.71, 3.36 and 3.64 out of 5 respectively, based on 14 responses to the targeted and the public consultations).

68 CEPS EIF final evaluation final study, available at https://op.europa.eu/en/publication-detail/-/publication/29d694d4-4696-11ec-89db-01aa75ed71a1/language-en/format-PDF/source-search.

the framework's overall cohesiveness, the conceptual model might be more closely related to the other two components. According to the research, the strength of the national frameworks is contingent on an in-depth understanding and design of these three EIF components. **The components' interdependence is exemplified by the connection between the semantic layer, the ideals of openness and transparency, and the section of the conceptual model on openness**. The principles and layered interoperability model are extremely synergistic, while enhancements to the conceptual model may result in more synergies.

The recommendations made throughout the EIF are largely self-reinforcing. Nonetheless, there are several instances where EIF guidelines overlap, at least thematically. While the overlaps may not cause problems, by better organising the recommendations, the important messages could be clarified, making the advice more actionable. On a more detailed level, the EIF monitoring mechanism's findings suggest that various enhancements might be made to further support the conceptual model's implementation in some Member States, notably, Germany, Ireland and Romania (see Figure 6 in Chapter 3).

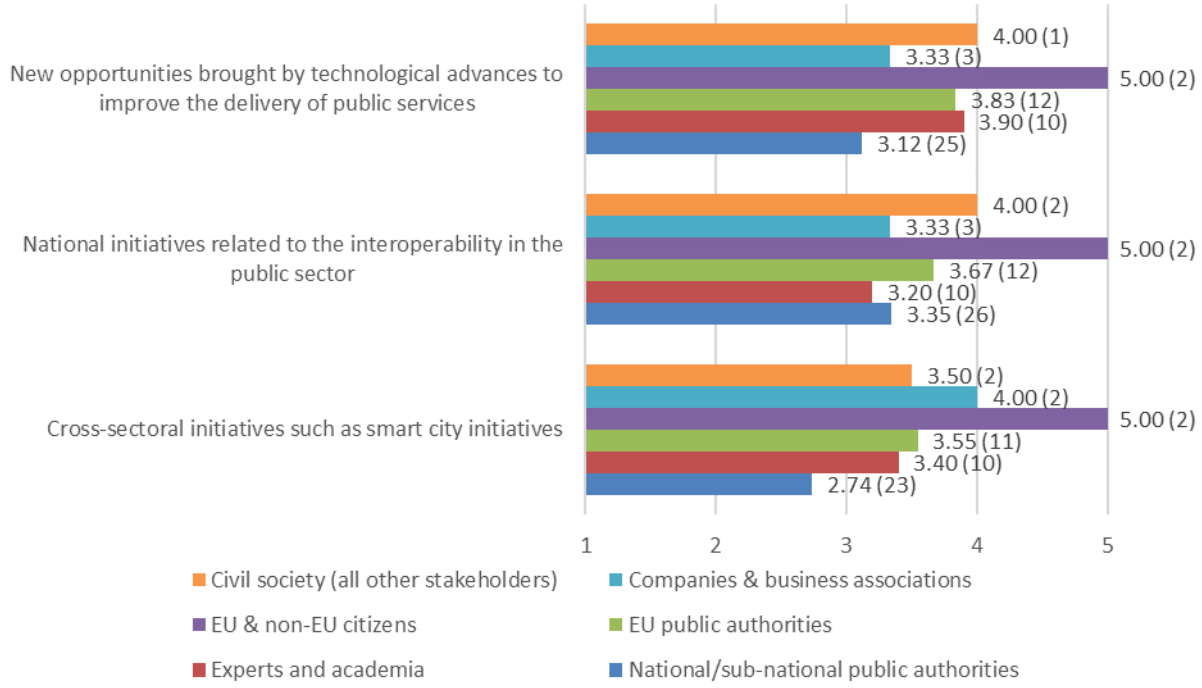
Almost all countries do admirably in the field of '**internal information sources and services**' (with scores of 4 almost everywhere), but efforts in some countries like Germany, Ireland and Poland would need to be stepped up (as signalled by scores of 1; see Annex VI.2). Additionally, progress on open data is encouraging, with all countries rating towards the top of the scale (scores of 3 and 4). Improvements could be made to cataloguing, external information sources and services, as well as security and privacy.

External drivers

External drivers such as technological advancements and national and cross-sectoral interoperability initiatives have contributed to some extent to the EIF's observed achievements. The main constraining factors, to be minimised, are seen as **limited resources and institutional complexity.**

According to respondents in targeted consultations, external drivers do, on average, contribute to the framework's implementation (see Figure 7).

Figure 7: Extent to which the following external factors contribute to implementation of the EIF (breakdown by group of stakeholders; average score and number of respondents)



Score: (1) not at all; (2) to a limited extent; (3) to some extent; (4) to a great extent; or (5) completely.
Note: Averages do not include respondents answering 'don't know/no opinion' (DK/NO).
Source: Study supporting the evaluation of the implementation of the EIF

However, the low average score assigned to cross-sectoral projects by national public agencies is particularly noteworthy. **This score indicates primarily a lack of coordination between the public administrations of the various Member States**. The COVID-19 pandemic has highlighted the critical nature of interoperable solutions. Nonetheless, several expert studies determined that **cross-sectoral initiatives** can play a significant catalytic role in advancing interoperability adoption. In this context, **smart city** efforts are instructive. There is significant opportunity to enhance such projects by ensuring that interoperability is a topic of discussion and, more significantly, a requirement, thereby reinforcing the EIF's fundamental messages. There are considerable opportunities to achieve economies of scale for smart cities by reusing tools, data, and applications[69].

Some unfavourable external influences have a similar impact on the EIF according to the respondents in the EIF evaluation consultations (see Figure 8). These are described below.

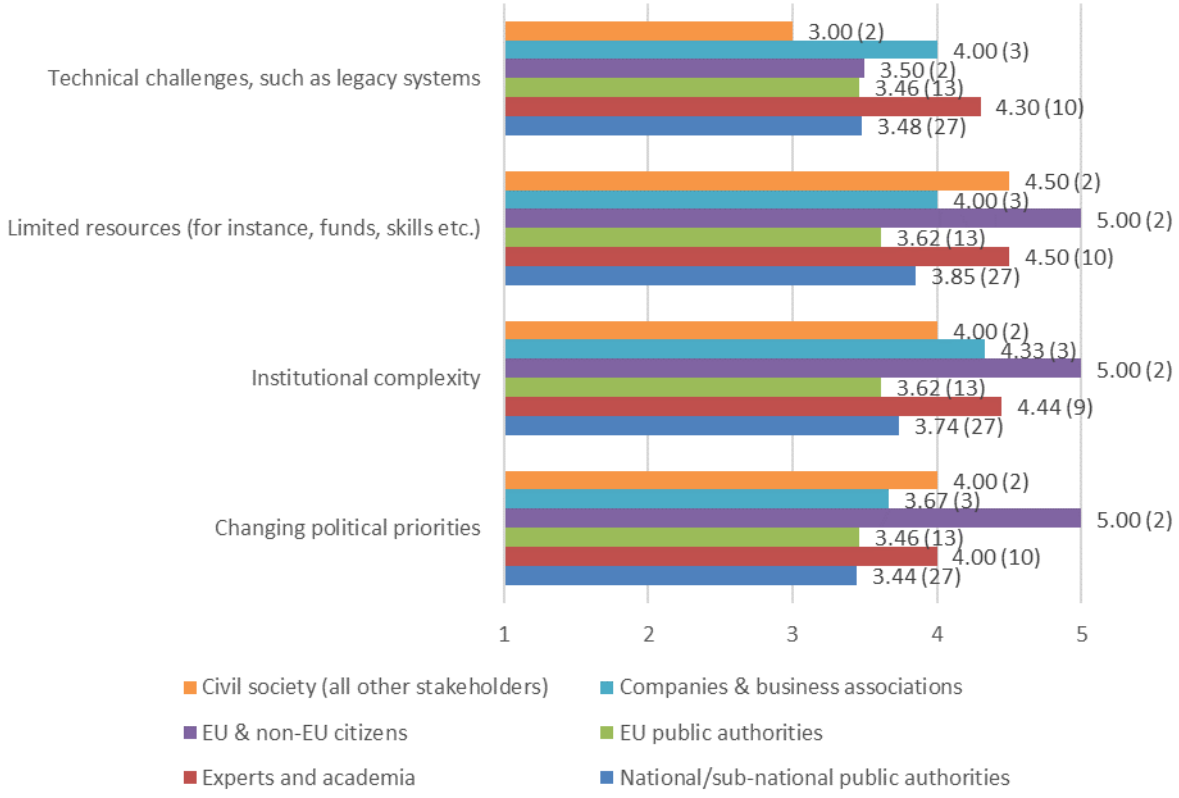
1. **Scarce resources. budgetary limits, organisational difficulties, and a skills shortage.** These obstacles stem mostly from a lack of human and financial resources, but also from the incompatibility of national databases[70].

[69] A new EIF for Smart Cities/Communities (EIF4SCC) is currently under development at EU level. See 'Proposed European Interoperability Framework for Smart Cities & Communities (EIF4SCC)', published on: 07/04/2021, Joinup. Available at: https://joinup.ec.europa.eu/collection/nifo-national-interoperability-framework-observatory/news/eif4scc-smart-cities-communities.

[70] European Commission, How do Member States and Norway ensure accurate, timely and interoperable data management in the asylum procedure?, EMN flash #18 – 2021. Available at: https://www.emn.lv/wp-content/uploads/2021/07/EMN-Flash_data-management-in-asylum-procedure_final_24062021.pdf

2. **Institutional complexity**[71]. This is undoubtedly the most challenging factor to solve, as it may be necessary to adjust the legislative framework in order to execute the EIF successfully, and institutional changes are slow to materialise. A new analysis on the influence of open source software on technological independence, competitiveness, and innovation in the EU economy identifies a fragmentation of duties in the field of digital policy, impeding collaboration on digital law-making[72]. This issue has a range of consequences for different countries, as some countries' legal systems are more amenable to reform than others. Interoperability and institutional complexity are inextricably linked; this issue can be partially resolved by enhancing interoperability.
3. **Limited awareness** is another barrier that is deemed to jeopardise the EIF's take-up, particularly at regional and municipal level and in the design of digital public services.

Figure 8: Extent to which the following external factors are jeopardising the implementation of the EIF (breakdown by group of stakeholders; average score and number of respondents)



Score: (1) not at all; (2) to a limited extent; (3) to some extent; (4) to a great extent; or (5) completely.
Note: Averages do not include respondents answering 'don't know/no opinion' (DK/NO).
Source: Study supporting the evaluation of the implementation of the EIF.

EIF beneficial effects

The framework has had some beneficial effects. The EIF has to a certain extent contributed to the improvement of the quality of public administration services and to the promotion of free

[71] Institutional complexity captures the difficulty and slowness of change in the legal system, as well as the complexity arising from a fragmented and multi-layered distribution of competences between the different levels of public administration.

[72] Fraunhofer ISI, OpenForum Europe (2021), The impact of Open Source Software and Hardware on technological independence, competitiveness and innovation in the EU economy, p. 307-308.

movement of products, services, capital, and labour across Member States. **A strong alignment between the NIF and the EIF would surely boost the direct and indirect benefits for stakeholders** (i.e. residents, enterprises, and public administrations) through better digital public services, particularly at cross-border level.

As explained above, some Member States have created an NIF based on the EIF, such as Belgium, Estonia, Greece, Spain, Cyprus, Luxembourg, Malta, Netherlands, Austria, Portugal, Romania and Slovenia.

Spain for example has passed an EIF-based NIF into law through a Royal Decree[73]. The purpose is to ensure that the systems and applications used by public administrations are technically, semantically and organisationally interoperable enough to enable rights to be exercised and duties fulfilled through electronic access to public services, while also enhancing effectiveness and efficiency. Thanks to the NIF, sound governance has been stablished across various administrative levels, and a set of supporting common services (eID, eSignature, eDelivery, eInvoicing…), infrastructures and technical specifications[74] have been devised for common and more efficient digital service provisioning. Thanks to this, public services were not disrupted during Spain's first COVID-19 lock-down (the most severe in Europe along with Italy's). The Spanish Chief Information Officer (CIO) highlighted common infrastructure and services as being among the key elements for the smooth delivery of public services during the first wave of the COVID-19 crisis. See below further details. In addition, thanks to Spain's EIF-based NIF, data on taxation, social security, justice etc. data can be exchanged through a common interoperable platform[75], used by all digital services in the country on a daily basis, reducing the administrative burden on people and businesses.

Likewise, on the 1 March 2019, Luxembourg's Government Council adopted an NIF[76] which guides public sector bodies within its remit on how to attain a higher level of interoperability. This was Luxembourg's first NIF bringing together in the same text all the elements needed for a coherent and clearly structured base for public sector interoperability. The NIF builds on the 2017 EIF whilst taking account of context and specific national needs. The NIF thus complies with the requirements set out in the Commission's EIF and enables the Luxembourg government to make progress towards greater interoperability.

The Slovenian framework provides for a website[77] for publishing public sector interoperability solutions and products. It connects a catalogue of interoperability solutions with best practices for reusing its content.

Some NIFs set up the necessary governance to work together in a coordinated matter on interoperability-related topics supporting common goals and priorities laid down by the national digitisation policies, as well as relevant EU legislation like eIDAS, the Single Digital Gateway Regulation and the Open Data Directive. Such governance arrangements typically bring on board all ministries at central level, the regions and even the local government in the design and implementation of common processes, IT systems and technical specifications.

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73 https://www.boe.es/buscar/act.php?id=BOE-A-2010-1331.

74 https://administracionelectronica.gob.es/pae_Home/pae_Estrategias/pae_Interoperabilidad_Inicio/pae_Normas_tecnicas_de_interoperabilidad.html.

75 https://administracionelectronica.gob.es/pae_Home/pae_Estrategias/Racionaliza_y_Comparte/elementos_comunes/Intermediacion_de_datos.html.

76 https://digital.gouvernement.lu/en/dossiers/2019/NIF-2019.html.

77 https://nio.gov.si/nio/vstopna.nio?lang=en.

The report on public administrations' digital responses to COVID-19 in Europe[78] shows that five countries (Czechia, Denmark, Estonia, Spain and the Netherlands) reported no disruption to their public services. This appears to be in line with what was outlined in the 2020 edition of the European Commission eGovernment benchmark[79] as four of these five countries are considered to have highly digitalised public services, scoring well above the European average. The delivery of public services in four of these five countries is also considered to be highly interoperable with scores above the European average on the EIF. This is also further corroborated by the Danish, Estonian Spanish and Dutch national CIOs, who stated that the already high level of digitalisation in public services delivery helped to ensure the continuity of these services throughout the first wave of the COVID-19 crisis.

An example of an EU solution which puts these generic interoperability guidelines into practice is the EU interoperability gateway for COVID-19 contact-tracing and vaccines. A national/bi-national solution is Estonia and Finland's X-Road[80] platform, linking all public digital services.

Estonian experience demonstrates that the EIF aided in the development of a wide variety of digital and cross-border public services relating to company and property registration (for more details, see also the above section covering the impacts of external factors). Additionally, the EIF contributes **to the free movement of commodities, services, capital, and labour throughout Member States**. Experts and academia, as well as businesses and business organisations, are generally more optimistic about the framework's potential benefits for **research, development, and innovation**.

With regard to implementation of the EIF, IMAPS is an online survey developed under the ISA² programme, helping **public service owners** evaluate, consider and improve all key interoperability aspects of their digital public service (legal, semantic, organisational, or technical), in compliance with the EIF. Some public bodies have used the tool on a voluntary basis to make their administrative procedures fit for purpose for the single digital gateway, assessing the level of digital maturity of a public service that needs to be provided online by 2023 and accessible via the gateway. Examples include online submission of corporate tax declarations or applications for a European health insurance card (EHIC). Some countries (Belgium, Czechia and Slovenia) and the city of Valencia have used the survey to detect areas for improvement and to make digital services more mature from the EIF perspective.

IMAPS publishes an annual report on the **interoperability maturity of European digital public services** assessed using IMAPS. The latest IMAPS report (2020) reveals that all assessed digital public services are on average below the essential interoperability level (IMAPS maturity level 3).

However, this EIF evaluation shows the limitations on providing a deeper and wider analysis of the level of EIF implementation across the hundreds and thousands of bodies in the 27 Member States. To do systematically, sound interoperability governance would be needed, involving the main national authorities dealing with digitalisation, in close coordination with the regions, local authorities and the European Commission. A common process for apply IMAPS would be beneficial, or a similar tool aligned with main interoperability and digitalisation goals stemming from the national and |EU strategies and policies. The aim would be to ensure that any interoperability maturity level assessment helped to monitor,

78 https://joinup.ec.europa.eu/collection/nifo-national-interoperability-framework-observatory/report-public-administrations-digital-response-covid-19-europe.

79 The European average for the eGovernment benchmark 2020 is 72%. The four countries scoring above the European average are: the Netherlands (78%), Spain (78%) Denmark (84%) and Estonia (92%).

80 https://x-road.global/.

rationalise and steer all implementation plans and investments, and find gaps, overlaps, inefficiencies and ways to bridge them.

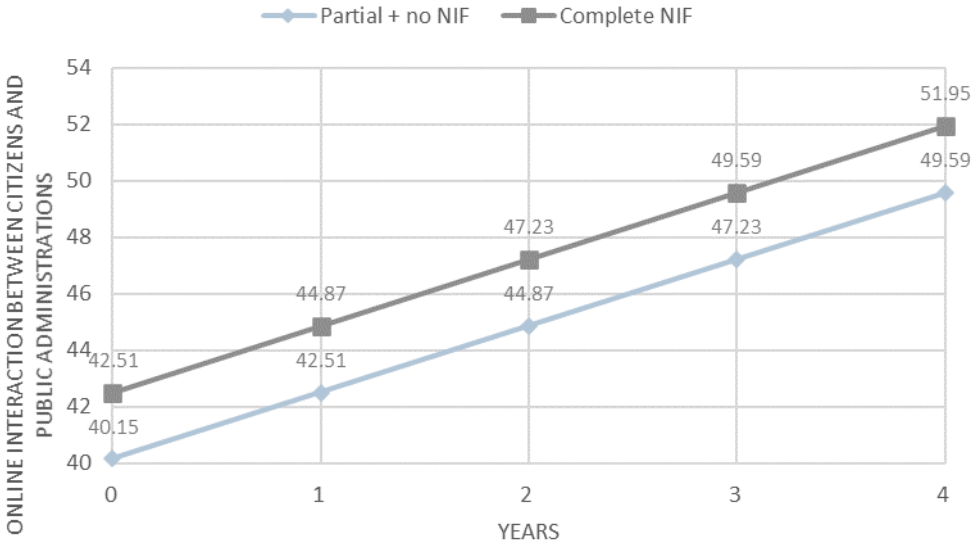
The EIF can serve as a **genuine catalyst for public-government dialogue**. It is possible to quantify both the impact of adopting an EIF-based NIF and the maturity level of digital, online public services to gain additional insight into the range of possible EIF impacts and improvements in digital public services.

An economic analysis demonstrates that an EIF-based NIF, or an NIF with EIF-based components, is more conducive to public-government interaction than no EIF-based NIF. Additionally, a 10% improvement in the quality of online public services would encourage an additional 4.3 million to 5 million EU residents to connect with their governments via the internet each year.

Figure 9 and Figure 10 respectively report the results obtained under two different regressions:

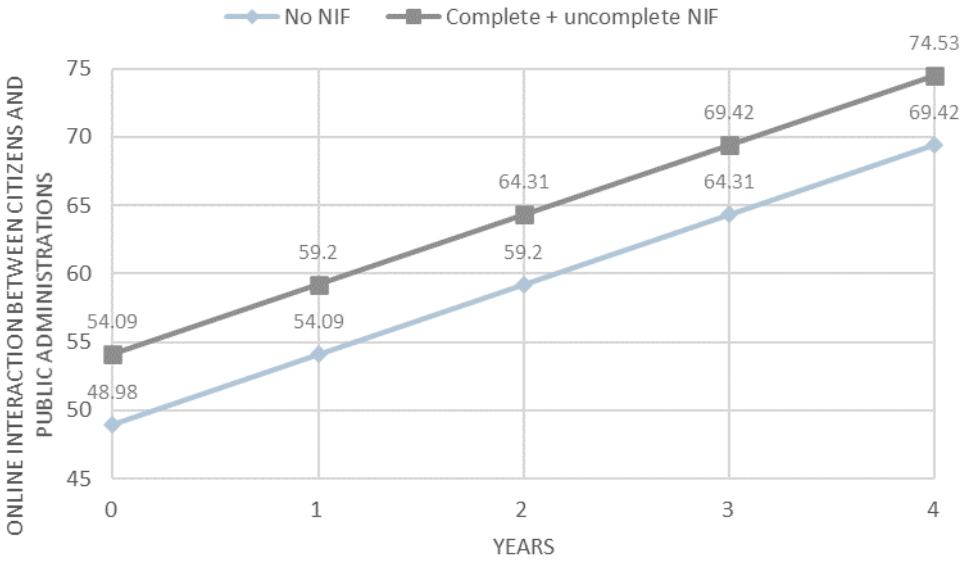
1. a 'complete' EIF-based NIF compared to an 'incomplete' EIF-based NIF or no EIF-based NIF; and
2. a 'complete' or 'incomplete' EIF-based NIF compared no EIF-based NIF.

Figure 9: Average effect of having a 'complete' NIF compared with an 'incomplete' NIF or no EIF-based NIF, on the level of people's online interaction with public administrations



Note: The results (i.e. when NIF 'complete'=1 and NIF 'incomplete'=0) compare countries having a fully EIF-based NIF with countries having a partially EIF-based NIF or no EIF-based NIF at all. The results assume linearity over time, i.e. the average effect of having an NIF on online interaction with public administrations is assumed to be constant over time.
Source: Study supporting the evaluation of the implementation of the EIF

Figure 10: Average effect of having a 'complete' or 'incomplete' EIF-based NIF compared with no EIF-based NIF, on the level of people's online interaction with public administrations



Note: The results (i.e. when NIF 'complete'=1 and NIF 'incomplete'=1) compare countries having a fully or partially EIF-based NIF with countries having no EIF-based NIF or similar strategies. The results assume linearity over time, i.e. the average effect of having an NIF on online interaction is assumed to be constant over time.
Source: Study supporting the evaluation of the implementation of the EIF.

This analysis is conducted at the macroeconomic level and is based on binary variables indicating whether or not the countries analysed have approved an NIF or comparable national strategic documents based entirely or partially on the EIF. As a result, the analysis **does not account for the effects of the practical implementation** of specific interoperability standards, but rather for the effects of strategic advice in general. The analysis determines the average impact throughout the sample examined. The magnitude of the effects may vary by country.

Additionally, the findings confirm the association between increased service quality and the fact that improved eGovernment services enable people to interact more with their government via the internet. More precisely, a 10 % increase in the eGovernment index results in an increase of 1.5-1.7 % in people's use of the internet to connect with public authorities while all other variables remain constant.

On the efficiency front, the data **indicate that benefits may outweigh costs in some cases**. While public administrations bear the costs of implementing the EIF, streamlining procedures and facilitating data exchange are seen as benefiting a broader range of stakeholders by improving interactions (i.e. saving time and money) between public administrations on the one hand and between public administrations and users of public services on the other.

Most of the EIF's benefits stem from two factors.

1. **Affirming the importance of administrative simplicity**. By streamlining and simplifying the digital delivery of public services, EIF implementation costs were negligible in comparison to the cost savings associated with interactions between public administrations, and between administrations and their constituents.

2. **Encouraging data reuse**. The EIF's goal is to assist public administrations in avoiding duplication of efforts and effectively leveraging existing resources and information, resulting in better service quality.

Concerning expenditure by public administrations in implementing the EIF, national and EU public administrations gave consistent responses. **Supporting the framework's roll-out is regarded to be reasonably inexpensive**, at both national and EU level. In the Netherlands, for example, an independent and external advisory body (ACTAL, the Dutch advisory board on regulatory burden) has been set up to assist the government and parliament on minimising regulatory burdens.

Additionally, short-term advantages must be weighed against long-term benefits. While initial investments can be costly, as procedures are optimised, operating costs tend to decrease over time.

The deployment of NIFs inspired by the EIF clearly also **resulted in various benefits.**

1. The EIF **facilitates synergies in the implementation and design of new services, contributing to the reuse** of a diverse range of software programmes collected in the Italian reuse catalogue, for example.
2. **Interoperability has resulted in cost savings associated with various ICT projects**. Centralised authorisation of ICT projects is estimated to have saved Czechia more than EUR 39 billion in public investment in 2019. Additionally, some ICT projects filed by public agencies were rejected due to their failure to meet interoperability criteria. Notably, public administrations were able to rethink and adapt their project ideas, resulting in further savings, by depending on the sharing and reuse of existing digital solutions and shared government services.

While voluntary adoption of the EIF and its recommendations has undoubtedly resulted in benefits recognised by public administrations, more should be done to foster an EU-wide strategy that is really integrated. However, **a comprehensive evaluation** is impossible to make due to the framework's broad scope and non-binding character.

Cost-benefit analysis

In measuring and comparing the expense of adopting the EIF and applying these costs to NIFs, **many difficulties arise** due to the voluntary nature of the framework. These difficulties are due to the varying cost of digitalisation across different public sector bodies and the different approaches taken by countries in implementing the EIF and the varying degrees of digitalisation. Comparisons between Member States are complicated, as costs may vary in terms of coverage and over time, even when cost differences are clear (see Box 1).

Moreover, interoperability is an underlying support function for digital transformation; for this reason, many of the assessments conducted by Member States are based on digital government transformation costs. Defining specific interoperability costs requires complex research and analysis. The consultation with the stakeholders nevertheless provided some reference points for the costs linked to producing a strategy or an NIF document and bound mainly to consultation services.

The complexity of EIF implementation make it hard for Member States to estimate the associated costs. Many different authorities and public services are involved and it is difficult to isolate EIF implementation from the overall digital transformation processes. This is also the case for the implementation of EU policies. The team working on the single digital

gateway conducted a study[81] to estimate the cost of implementing the once-only principle where interoperability plays a major role. Its conclusions, summarised below, show that the costs were hard to quantify.

1. The scarcity and low comparability of data makes it difficult to assess the costs and benefits of incorporating the EIF into national frameworks. The voluntary nature of the framework is reflected in its uneven and ad hoc uptake across the EU, limiting the availability of data and making comparison between countries difficult. Furthermore, implementation of the EIF has not followed the same timeline in the different countries. To overcome this limitation, the study team contacted the national public authorities that responded to the consultation activities and indicated their availability to participate in a follow-up interview, to gain insight on the time spent (in terms of person-days) on the incorporating the EIF, or part of it, into their national framework.

2. The overarching scope of the EIF hinders the assessment of the direct costs and benefits stemming from its implementation. Costs and benefits deriving from the EIF do not relate exclusively to implementation of the framework; costs and benefits also depend Member States' levels of digitalisation, the degree of centralisation and varying organisational structures involved in delivering public services. The costs related to interoperability initiatives are borne at different levels of administration in different countries. The cost discrepancies are due to the following factors.
   - **The extent to which information technology has been digitised**. Member States that have already deployed interoperable solutions in line with the EIF can quickly build on pre-existing solutions, resulting in reduced costs and responsibilities. Additionally, governments that rely on open source solutions mitigate the risk of lock-in. As a result, solutions can be more easily transferred or altered, resulting in cost savings.
   - **Catch-up effects**. Because public services have differing degrees of centralisation and organisational structures, the costs of interoperability projects are borne at varying levels of administration in different countries, as stated in the expert assessments accompanying this study. In Sweden, for example, costs are borne primarily by individual agencies. In comparison, the role of national government initiatives and support is substantially stronger in neighbouring Norway and Denmark. It is often difficult to assess the cost of ICT projects since they can contain significant hidden costs such as the involvement of existing workers in modifications required for the new operation design, such as training, or time spent on transitional operations.

These constraints underline the need to identify common criteria so that Member States' costs can be assessed consistently.

Furthermore, incorporating EIF guidance into the national framework is likely to have delivered different benefits in the different Member States (see Box 2).

Box 1: Member States' feedback on EIF implementation costs

Several representatives of public authorities in the Member States provided additional feedback on the number of person-days required to take up the EIF in the development of national frameworks or strategies for interoperability. The number of person-days is

[81] Readiness of MS to connect and exchange data in accordance with Article 14 of the Single Digital Gateway Regulation and the once-only principle infrastructure.

translated into a costing based on average labour costs in all sectors (based on NACE rev.2 activity)[82] in the respective countries. In line with the better regulation toolbox, an extra 25% is added to labour costs to account for overheads (e.g. rent costs, utilities, insurance, office equipment and supplies, and travel costs)[83]..

On that basis, time and costs can amount to **150-205 person-days** (equivalent to approximately **EUR 24 000 –EUR 30 000**) for creating updated drafts of existing national documents and strategies based on the EIF, and **550 person-days** (equivalent to approximately **EUR 169 000**) for designing EIF-based national documents and strategies from scratch. Costs also differ according to how fully the EIF has already been implemented. Countries that have not implemented the EIF before may incur more up-front costs to 'catch up' with the other Member States.

Box 2: Cost-saving benefits of interoperability

Limited interoperability impedes the digitalisation of the public sector and makes it difficult to achieve benefits such as time and cost savings. Addressing this problem and enabling digital transformation in public services could save result in significant savings. Several studies have carried out cost-savings analyses in different countries or geographical areas following the implementation of different solutions. Table 1 reports the findings on estimated cost savings collected during the desk research.

Table 1: Cost-savings estimations

Geographical coverage	Implemented solutions	Cost savings
Belgium[84]	Digital government solutions	In 2016: 1. EUR 4.6 million for businesses 2. EUR 28 million for the public
UK[85]	Digital strategies and implementation of key principles: digital-by-default public services	GBP 1.7 billion to GBP 1.8 billion every year
Netherlands and Belgium[86]	Digital strategies and implementation of key principles: **once-only principle**	In 2017: EUR 163 million EUR 100 million a year

82 Eurostat (reference year: 2019), Labour cost levels by NACE Rev. 2 activity, available at: https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=lc_lci_lev&lang=en.

83 European Commission (2017), Better Regulation Toolbox, p. 496.

84 For further details please see: Digital Dashboard Belgium, Evolution of cumulative annual cost reduction per target group 2016, https://digitaldashboard.belgium.be/en.

85 For more details please see: https://gds.blog.gov.uk/2015/10/23/how-digital-and-technology-transformation-saved-1-7 bn-last-year/.

86 For further details please see: Cave J. et al (2017), EU-wide digital once-only principle for citizens and businesses, https://ec.europa.eu/digital-single-market/en/news/eu-wide-digital-once-only-principle-citizens-and-businesses-policy-options-and-their-impacts.

Spain[87]	Digital strategies and implementation of key principles: e-administrations**, once-only principle**, and interoperability platforms	EUR 22 billion between 2008 and 2011, with: 3. 60% linked to e-administration 4. 20% to the implementation of the once-only principle and 5. 20% to interoperability platforms
EU[88]	Digital strategies and implementation of key principles: **once-only principle** and digital-by-default public services	In 2014: 1. EUR 5 billion a year linked to the once-only-principle; and 2. EUR 10 billion a year linked to the digital-by-default principle

Source: Study supporting the evaluation of the implementation of the EIF based on official reports.

The expense of translating the EIF, or parts of it, into national frameworks is **difficult to assess** and ranges from EUR 24 000 to EUR 169 000 (based on the estimates of time translated into costs provided by representatives of several public authorities in the Member States).

The impacts of a public sector interoperability policy are more difficult to identify and quantify than those of many other EU initiatives. A report by the JRC[89] analysed the economic impact of public sector interoperability overall. It found that, due to its very nature as an enabling factor across many policy fields, the impact of interoperability is hard to isolate from other aspects of a policy. Interoperability in its many forms is an important enabler but it is interoperable policies and public services that deliver benefits (and consume resources).

Nevertheless, the evidence is quite conclusive. For instance, in terms of economic impact, the study by the JRC found that, at a conservative estimate, the public could save up to 24 million hours a year through improved interoperability. This would represent monetary savings in the order of EUR 543 million annually. For businesses, improved interoperability would lead to time savings of 30 billion hours. In monetary terms, this translates into savings of EUR 568 billion annually. Improvements in public sector performance due to interoperability could lead to an increase of 0.4% in GDP. Overall, the potential positive benefits derived from increased interoperability for the public sector in the EU are considerable. For instance, converting these estimates into monetary terms, a 1 % improvement in the indicators used, through greater interoperability, would boost EU GDP by EUR 21 billion - EUR 56 billion.

87 Gallo, C., Giove, M., Millard, J., Thaarup, R. (2014), Study on eGovernment and the Reduction of Administrative Burden, European Commission, p. 35. Available at: https://ec.europa.eu/futurium/en/system/files/ged/finalreportstudyonegovernmentandthereductionofadministrativeburden.pdf.

88 Ibid., p. VI.

89 Ulrich, P., Duch Brown, N., Kotsev, A., Minghini, M., Hernandez Quiros, L., Boguslawski, R. and Pignatelli, F. (2022), Quantifying the Benefits of Location Interoperability in the European Union, EUR 31004 EN, Publications Office of the European Union, Luxembourg, 2022, ISBN 978-92-76-48846-0, doi: https://doi.org/10.2760/72064, JRC127330.

Future monitoring should focus on reusing developed technologies and providing better estimates of costs. In this regard, a set of EIF-specific criteria could make it easier to compare costs across the EU (including, for instance, the daily cost of work by the team tasked with implementing the EIF at national level, the cost of partial implementation of the EIF, the number of consultations between the European Commission and the Member States when the EIF was agreed on and introduced, the time spent by annual reporting under the NIFO initiative, etc.).

The present evaluation study also shows the current limits to proper correlational analysis between digitalisation and interoperability, and the difficulties in decoupling the two effects in the estimates. Future work is needed to come up with sound methodologies for estimating the cost of interoperability, as opposed to the costs of digital transformation in a broader setting.

Coherence

The EIF is found to be consistent with initiatives such as **the Single Digital Gateway Regulation, the digital single market strategy, and the data strategy**. Both strategies highlight the EIF's role in digitalising EU public services. In addition, the 2017 EIF and measures to monitor its implementation reflected measures outlined in the eGovernment action plan 2016-2020. Moreover, the 2015 DSM strategy[90] called for revision of the EIF to better complement the strategy's goals of digitalising public services in the EU. The 2017 EIF heeded this call. The **interoperability action plan**[91] included key steps to be taken to further support the vision of digital and interoperable public services. The ISA² final evaluation study highlights the programme's contributions (as the main EIF implementation instrument).

Moreover, the adoption of a revised **EIF Communication** in 2017 helped with the successful completion of two actions in the e-government action plan for 2016-2020, namely actions 4 and 6. It was developed as part of the NIFO initiative, which is funded by the ISA² programme to monitor the framework's implementation in the Member States. The NIFO action also included an EIF toolbox. The toolbox maps possible interoperability solutions produced as part of the ISA² and CEF programmes, which public administrations can use to implement EIF recommendations. The toolbox also links the EIF's suggestions to their accompanying solutions.

Many of the EIF principles or 47 recommendations have been targeted by other provisions (examples given already include open data, SDG for once-only, privacy and data protection (GDPR), accessibility, etc.) This can be seen from a first mapping of digital-relevant EU initiatives onto the EIF pillars and individual recommendations, part of the EIF toolbox resources (see Annex VIII). However, some parts of the EIF are not yet specifically targeted by the EU regulator, such as interoperability governance or reusability.

As examples of coherence at EU level, the SDG Regulation mentions a number of ideas and fundamental concepts promoted by the EIF, such as the potential for reusing an ISA² solution and the core public services vocabulary application profile (CPSV-AP). The Regulation itself

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90 COM(2015) 192 final, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, A Digital Single Market Strategy for Europe, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A52015DC0192.

91 COM(2017) 134 final, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, European Interoperability Framework - Implementation Strategy, Annex 1.

implements a pan-European technical system using EIF principles and some solutions from the interoperability action plan, such as e-delivery and common vocabularies.

To implement the once-only principle, Article 14 of the Regulation obliges Member States to exchange evidence for 21 administrative procedures listed in Annex II to the Regulation. The EIF is fundamental to this endeavour. Implementation of harmonised common data models has already started for eight evidence types, to enable data to be shared according to semantic interoperability principles and fully in line with EIF guidance (semantic layer principles). These evidence types include the birth certificate, the absence of criminal records and academic qualifications. At Member State level, this involves firstly the central state digitalisation units. The last mile is taken care of by regional and local governments who host digital services in most cases and are strongly impacted by EU policies. Solutions for eDelivery and for interconnecting authoritative sources of data on people and businesses are also designed in line with principles and solutions stemming from the EIF conceptual model for integrated digital public service delivery.

The data.europa.eu portal has also been set-up using the EIF as inspiration, reusing a data model[92] created under the ISA² programme, to catalogue data and link up the open data sets from EU institutions, agencies and bodies, as well as European countries national and regional catalogues in an interoperable manner, according to the principles of the EIF conceptual model

Data portability is one of the main driving forces of the EIF. As another example, Article 28 of the data act draft proposal provides for common specifications and core vocabularies to underpin the interoperability of cross-sector and cross-border data spaces, fully in line with EIF principles and recommendations, to ensure interoperable data sharing services and flows. To ensure strong interoperability governance, the draft assigns a major role to the European Data Innovation Board, at least for public sector services. Where there are different approaches between sectors and even Member States on privacy, data protection, responsibilities, common use cases, data flows and data specifications, this can result in a lack of legal certainty for the sharing of data across domains, policy areas and borders. The data act proposal is meant to address this lack of legal certainty, in conjunction with EU data policy and data governance. In this regard, it is aligned with the legal interoperability concept promoted in the EIF, ensuring that organisations operating under different legal frameworks, policies and strategies can work together.

Health is another practical example. Patients typically have medical records that are hosted in a hospital or medical centre as a digital record. If the person moves to another location or country, transferring the file to another hospital digitally can be problematic since there are no, or few, common formats or solutions widely used in Europe. The solution is to agree on the pieces of information for the record, and then on common formats for the records.

This will be part of the European Health Data Space[93]. It has to be done in a way that not only health service providers, such as hospitals, but also other data users, for instance research institutions conducting medical research, can easily interpret the data and combine it with other data sources, such as mobility, socio-economic or environmental. This is one of the reasons why data spaces should be interoperable across themselves, and minimum technical

[92] https://joinup.ec.europa.eu/collection/semantic-interoperability-community-semic/solution/dcat-application-profile-data-portals-europe

[93] https://health.ec.europa.eu/ehealth-digital-health-and-care/european-health-data-space_en

requirements are needed. Cooperation and ongoing work in the area of digital health and health data use is applying EIF principles and actively seeking interoperability support.

ISA² solutions also help to implement the EIF and more broadly interoperability initiatives at EU and Member State level.

Other than those mentioned, **the EIF aligns with Horizon 2020, the INSPIRE Directive**, and the smart cities/communities projects. Moreover, the EIF's overlaps and inconsistencies with other projects are restricted.

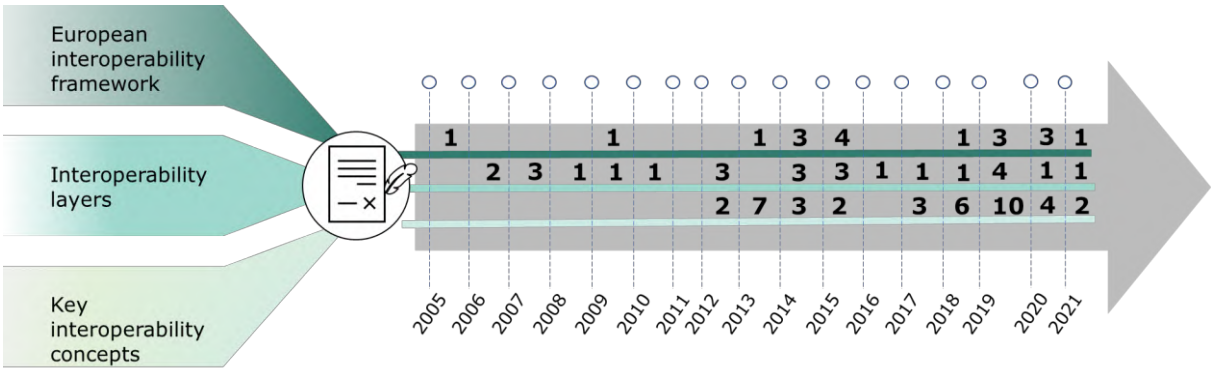
More direct references to the EIF could help reinforce the idea that such an EU-level framework has broad consequences, and that interoperability is vital for projects wanting to leverage the benefits of digital transformation.

An examination of rules, directives, decisions, and Commission communications from 2004 to 2021 demonstrates that the EIF's interconnections with other EU programmes might be strengthened. We discovered that:

1. the EIF has been considered **in the preparation of some legislation in areas** where interoperability is vital;
2. the EIF is mentioned in relevant communications, with a spike in 2020, indicating that public sector interoperability is becoming a more important policy issue. Most references are found after the 2010 EIF was adopted, although a few more references have been identified since the 2017 EIF was published.

Figure 11 lists the EIF and related keywords in regulations, directives, and decisions from 2004 to April 2021.

Figure 11: EIF mentioned in EU policies



Source: Study supporting the evaluation of the implementation of the EIF *based on the EurLex dataset and the EurLex website*

Finally, more could be done to strengthen the position of the EIF as a guiding, strategic document. It is important to ensure that alignment with the EIF is not limited only to the declarative level, but that it is fully taken on board in implementing new policies. A future interoperability strategy and policy could definitely contribute in this regard.

4.2 How did EU intervention make a difference?

National or sub-national initiatives would make a **very limited contribution** to the EIF's aims. Consulted public authorities saw only **limited potential** for **national and sub-national efforts** to contribute to the EIF's existing aims, with substantial reliance on national expertise and improvements in digital public services. Indeed, there are countries at both ends of the spectrum: those that are more advanced and experienced and those that are less advanced and experienced. This heterogeneity may have a detrimental effect on interoperability at EU level.

Heterogeneity of solutions and methods may impede EU-wide interoperability. More crucially, **the cross-border dimension cannot be addressed sole through the efforts of national or sub-national governments**. Even if national, regional, and local public administrations strive to improve their approach to digital and interoperable public services, without coordination, the strategies and solutions selected may impede cross-border interoperability. Thus, the EU can serve both as a coordinator, ensuring a consistent approach to interoperability throughout the EU, and as a stimulant, offering direction and support.

The Tallinn Declaration of 2017 and the Berlin Declaration of December 2020[94] both emphasised the importance of a unified strategy to interoperability. Additional evidence from desk research corroborates these conclusions. The list of Member States that have adopted an NIF or comparable strategic documents (**Figure 3** and **Annex VI.2**) demonstrates that several countries have incorporated the EIF into their national frameworks, and in some cases, the EIF served as the starting point for such papers (as it is the case, for instance, for Croatia).

Benefits at EU level

By using economies of scale (via shared technologies) and economies of learning, the EIF is almost certain **to achieve its objectives at a lesser cost than equivalent national or sub-national projects** (dialogue and shared solutions).

The EIF decreases costs through economies of scale (via common tools) and economies of learning, as confirmed by responses to the evaluation consultations (dialogue and shared solutions). Initiatives at the national and/or local level would be substantially more expensive. Additionally, the EIF generates positive externalities as a result of stakeholder collaboration. Notably, **the ISA² programme has aided** in the development and sharing of tools and solutions by serving as one of the primary instruments for executing the EIF, **namely the interoperability action plan**[95].

A uniform EU strategy eliminates the costs associated with each Member State assessing and devising actions to address challenges on an individual basis. Additionally, a lack of coordination is likely to result in divergent paths being taken, resulting in increased fragmentation rather than a shared vision.

On average, **the EIF has aided in the advancement of shared EU policy**. However, more could have been accomplished. The EIF is underutilised across sectors and by Commission departments. Cooperation between other Commission departments should be strengthened to enable the EIF to produce stronger outcomes. A future interoperability governance, which is now being evaluated as part of the back-to-back study of a future interoperability policy, may help to close this gap.

Although the EIF has given value to the EU, **cross-border interoperability remains limited and driven by sectoral needs**. The benefits of cross-border interoperability, as promoted by the EIF, have not been shared equitably throughout Member States.

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94 Berlin Declaration on digital society and value-based digital government, at the ministerial meeting during the German Presidency of the Council of the European Union on 8 December 2020, https://www.bmi.bund.de/SharedDocs/downloads/EN/eu-presidency/gemeinsame-erklaerungen/berlin-declaration-digital-society.pdf?__blob=publicationFile&v=6.

95 See SWD/2021/965 final (Staff working document), COM/2021/965 final (Report), CEPS (2021), Study supporting the final evaluation of the ISA² programme. Available at: https://op.europa.eu/en/publication-detail/-/publication/afa4297a-0acc-11ec-adb1-01aa75ed71a1/language-en/format-PDF/source-229005953.

Without a doubt, the framework might make a greater contribution to the development of a European interoperability environment. **Identifying and addressing significant cross-border demands** would very certainly result in increased EIF take-up and consequently increased EU added value.

The EIF's primary contribution to cross-border interoperability is in raising awareness of the need for interoperability and in encouraging countries to implement NIFs based on a common model. The EIF contributes to cross-border interoperability in three ways.

1. It **has increased awareness** of the multi-tiered approach to interoperability that goes beyond technical considerations. The EIF establishes a consistent vocabulary and conceptualisation of interoperability (including the interoperability layers and conceptual model), which can serve as a common starting point for future projects in the field.
2. It encourages Member States to implement **NIFs based on a common model**, fostering an EU-wide approach to interoperability. The EIF promotes conversation and cooperation. eIDAS, the electronic personal identity recognition and management system, has been adopted by 15 Member States, supporting people when moving permanently or temporarily, or completing official procedures. E-invoices are another example of an EU-developed interoperable solution successfully reused at national level.
3. **Specific major digitalisation polices in the EU** – such as the Single Digital Gateway Regulation (SDGR) or the Open Data Directive – have been designed in the implementation phase of the polices, following the guidance of the EIF and reusing some solutions developed under the EIF, such as eID, eDelivery and interoperable data models. A first mapping of digital-relevant EU initiatives onto the EIF pillars and individual recommendations shows this internal coherence. The SDGR is contributing to the interoperability of digital services and implementation of the once-only principle in many countries, such as Germany, Greece, Italy and Portugal. They have national plans – sometimes funded through the resilience and recovery plans (in Italy's case) – to develop interoperable and data sharing platforms, infrastructure and portals, common semantic models, and internal coordination and cooperation across various administrative levels, in the spirit of implementing the once-only principle in parallel at home. With regards to the Open Data Directive, the national open data portals – that have a set-up following the Directive in Member States such as in Belgium, Spain, Ireland, Italy, the Netherlands, and Sweden[96] – are based on a common EU interoperable semantic model developed under EIF principles, guidance and solutions. Thanks to the semantic model, Member States can easily foster their national portals as interoperable hubs connecting other data repositories in the country, mainly from regions and big cities, so that data sets can be found easily and reused in an interoperable manner. Likewise, these portals are interoperable and integrated since April 2021 in data.europa.eu, the official portal for European data, https://data.europa.eu, which relies on the same specification and their counter partners in the other countries in a cross-border setting, allowing citizens and businesses in Europe to search for data sets hosted in any Member States of competent authority in a user centric way.

Alignment at international level

[96] https://joinup.ec.europa.eu/collection/semantic-interoperability-community-semic/solution/dcat-application-profile-data-portals-europe/about.

On a global scale, the Organisation for Economic Cooperation and Development (OECD)'s work on digital government lends itself to comparison with the EIF. The 'Recommendation on Digital Government[97],' approved in 2014 and consisting of high-level recommendations, and the 'digital government toolkit'[98] in particular, are relevant, with the toolkit giving assistance in implementing the high-level proposals. The OECD's approach is, however, larger and less granular than what the EIF sought to do.

The EIF is strongly aligned with OECD recommendations on interoperability; nevertheless, when it comes to recommending the implementation of standards, it does not expressly refer to standards development organisations (SDOs).

Most open data standardisation activities occur at the international level through the W3C and OASIS, as documented in the chapter on 'Big data, open data, and public sector information' in the 2022 rolling plan for ICT standardisation[99].' Additionally, it should be emphasised that the rolling plan now makes a reference to the EIF. Moreover, the Commission states in its Communication on European data strategy[100] that 'the use of standard and shared compatible formats and protocols for collecting and processing data from diverse sources in a consistent and interoperable manner across sectors and vertical markets should be encouraged through the rolling plan for ICT standardisation and (in the case of public services) a strengthened European Interoperability Framework.'

To summarise, the EIF could **promote further adoption of standards created by standardisation bodies**. The ICT standardisation rolling plan could go beyond just referencing the EIF and specify possible actions involving standards development organisations. Finally, given the EU's uniform approach to interoperability, the EIF may help ensure that standardisation initiatives support the European data strategy in line with the notion of digital sovereignty for Europe.

4.3 Is the EIF still relevant?

The EIF mainly aims to assist public administrations in providing vital interoperable, user-centric digital public services to businesses and residents at EU, national, regional and municipal level.

Some issues with EIF design persist. Among these are the need to raise awareness about interoperability, solve skills shortages in public sector IT departments, enhance investment capacity, keep up with rapid technological change, and support public-private collaborations.

Nonetheless, the EIF appears to have attained some of its key objectives based on input from the targeted consultation.

The EIF's early goals **were to inspire and guide European public administrations at all levels to develop and provide seamless European public services**. While the EIF has issued recommendations, it is insufficiently implemented.

Public administrations would still benefit from **a common, more practical, end-to-end approach** from the EIF, from policy to implementation. This would increase its relevance. Stakeholders seem to agree that more direction and awareness-raising is required among

97 OECD (2014), Recommendation of the Council on Digital Government Strategies, Adopted by the OECD Council on 15 July 2014, http://www.oecd.org/gov/digital-government/Recommendation-digital-government-strategies.pdf.

98 OECD Digital Government Toolkit, http://www.oecd.org/governance/digital-government/toolkit/home/.

99 For further details please see: https://joinup.ec.europa.eu/collection/rolling-plan-ict-standardisation/big-data-open-data-and-public-sector-information.

100 https://ec.europa.eu/info/sites/default/files/communication-european-strategy-data-19feb2020_en.pdf

public authorities, especially at sub-national level. More guidance goes hand in hand with **promoting interoperability** at all levels. More ambitious measures are expected to raise public administrations' knowledge of the EIF's potential benefits, especially at sub-national levels[101].

Cultural characteristics, especially the diversity of the public sector and associated actors[102], can play a major role in implementing interoperability solutions**. A silo-based strategy**, for example, produces fragmentation owing to user-unfriendly systems, which hinders the exploitation of synergies[103], according to the impact assessment accompanying the SDG proposal. Some stakeholders mentioned the linguistic barrier. Interoperability is thus not primarily a technology issue, but an organisational and informational one, influenced by conventions and values. Taking cultural issues into account, especially the diversity of public sector and associated actors, can play a vital role in developing interoperability solutions (see also Box 3).

Box 3: The role of culture in enhancing interoperability

Interoperability plays a central role in reducing administrative barriers, which are underpinned by a 'complex context of different linguistic, cultural, legal, and administrative environments in the EU.'[104] Although European public administrations share the values associated with democracy and the rule of law, national administrative cultures show some differences[105]. While it is expected that cultural differences influence the adoption of interoperability solutions in various ways, disentangling the causal effects and the main factors involved is not straightforward. The literature contains no accurate assessment of the extent to which different national administrative cultures influence the adoption of interoperability solutions by European public administrations[106].

To create a culture of interoperability and secure common efforts to attain interoperability goals in the EU, raising awareness across all EU Member States and stakeholders is crucial. To this end a future interoperability strategy should consider ways to raise awareness of the benefits of interoperability across the EU among European public administrations, businesses and the public. In this regard, the upcoming Digital Europe programme could foster awareness of interoperability benefits, thus contributing to the achievement of the objectives

101 See Halmos (2018), Cross-border digital public services. Available at: http://institute.cesci-net.eu/en/crossborder-review-2018.

102 Pardo & Tayi (2007) identify the multitude of actors and types of information as a barrier that could impede the development of interoperability.

103 Commission staff working document impact assessment accompanying the 'Proposal for a regulation of the European Parliament and of the Council on establishing a single digital gateway to provide information, procedures, assistance and problem-solving services and amending Regulation (EU) No 1024/2012', p. 21. Available at: https://ec.europa.eu/transparency/documents-register/detail?ref=SWD(2017)213&lang=fr.

104 COM(2017) 134 final, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, European Interoperability Framework – Implementation Strategy, Annex 2, p. 26.

105 Thijs N., Hammerschmid G., Palaric E. (2017), A comparative overview of public administration characteristics and performance in EU28, European Commission, pp. 34-37. Available at: https://op.europa.eu/en/publication-detail/-/publication/3e89d981-48fc-11e8-be1d-01aa75ed71a1/language-en.

106 Nauta B. (2019), The influence of national culture on the interoperability of cross-border IT systems, Dissertation submitted to the IC Institute. Available at: https://www.researchgate.net/publication/337104072_The_influence_of_national_culture_on_the_interoperability_of_cross-border_IT_systems_A_mapping_of_dimensions_of_national_culture_and_layers_of_interoperability.

of the future interoperability strategy.

Relevance at EU level

Digital (and interoperable) transformation of the EU public sector requires **greater EU cooperation, common rules and initiatives**. The COVID-19 epidemic has undoubtedly hampered cooperation and necessitated stronger governance mechanisms. The crisis has highlighted the **significance of digitisation and interoperability** in the public sector, not just to improve basic public services but also **to build resilience and capability to deal** with unexpected emergencies. Studies into the pandemic's impact and the EU's response provide evidence. During the epidemic, countries with more digitalised and **interconnected** governmental administrations and services reported less service disruption (Charay et. al., 2021). The pressing need for data transfer across countries has helped raise awareness of the importance of **interoperable systems**, particularly for crisis management and response. The field literature supports targeted interoperability approaches.

The pandemic also highlighted the need for **better governance of pandemic response mechanisms across the EU**. Data exchanges, compatible systems and processes, and shared standards all play a role. The lack of data consistency hampered the EU's capacity to respond cooperatively early in the outbreak (Renda and Castro, 2020). Interoperability by design was emphasised as vital for effective cross-border contact-tracing apps in the EU (Ciucci and Gouardères, 2020). The argument around the EU Digital COVID certificate included discussions about standardisation and interoperability.

To promote digitalisation initiatives and the creation of a cohesive interoperability environment across the EU, **a more binding approach to interoperability requirements** may be required in future. Interoperability by design and reuse of interoperability solutions could potentially be explored as ways to improve the cohesiveness of the interoperability environment across the EU. The usage **of conditionality** and the need for more interoperability collaboration are among the conclusions of the ISA² interim and final evaluations.

Stakeholders emphasised the EIF's potential benefits in other areas like mobility, environment, and smart cities. **Encouraging public-private** partnerships is also possible, as public services are not always generated and delivered solely by the public sector.

5. WHAT ARE THE CONCLUSIONS AND LESSONS LEARNT?

5.1 Conclusions

Interoperability makes for efficient digitalisation of government services, and enables the seamless and trusted exchange of data and connectivity of services across levels of administration, borders and sectors. It is a foundational element for any modern digitalisation strategy.

The 2017 EIF is a non-binding framework for interoperability in the EU public sector (a first version of the EIF was developed in 2004; a new version EIF was formally adopted in 2010 through a Commission Communication). The EIF has issued suggestions and guidance on interoperability to enable public administrations to establish digital and interoperable public services. A whole set of interoperable and reusable solutions have been created as part of the interoperability action plan, and supported by the ISA² and CEF programmes to make the EIF more actionable and implementable. This report has assessed the framework's achievements and faults, as well as lessons learnt, four years after its introduction.

Successful elements of the 2017 EIF

Because it represents an outstanding (but non-binding) reference approach to interoperability (see **Section 4.2**) the EIF brings EU added value. National or sub-national initiatives would contribute very little to the EIF's goals. Particularly, national or sub-national governments cannot achieve cross-border interoperability alone. Economies of scale (through shared technologies) and experience enable the EIF to achieve its goals more cheaply than equivalent national or sub-national projects (dialogue and shared solutions).

The framework has provided high-level advice through concepts and models to help guide the creation of interoperable digital public services. In this regard, the EIF monitoring mechanism shows that some of the EIF's recommendations have been conceptually implemented by the Member States, such as openness, technological neutrality, data portability, reusability of IT solutions, and the layered interoperability model (except for the interoperability governance layer), including open data and base registries.

In terms of **efficiency**, the EIF's benefits may outweigh the expenditures incurred by public agencies to implement it (see Section 4.1). Implementing the EIF guideline, or parts of it, through national frameworks may cost between EUR 24 000 and EUR 169 000 per Member State (based on estimates of time translated into costs provided by representatives of several public authorities in the Member States). Also, short-term investments must be weighed against long-term rewards. While initial expenditure can be costly, implementing EIF advice is projected to reduce costs over time as processes are optimised.

The concepts, layered interoperability architecture, and conceptual model for integrated public service delivery defined in the EIF are generally synergistic, and the suggestions mutually reinforce each other (see Section 3.1.3). In terms of external coherence, the examination indicates that the EIF has been considered in areas where interoperability is critical (see Section 3.1.3). Public and targeted dialogues as well as desk research have identified synergies between the EIF and the single digital gateway, the digital single market strategy, the data strategy and the upcoming data act. The EIF's role in digitalising EU public services is highlighted by the digital single market and data strategies. While the Single Digital Gateway Regulation does not expressly address the EIF, it does mention several of its major principles and concepts. However, these are more commonly mentioned in contexts other than the SDG and the two strategies mentioned, demonstrating that public sector interoperability is becoming more of a policy debate topic.

Similar to the EIF, the OECD's Digital Government initiative provides advice on setting up digital and interoperable public services. The OECD's methodology is wider and less specific than the EIF's. The EIF thus adds value in the EU.

Less successful elements of the 2017 EIF and areas for improvement

Whilst the EIF as an EU-level intervention has an added value to the interoperability environment (see Section 3.2), its ultimate impact is dependent on national and sub-national implementation across all sectors with digital public services. The EU's solution and strategy heterogeneity may impede interoperability.

Given the EIF's low overall success and the **need for additional practical direction**, it is judged just moderately useful. The **EIF recommendations** have only partially helped meet the goals set when the framework was adopted in 2017. This is because the EIF has wide aims and the suggestions are often high-level. More granularity is required for efficient framework implementation, especially at the local level. A few concepts (evaluation of efficacy and efficiency, subsidiarity and proportionality, multilingualism, and information preservation) are too abstract or require additional elaboration to be effective. Also, the **principles** of openness, technological neutrality, and user-centricity require more clarification and practical direction. The EIF monitoring mechanism found that certain principles need to be improved at

country level, indicating the need for further guidance (including the assessment of effectiveness and efficiency, multilingualism, and subsidiarity and proportionality). Further advice is needed to the **make the layered interoperability and conceptual models more actionable**, according to the study. For example, the layered interoperability model's advice on interoperability governance, organisational, and legal interoperability should be improved (as emphasised throughout the consultation activities and through the results of the EIF monitoring mechanism).

Internal coherence could be improved by better organising the components. Assemblage of the three components should be improved. The EIF's suggestions typically reinforce each other. Nonetheless, numerous EIF recommendations overlap, at least thematically (e.g. Nos 2, 42 and 43; and Nos 21, 22, 23 and 24). The overlaps are not a problem, but better organising the advice would make the big **ideas clearer and more actionable**. In terms of **external coherence**, the EIF is openly mentioned in policy documents and less so in EU legal acts like directives and regulations. **On coherence**, the EIF is found to be consistent with initiatives such as **the Single Digital Gateway Regulation, the digital single market strategy, and the data strategy**. To increase interoperability governance and the EIF's role, more references in associated legal acts are needed.

While, as an EU-level intervention, the EIF has added value to the interoperability landscape (see Section 3.2 and Annex VIII), ultimately its impacts depend on the level of practical implementation at national and sub-national level and across all sectors with digital public services. Heterogeneity of solutions and strategies across the EU may hinder interoperability at EU level.

Will the identified needs be met, and problems resolved, over time?

The EIF has only partially addressed the demands and challenges indicated by the stakeholders (see Section 3.3). Public administrations emphasise the need for further cooperation, citing **inadequate EIF implementation guidance**. In this context, a more **practical, end-to-end EIF** approach should deliver additional benefits. The digital (and interoperable) transformation of the EU public sector requires unified norms and policies. Other public sector interoperability needs include raising public knowledge of the EIF, addressing staffing shortages in IT departments, increasing investment capacity, and encouraging private-public cooperation.

In this respect, as stated before **external factors** such as technical improvements and national and cross-sectoral interoperability initiatives help the EIF to deliver. At the same time, negative aspects such as limited resources and institutional complexity must be mitigated (see Section 4.1). Finally, the COVID-19 epidemic has heightened the need for greater coordination and cooperation to improve interoperability in the EU public sector.

In summary, the **needs and issues identified are expected to persist**. To satisfy the needs and overcome the challenges outlined, **more cooperation, common rules, and coordinated EU initiatives are required.** It is worth exploring the possibility of putting in place sound governance to enhance cooperation in a future **interoperability policy**.

5.2 Lessons learnt

The EIF's actual results only partially match the predicted outcomes and consequences mentioned in the EIF's intervention rationale (see Section 2). As a model for national interoperability policies and plans, the EIF has given high-level guidelines promoting the development of interoperable digital public services across the EU. Most Member States have adopted NIFs or equivalent national strategic papers that incorporate EIF suggestions, principles, and models. Over the last two years, a small but a steady improvement has been

observed in general in the level of implementation of the framework across the three main areas, namely the principles, the interoperability layers, and the conceptual model.

However, there is **a disconnect between high-level guidance and actual execution, particularly at regional and municipal level**. So far, the EIF has helped build the digital single market by promoting cross-border and cross-sector interoperability, but more can be done. Developing a European public services ecosystem and making interoperable, user-centric public services widely available in the EU are key priorities.

Improving interoperable digital public services would surely boost direct and indirect benefits for stakeholders. An economic analysis reveals that adopting an NIF based on the EIF, or only part of it, is preferable to not adopting it at all. A 10% improvement in online public service quality would also attract 4.3 million to 5 million more EU residents each year to interact with public authorities online.

In connection with the European Commission's REFIT project, enhancements to the EIF methodology could reduce administrative costs by streamlining processes and assist the production of more efficient digital public services through improved interoperability.

Another difficulty is the scarcity of data, especially comparable data, for assessing the costs and benefits of translating the EIF into national frameworks. The voluntary nature of the framework is reflected in its uneven, ad hoc uptake across the EU, limiting the availability of data and making comparison between countries difficult. Furthermore, implementation of the EIF has followed different timelines in different countries.

Several lessons can be derived from the experience of EIF implementation in recent years. These lessons will be helpful in further enhancing interoperability activities at EU level.

1. **Clarify the recommendations** that are generally sound, although they might be enhanced with better structure, clarity, granularity, and implementation guidance. The recommendations could be enhanced by: i) arranging them by target stakeholders (national government, data owners, and local agencies); ii) distinguishing between basic and advanced recommendations; iii) bridging the conceptual and practical gaps. The recommendations could be refined to better support public administrations in implementing the EIF.
2. **Give practical guidance** by strengthening the links between EIF and ISA² solutions. The EIF Toolbox helps to connect the EIF's suggestions to available solutions. Future EU public sector interoperability policies should provide an integrated approach, integrating strategic initiatives with activities to increase adoption of standard interoperability solutions. To make the EIF more actionable in the future, it must be linked to specific solutions.
3. **Encourage best-practice sharing**. Given the EIF's strategic and overall high-level recommendations, best practices for implementation might be added. In this context, the NIFO collection on Joinup's digital policy hub presents examples of trends across the Member States. The hub might be maintained in the future, and **more examples of Member States'** specific implementing solutions could be collected, building on the EIF's guidelines.
4. **Foster coordination through common rules**. Common rules could improve digital public services across the EU and strengthen the public sector's resilience to unanticipated shocks. The EIF's voluntary framework has helped promote interoperability in public service design, but an EU public sector interoperability policy might benefit from a compulsory approach and might consider the following.
    a. **Enhanced EU policy for interoperability with more binding requirements**. Coordination is required to create an EU-wide digital public service landscape.

Having EU-wide laws would help to ensure that cross-border aspects of digital public services are considered.

   b. **Use of conditional interoperability solutions and interoperability by design** in the development of digital public services could help achieve interoperable cross-domain and cross-border services throughout the EU. Such a framework may combine, for example, EU financing for public sector transformation and digitisation with interoperability standards.

5. **Strengthen the EIF's role as a strategic guide**. Enhancing synergies between the EIF and EU interoperability, and digitalisation efforts, is critical for a cohesive EU interoperability environment. In this regard, more direct references to the EIF may assist raise awareness of its broad implications. It is also vital that other EU programmes are completely aligned with the EIF in terms of policy implementation.
6. **Educate and involve stakeholders**. Interoperability has long been a technical topic, but its broader ramifications are becoming apparent, with the EIF's help. To keep EU action in this subject relevant, it is necessary to:
   a. **promote interoperability** as a fundamental enabler for public sector digitisation.
   b. ensure that s**takeholders are aware** of the benefits stemming from interoperability and thus incentivise public administrations to carry out coordinated initiatives for digital public services that are compatible, so contributing to a more cohesive public sector interoperability environment across the EU.
7. Ensure **monitoring of progress in the field of interoperability** and the EIF's effects, to keep building a solid understanding on the EIF's effectiveness, especially at the local level. Monitoring initiatives should thus continue to gather data on interoperability guidance implementation and costs, and encourage reuse of developed technologies. In addition, the EIF monitoring mechanism might be improved to better capture practical acceptance of recommendations in developing digital public services.
8. The EIF could **promote the adoption of open specifications and standards created by standardisation bodies**. The EIF is already referenced in the ICT Standardisation rolling plan, and some semantic interoperability specifications are mentioned. Finally, given the EU's uniform approach to interoperability, the EIF may help ensure that standardisation initiatives support the European data strategy and the data act proposal, in line with the notion of digital sovereignty for Europe.
9. **Future monitoring** should focus on reusing developed technologies and on providing better estimates of costs. In this regard, a set of EIF-specific criteria could make it easier to compare costs across the EU (including, for instance, daily work of the team tasked with implementing the EIF through official documents, the degree of implementation of the EIF, the number of consultations between the European Commission and the Member States when the EIF was agreed on and introduced, the time spent by annual reporting under the NIFO initiative, etc.).
10. In terms of efficiency and the **quantification of cost-benefits** stemming from interoperability, future sound methodologies to estimate the costs of interoperability, as opposed to the costs of digital transformation in a broader setting, must be implemented and applied in the field.

For all of it, a future enhanced EU policy for public administration interoperability is now being assessed along with this EIF evaluation (back-to-back impact assessment for a future interoperable Europe policy). The policy will address binding requirements and a governance supporting a more practical and actionable EIF. In addition, it will identify common specifications and standards, reusable tools, and solutions to support at least digital checks for new EU policies.

ANNEXES

Annex I. Procedural information

Lead DG: Directorate General for Informatics

D*e*cide Planning: PLAN/2020/7507 - 'Evaluation of the implementation of the European Interoperability Framework (EIF) and proposal for an EU governments interoperability strategy'.

The Initiative is part of CWP 2022 - REFIT initiatives, point 12, and is referenced under the Policy objective 'A Europe fit for the Digital Age'. The adoption is planned for Q2 (June 2022).

Organisation and timing

31/08/20	D*e*cide Political Validation (Hahn, Vestager)
15/09/20	1st ISSG meeting Participating DGs: CNECT, DEFIS, DIGIT, ECFIN, EMPL, ENER, ENV, ESTAT, FISMA, GROW, the JRC, JUST, MOVE, NEAR, OP, REFORM, REGIO, RTD, SANTE, SG and TAXUD
15/10/20	Publication of combined Evaluation Roadmap and Inception Impact Assessment
01/02/21– 26/04/21	Public consultations
12/10/21	ISSG approval for supporting studies
15/10/21	Recommendations of the Expert Group on interoperability of public services
24/11/21	9th ISSG meeting Participating DGs: CNECT, ENV, ESTAT, GROW, JUST, the JRC, MOVE, OP, REGIO, RTD, SANTE, SJ, SG, TAXUD, DIGIT
19/01/22	RSB meeting

Consultation of the RSB

An upstream meeting with the RSB took place on 12 March 2021, whose recommendations were duly taken into account.

This draft EIF evaluation SWD was submitted to RSB on 17 December 2021 for the RSB hearing that was held on the 19 December 2022, getting a positive opinion with some comments for improvement.

The Table below summarises the changes introduced to this Staff Working Document (SWD) in response to the Board's main comments

Main RSB considerations	**Changes made to the SWD**

Main RSB considerations	Changes made to the SWD
The scope of the EIF is unclear. The report does not clearly outline the areas covered by interoperability principles and solutions, in particular whether the focus is on cross-border interoperability or on national frameworks, and which stakeholders the initiative targets	The scope of the EIF and the definition of the concept of interoperability, as understood in this context, have been made clearer and presented in more detail in the introduction and section 2.1
The evaluation lacks concrete examples to illustrate the achievements of the EIF, whether in a specific sector, policy area or Member State, or at EU level.	The evaluation illustrates now in sections 3.1 and 4 interoperability an update of the EIF effects at policy level as a guidance instrument in the 27 MS, and the evolution at macro level from 2021 to 2021. Also, it gives examples, drawing on achievements from particular sectors or from Member States, which can be directly attributed to interoperability and the implementation of the EIF.
The evaluation does not clearly identify the specific contributions of interoperability, and of the EIF specifically, as opposed to broader benefits of the digitalisation of public services.	Addressed particularly in sections 3 and 4.1 and 4.2. Explicit mentions have been emphasised to the limitations of estimating the costs of interoperability, as opposed to the costs of digital transformation in general.
The analysis of costs and benefits does not sufficiently explain why cost data are difficult to quantify, and whether this is the case for all aspects of interoperability.	Added in section 4.1: • Expanding the cost benefit analysis with the findings of the economic impact of public sector interoperability in geolocation • further insights on the current difficulties and limitations to quantify cost based on sound data • emphasising the tools that allow monitoring and measurement of the level of implementation of the EIF principles with some examples

Evidence, sources and quality

The Commission has been working for more than 25 years now on interoperability at EU level with different stakeholders involved in the digital transformation of the public sector and creation of EU-wide digital public services.

The evidence used in the Impact Assessment have been collected from the following main sources and has been used at different steps in the preparation of the initiative:

- **National Interoperability Framework Observatory (NIFO) data collection:**
  - The Digital Public Administration Factsheets collected and published yearly; available on the Joinup platform[107];

[107] The factsheets can be consulted on Joinup.

- The European Interoperability Framework (EIF) Monitoring Mechanism[108];
- **Other databases** including: Eurostat, the World Bank Worldwide Governance Indicators, United Nations e-Government survey, and the Organisation for Economic Co-operation and Development (OECD) Digital Infrastructure indicators; the datasets related to the e-Government Benchmark reports[109];
- **Expert Group on interoperability of public services** inputs and recommendations
  - The interoperability expert group was created on 14/02/2020 with representatives of the national administrations CIO offices, members appointed for all 27 Member States and observers from EFTA and Western Balkans countries
  - Position papers from 18 Member States: In December 2020 the Commission kindly asked the members of the expert group to react on a short policy paper with some initial ideas for the next interoperability policy (vision, general approach, policy instruments, etc.);
  - Co-creation workshops – five informal discussions and brainstorming sessions took place between January and December 2021 with more than 200 participants;
  - Bilaterals – the Commission organised 26 bilateral calls with 26 different Member States between July and September 2021;
  - Policy recommendations – they were formally endorsed by consensus of the whole group on the 5th of October 2021. Those recommendations served as a basis to build the draft legal text and the two dedicated workshops.
  - Two workshops on legal draft – They took place in November 2021 gathering both around 40 external participants each.
- **CEPS external supporting studies** - The Commission contracted the Centre for European Policy Studies (CEPS) to conduct three independent supporting studies between September 2020 and October 2021.
  - Supporting study for the evaluation of the ISA² programme
  - Supporting study for the evaluation of the EIF
  - Supporting study on the impact assessment for a future interoperability strategy
- **Joint Research centre (JRC) analysis** – JRC has provided extensive support in preparation of the Impact Assessment, in particular with a study on quantifying the benefits of Location Interoperability and general costs of interoperability in the EU[110]
- **Input received to the Inception Impact Assessment feedback period[111],** 13 responses that are summarised in Annex V.
- **Targeted online survey** 94 responses that informed the analysis and the conclusions of the study, summarised in Annex V.
- **In-depth interviews with 23 experts and stakeholders**
- Input from **Public Consultation** launched for 12 weeks, from 01/02/21– 26/04/21, summarised in Annex V.
- **4 public workshops**: 1 inception workshop and 2 validation workshops in the framework of the DIGIT all conference, 1 public expert panel on options for a legal instrument

The Impact Assessment was based on certain assumptions, namely:

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108 An overview of the EIF Monitoring Mechanism.

109 The e-Government Benchmark datasets are available at: https://digital-agenda-ata.eu/datasets/e-gov

110 Ulrich, P., Duch Brown, N., Kotsev, A., Minghini, M., Hernandez Quiros, L., Boguslawski, R. and Pignatelli, F., Quantifying the Benefits of Location Interoperability in the European Union, EUR 31004 EN, Publications Office of the European Union, Luxembourg, 2022, ISBN 978-92-76-48846-0, doi:10.2760/72064, JRC127330.

111 See relevant web page on Europa Have your say, available at https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12579-Interoperable-digital-public-services-European-Interoperability-Framework-evaluation-&-strategy_en

- It was estimated that the number of cross-border cases of usage of digital public services would be growing with the increase of the number of people living and working in a Member State different from the one of their origins and with the increase of the number of people traveling for tourism purposes.

The data limitations encountered in this Impact Assessment were the following:

- Lack of data focusing solely on the benefits and costs of interoperability
- Lack of comparable data on the costs and benefits of transposing the EIF into national frameworks, due to the voluntary nature and heterogeneous uptake of the framework
- Relatively low number of respondents to the different surveys

To mitigate the impact of the data limitations (to the extent possible), the external contractor followed up directly with some of the stakeholders to clarify certain aspects. The Joint Research Centre kindly offered their expertise and has developed a more specific study that took both a qualitative approach (20 use cases on location data interoperability) and quantitative (estimation of general costs of interoperability at EU level). In addition, where quantification of costs and benefits was not feasible, a qualitative approach was chosen instead (description of practices, processes and types of costs and benefits deriving from the options). To increase the number of stakeholders, involved an important number of public and targeted consultation activities were put in place.

Annex II. Methodology and analytical models used

This annex presents the methodology employed for the back-to-back evaluation and impact assessment. It details the types of data collected and their validation, the methods used, and the main limitations of the analysis.

Overview of information and data sources

In the Data Collection Phase, a mix of data collection methods and desk research was employed to gather both primary and secondary information and data, as follows:

- **Primary information and data** were collected via the following consultation activities:
  - Work on **recommendations with the Expert Group on Public Sector** interoperability
  - Targeted in-depth interviews;
  - Targeted online survey;
  - Public consultation.
  - feedback received on the **Combined EIF Evaluation Roadmap and Inception Impact Assessment**[112]
- **Secondary information and data** were collected by reviewing:
  - The Digital Public Administration Factsheets, developed as part of the NIFO action and available on the Joinup platform[113];
  - The EIF Monitoring Mechanism[114];

[112] The feedback of stakeholders can be consulted at: https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12579-European-Interoperability-Framework-EIF-evaluation-and-EU-governments-interoperability-strategy/feedback?p_id=9804060&page=1

[113] The factsheets can be consulted on Joinup: https://joinup.ec.europa.eu/collection/nifo-national-interoperability-framework-observatory/digital-public-administration-factsheets

[114] An overview of the EIF Monitoring Mechanism is available at: https://joinup.ec.europa.eu/collection/nifo-national-interoperability-framework-observatory/eif-monitoring-mechanism

- Databases including Eurostat, the World Bank Worldwide Governance Indicators, and the Organisation for Economic Co-operation and Development (OECD) Digital Infrastructure indicators;
- The datasets related to the e-Government Benchmark reports[115];
- Relevant literature;
- Official EU-level documents such as communications, regulations, and directives;
- Official national-level documents such as national interoperability frameworks.

The above-mentioned sources were complemented by expert assessments conducted by five independent experts who were part of the Team on the supporting studies conducted by CEPS, in accordance with the Technical Proposal. The independent experts were tasked with completing the questionnaire that served as the basis for the in-depth interviews and with providing additional expert input to support the evaluation and impact assessment.

Primary data

The consultation activities were launched in December 2020 (with a kick-off workshop to raise awareness on the evaluation process) and lasted until the end of April 2021 (marked by the end of the public consultation). The duration of each consultation activity was planned to ensure that stakeholders had enough time to provide their inputs. This was complemented with a co-creation process with the Expert Group on interoperability of public services (see Annex V).

The general consultation activities resulted in a total of 134 responses for the impact assessment and 112 responses for the EIF evaluation, which can be divided into six stakeholder groups as presented in **Table 2**. The stakeholder categories were defined on the basis of the assessment of relevant stakeholders conducted in the inception phase and by taking into account the need to ensure the comparability of results between the three strands of the consultation activities: in-depth interviews, online survey, and public consultation (considering in particular the mandatory template for background information used for public consultations).

Table 2: Overview of responses to the consultation activities by stakeholder group for the impact assessment/evaluation

Consultation Stakeholders	In-depth interview	Online survey	Public consultation	TOTAL
Civil society (all other stakeholders)	1/-	1/2	8/7	**10/9**
Companies and business associations	-/-	5/3	13/14	**18/17**
EU and non-EU citizens	-/-	4/2	31/18	**35/20**
EU public authorities	3/5	10/8	-	**13/13**
Experts and academia (including the independent	6*/6*	3/4	5/4	**14/14**

115 The e-Government Benchmark datasets are available at: https://digital-agenda-ata.eu/datasets/e-gov

Consultation Stakeholders	In-depth interview	Online survey	Public consultation	TOTAL
expert assessments)				
National public authorities	-/2	27/25**	16/12	**44/39**
TOTAL	**10**	**50**	**73**	**134/112**

Note: x/y:x:Number of participants in impact assessment, y:number of participants for EIF evaluation.
** In-depth interviews conducted with experts and academia include four independent expert assessments.*
***One follow-up interview to the targeted online survey was conducted.*
Source: Study supporting the impact assessment for a future interoperability strategy

In order to facilitate the comparison of stakeholders' responses, the questionnaire of each consultation activity relied on Likert scales. Respondents were thus asked to provide their feedback by referring to a scale from (1) to (5) or (--) to (++), depending on the type of question[116]:

1. (1) – not at all; (2) – to a limited extent; (3) – to some extent; (4) – to a great extent; or (5) – completely;
2. (--) very negative; (-) negative; (0) neutral; (+) positive; or (++) very positive.

The SWD presents the aggregate results of the consultation activities using bar charts showing the average scores of responses from each stakeholder group. The average scores do not account for 'don't know/no opinion' answers. The data labels of the bar charts display the average score first, then the corresponding number of respondents in brackets.

In order to assess the reliability of primary data, **Figure 12** provides an overview of the level of knowledge in the field of digital public services, as well as the knowledge of the EIF among the participants who contributed to the consultation activities. Overall, stakeholders reflect a high level of knowledge, strengthening the reliability of the primary data collected.

Overview of the level of knowledge of respondents

On average, respondents have a good level of knowledge in the field, noting they are familiar to a great extent with digital public services and interoperability. EU and non-EU citizens report a relatively lower level of knowledge, but even in this case, the respondents are familiar at least to some extent (3.50) with the field of digital public services and interoperability.

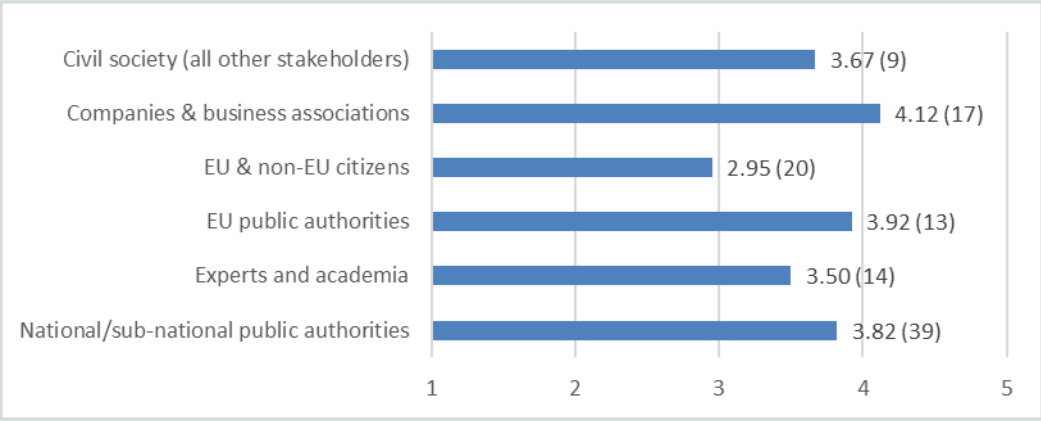
Figure 12: Knowledge of digital public services and interoperability (breakdown by group of stakeholders; average score and number of respondents)

116 For each question, the respondent also had the possibility to select the answer 'don't know/no opinion'.

Score: (1) not at all; (2) to a limited extent; (3) to some extent; (4) to a great extent; or (5) completely.
Note: Averages do not account for respondents answering 'don't know/no opinion' (DK/NO).
Source: Study supporting the impact assessment for a future interoperability strategy

Furthermore, respondents across almost all groups are, on average, familiar to a great extent with the EIF (see Figure 13). The only exception concerns respondents among EU and non-EU citizens who have a relatively lower level of familiarity with the EIF, but they are still, on average, familiar to some extent with the EIF.

Figure 13: Knowledge of the EIF (breakdown by group of stakeholders; average score and number of respondents)



Score: (1) not at all; (2) to a limited extent; (3) to some extent; (4) to a great extent; or (5) completely.
Note: Averages do not account for respondents answering 'don't know/no opinion' (DK/NO).
Source: Study supporting the impact assessment for a future interoperability strategy.

Secondary data

The **impact assessment** builds primarily on the evaluations of the ISA² programme and the EIF[117]. These evaluations were conducted simultaneously with the impact assessment as key sources to assess achievements accrued so far in the field of public sector interoperability in the EU as well as lessons learnt.

The EIF Evaluation relies on an extensive review of available secondary data. One of the main sources of data is the **National Interoperability Framework Observatory (NIFO)**

117 See SWD/2021/965 final (Staff working document), COM/2021/965 final (Report), CEPS (2021), Study supporting the final evaluation of the ISA² programme. Available at: https://op.europa.eu/en/publication-detail/-/publication/afa4297a-0acc-11ec-adb1-01aa75ed71a1/language-en/format-PDF/source-229005953
CEPS (2021), Study supporting the evaluation of the implementation of the EIF. Available at https://op.europa.eu/en/publication-detail/-/publication/29d694d4-4696-11ec-89db-01aa75ed71a1/language-en/format-PDF/source-search

action supported by the ISA² programme and its **outputs that are available in the Joinup collection** with the same name[118]. The particular sources developed as part of NIFO and used as evidence feeding into the evaluation of the EIF include:

- The **Digital Public Administration Factsheets**, contributing to the assessment of the effectiveness of the EIF by providing an overview of the development of national interoperability frameworks or similar strategies[119];
- The 2020 **Report on the State-of-Play of Digital Public Administrations and Interoperability**, detailing the progress made by the EU Member States in enhancing the provision of digital and interoperable public services (the report also covers nine additional countries: Iceland, Liechtenstein, Norway, Switzerland, the United Kingdom, Ukraine, Montenegro, Turkey and the Republic of North Macedonia)[120]. This Report contributes to the assessment of the effectiveness and coherence of the EIF by providing an overview of key developments across the EU and the level of implementation of the EIF;
- The **2019 EIF Monitoring Mechanism**, tracking the implementation of the EIF and its principles, model and recommendations across the EU, thus contributing to the assessment of the effectiveness of the EIF[121];
- Other reports and documents developed as part of NIFO and available on Joinup, including the Report on Public Administrations' Digital Response to Covid-19 in the EU[122], contributing in particular to assessing the relevance of the EIF.
- The webpages of ISA² actions and the ISA² Rolling Work Programmes.

Relevant indicators measuring digitalisation in the public sector were considered from a variety of databases, namely: Eurostat, the World Bank Worldwide Governance Indicators, and the Organisation for Economic Co-operation and Development (OECD) Digital Infrastructure indicators. In addition, the datasets related to the e-Government Benchmark reports[123] were used, contributing in particular to the assessment of the effectiveness and efficiency of the EIF and for the impact assessment contributing in particular to quantify the existing problems and the assessment of the potential impacts stemming from the policy options considered for this impact assessment;

Official documents such as **communications, regulations, directives and decisions** were reviewed contributing in particular to the assessment of the coherence and EU added value of the EIF. In addition, official national-level documents such as national interoperability frameworks were also reviewed, primarily as part of the analysis of the effectiveness of the

118 For further details please see: National Interoperability Framework Observatory, Knowledge Centre, available on Joinup: https://joinup.ec.europa.eu/collection/nifo-national-interoperability-framework-observatory/knowledge-centre

119 The factsheets can be consulted on Joinup: https://joinup.ec.europa.eu/collection/nifo-national-interoperability-framework-observatory/digital-public-administration-factsheets

120 Bouhend, A., et al. (2020), 'Report on the State-of-Play of Digital Public Administrations and Interoperability', European Commission. Available at: https://joinup.ec.europa.eu/sites/default/files/news/2020-10/SC263_D04.02_State-of-play%20report%20on%20digital%20public%20administration%20and%20interoperability%202020_vFINAL.pdf

121 The underlying data was shared with the Study Team by DIGIT.D2 to facilitate the analysis. An overview of the EIF Monitoring Mechanism is available at: https://joinup.ec.europa.eu/collection/nifo-national-interoperability-framework-observatory/eif-monitoring-mechanism

122 Charay et. al. (2021), Report on Public Administrations' Digital Response to COVID-19 in the EU, Publications Office of the European Union. Available at: https://joinup.ec.europa.eu/collection/nifo/report-state-play-digital-public-administration-and-interoperability

123 The eGovernment Benchmark datasets are available at: https://digital-agenda-ata.eu/datasets/e-gov

EIF, while also contributing to understanding the EU added value of the framework. For the impact assessment these data sources contributed across the study, from depicting the policy context to comparing the policy options considered for this impact assessment;

In building the evidence base, **the relevant literature in the field of interoperability** was reviewed and considered throughout the evaluation process. The key insights from literature contribute particularly to the assessment of the relevance of the EIF and for the impact assessment particular the existing problems in the field of public sector interoperability.

Data validation

To ensure the robustness of evidence, the collected data were **validated via triangulation**. Tool #4 of the Better Regulation Toolbox on evidence-based better regulation defines triangulation as 'the application and combination of several research methodologies in the study of the same phenomenon'[124]. Validation requires checking 'whether the findings of a study are true and certain: 'true' in the sense that research findings accurately reflect the situation; and 'certain' in the sense that research findings are supported by evidence'[125]. To ensure that the findings are supported by well-founded evidence, data were collected from **multiple sources and using different tools** to analyse the evaluation criteria and questions. This approach allows for increasing confidence in collected data, comparing and contrasting findings, and providing a clearer understanding of the issues at stake. The analysis relies on three different types of triangulation to provide a solid basis for drawing robust conclusions:

- ☐ **Triangulation of data**, relying throughout the impact assessment on data collected from multiple sources and stakeholders.
- ☐ **Triangulation of methods**, based on data collected via at least two different data collection methods (e.g., interview, targeted questionnaire, public consultation, desk research).
- ☐ **Triangulation of evaluators**. Several members of the Core Study Team and Support Team were involved in data collection activities. In addition, each element of the impact assessment was addressed by at least two members of the Core Team. Hence, conclusions were agreed upon by at least two researchers.

Methods

The evaluation and impact assessment combines both quantitative and qualitative data, thus relying on a variety of methods and tools to analyse the collected data. In particular, the qualitative information was aggregated, compared and summarised to substantiate the evidence feeding into evaluation and impact assessment. To analyse the findings from the consultation activities, the Study Team employed descriptive statistics. To complement these methods, other specific quantitative methods were used to evaluate the effectiveness, efficiency and coherence of the framework:

Cost-benefit analysis (CBA)[126]

CBA is a method of comparing the costs and benefits associated with a certain initiative, typically a government policy, programme or project, in order to assess whether the initiative is expected to bring about a net improvement. A key feature of CBA is that all costs and all

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124 Better Regulation Toolbox (2017), Tool #4 Evidence-based better regulation, https://ec.europa.eu/info/sites/default/files/file_import/better-regulation-toolbox-4_en_0.pdf

125 Triangulation: Establishing the Validity of Qualitative Studies, Lisa A. Guion, David C. Diehl, and Debra McDonald, 2011.

126 Better Regulation Toolbox (2017), Tool #59 Methods to assess costs and benefits, https://ec.europa.eu/info/sites/default/files/file_import/better-regulation-toolbox-59_en_0.pdf

benefits are quantified and expressed in monetary terms, and are adjusted for the 'time value of money' (through some discounting mechanism), so that all benefits and costs that occur at different points in time are expressed on a common basis in terms of their 'present value'. The main limitations of CBA concern the difficulties in attributing a monetary value to items for which no market exists and the fact that certain non-monetisable effects simply cannot be taken into consideration. CBA was used to assess of the potential impacts stemming from the proposed policy options.

*The **standard cost model** (SCM)*[127]

SCM aims at assessing administrative costs imposed by rules or policies *inter alia* on businesses and public administrations. It is based on the identification of the basic components of a rule, the Information Obligations, whose costs for the addressees can be measured and quantified. An Information Obligation is a specific duty to gather, process or submit information to the public authority or a third party. The SCM is employed to measure the costs borne in terms of days spent by national public administrations to transpose the EIF into national frameworks as well as the costs that would be borne by public administrations when implementing the proposed policy options.

*The **Multi-criteria analysis** (MCA)*[128]

MCA is a technique for comparing and ranking different courses of action that yield multiple outcomes expressed in different units of accounts (i.e. some are expressed in monetary terms, others in physical units of different nature, e.g. number of lives saved and quality of gaseous emissions). In some respects, it can be said that MCA goes one step further than CBA, as it gives explicit recognition to the fact that a variety of both monetary and non-monetary objectives (i.e. social, environmental, technical, economic, and financial) may influence policy decisions. At the same time, this kind of analysis inevitably includes a higher degree of subjectivity compared to CBA, especially regarding the weighting and ranking of different criteria. Therefore, unlike CBA, a basic feature of MCA is its implementation through participatory processes, involving policymakers, experts (e.g. through Delphi panel method), stakeholders, etc. This method was employed to compare the proposed policy options based on their effectiveness, efficiency, coherence and feasibility.

Text mining

Text mining is a technique referring to a set of data-processing operations that extract knowledge according to a criterion of novelty or similarity in texts. In practice, this technique is based on an algorithm that counts the number of times a specific reference is made in a given text corpus. In this evaluation, text mining is used to evaluate the degree of external coherence of the EIF, together with its principles, interoperability layers and conceptual model. In particular, this approach allows checking, throughout the corpus of EU legislation and Commission communications, the extent to which the EIF and its components are taken into consideration by other EU initiatives in the field of interoperability that were adopted since the first version of the EIF (2004).

This analysis can be done in two steps:

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127 European Commission (2017), 'Tool #60. The standard cost model for estimating administrative costs', in the Better Regulation 'Toolbox', available at https://ec.europa.eu/info/sites/info/files/better-regulation-toolbox_2.pdf; SCM Network (2005), 'The International SCM Manual; Measuring and Reducing Administrative Burdens for Businesses', available at: http://www.administrativeburdens.com/filesystem/2005/11/international_scm_manual_final_178.doc

128 For an excellent review, please see Department for Communities and Local Government, Multi-criteria analysis: a manual, London, January 2009.

- Searching through the corpus of EU legislation and Commission communications since the adoption of the first version of the EIF (2004) to obtain an overview of the number of times the EIF and keywords related to the EIF are mentioned in official EU documents;
- Taking a more in-depth look at a selection of relevant official documents and conducting a more granular analysis to understand which elements of the EIF are referenced.

While the first approach provides a quantifiable overview of the references to the EIF in different pieces of legislation and communications over time, the second approach provides more insights into the take-up of the EIF and its specific elements.

To quantify the number of mentions of the EIF and keywords related to the EIF in pieces of EU legislation, the Study Team relied on an extensive dataset, the 'CEPS EurLex dataset', customised to facilitate text mining[129]. The dataset contains 142,036 pieces of EU legislation adopted between January 1952 and August 2019, representing almost the entire corpus of the digitally available EU legal acts from this timeframe. The dataset covers three types of legally binding acts adopted by the EU institutions: regulations, directives, decisions, and implementing and delegated acts. When it comes to quantifying the number of references to the EIF and keywords related to the EIF in Commission communications, the analysis was run for documents including green and white papers, communications, reports (categorised as 'DC' on EurLex)[130]. Importantly, the analysis excluded self-references to the EIF Communications.

The datasets were used to search for specific keywords in the timeframe 2004 (the year of the adoption of the first EIF) to August 2019. In addition, to cover the period from August 2019 and April 2021, the EurLex website was used. The keywords, selected based on their connection to the EIF and the extent to which they would be expected to yield results in a text mining exercise, were grouped into three clusters as follows[131]:

- Cluster 1: European Interoperability Framework. This cluster refers exclusively to the EIF and contains three keywords: 'European Interoperability Framework', 'EIF' and 'interoperability framework';
- Cluster 2: Interoperability layers. This cluster gathers together the following keywords: 'semantic interoperability', 'technical interoperability', 'organisational interoperability' and 'legal interoperability';
- Cluster 3: Key interoperability concepts. This cluster contains the following keywords: 'once-only' (keyword related to the 'once-only' principle), 'digital by default', 'privacy by design', 'user-centricity', 're-use of data', 'interoperability principle', 'interoperable e-Government service'.

The datasets of EU legislation and communications were searched for the keywords, resulting in a list of pieces of legislation and communications where the keywords were found. The results were thus summarised by year and number of mentions per cluster of keywords.

Econometric modelling

The **econometric model** statistically tests pre-determined assumptions regarding the relationship between two variables. The econometric tool is more powerful than a simple

129 Borrett, Camille; Laurer, Moritz, 2020, 'The CEPS EurLex dataset: 142,036 EU laws from 1952-2019 with full text and 22 variables', https://doi.org/10.7910/DVN/0EGYWY, Harvard Dataverse.

130 Hradec, Jiri, 2021, the database is part of the 'Trends in Global Governance and Europe's Role' (TRIGGER) project.

131 An additional keyword, 'conceptual model' (related to the EIF conceptual model for integrated public services provision), was dropped from the analysis as it did not yield results related to the EIF.

correlation because it unilaterally determines and quantifies the impact of an independent variable on a dependent variable. By isolating the effects of the variables of interest (i.e. independent variables) on the main variable (i.e. the dependent variable), the model specifies the statistical relationship existing (or not) between two variables. In order to test for the effectiveness of the EIF, the model is used to estimate the effects of adopting an EIF-based NIF and improving the quality of digital public services on the share of citizens using the Internet to interact with their public administrations. The model is estimated by relying on a regression with fixed effects:

$$Index\_PA_{i,t} = c + \beta_1 \times Index\_egov_{i,t} + \beta_2 \times NIF_{i,t} + \beta_3 \times R\&D_{i,t} + \beta_4 \times GDP\_cap_{i,t} + \beta_5 \times gov\_eff_{i,t} + \beta_6 \times infra_{i,t} + u_i + \varepsilon_{i,t}, \quad \text{(Eq. 1)}$$

where the indexes i and t denote the country and the year, respectively. In the model, c is the intercept, $\sum_{j=1}^{6} \beta_j$ are the coefficients associated to each variable accounted for in the model, u_i defines the fixed effects per country, and $\varepsilon_{i,t}$ is the error term. This model controls for additional country-level variables that are difficult to measure or observe and that do not vary over time (such as cultural factors). Fixed effects isolate the impacts of time-invariant characteristics so that we can assess the net effect of the predictors on the outcome variable. In other words, this first model estimates an additional and single effect (u_i) per country, but the latter is assumed to be common across time.

Several additional variables (control variables), which vary over the time, are taken into consideration in order to isolate the effects of the variables of interest (i.e. NIF and e-Government index). These control variables ensure that other potential factors are properly captured in the analysis:[132] i) the real GDP per capita captures any differences that may stem from the economic development of a country; ii) the level of infrastructure development accounts for effects that may result from limited access to the Internet; iii) public spending on research and development related to general public services considers all the effects that can arise from discrepancies between countries' expenditures in innovative public services; and iv) government effectiveness measures any effects that may arise from the perceived qualit13y of public services. All the variables used in the model are described in **Table 3**. Moreover, Table 4 provides descriptive statistics of the analysed variables.

Table 3: Description of variables used in the econometric analysis

Variable	Description	Type	Source
Dependent variable			
Online public services use (index_PA)	Index computed as an average of the percentage of individuals (aged between 16 and 74) using the Internet to interact with public authorities, obtain information from public authorities' websites, download	Percentage	Eurostat

132 Several econometric studies conducted in the field of e-Government services and, more broadly, digital economy rely on similar variables. See, for instance, Lakka et al. (2013), What drives eGovernment growth? An econometric analysis on the impacting factors, Int. J. Electronic Governance Vol. 6, No. 1; Sakari Taipale (2013), The use of e-government services and the Internet: The role of socio-demographic, economic and geographical predictors, Telecommunications Policy 37 (2013) 413–422; Zaho et al. (2014), E-government development and the digital economy: a reciprocal relationship, Internet Research, Vol. 25 Iss 5 pp. 734 - 766; and Lakka et al. (2015), Cross-national analysis of the relation of eGovernment maturity and OSS growth, Technological Forecasting & Social Change 99 132–147.

Variable	Description	Type	Source
	official forms and submit completed forms (over the last 12 months).		
Independent variables			
e-Government indicators (index_egov)	Index computed as an average of User centricity, Transparency, Citizen Mobility, Business Mobility and use of Key enablers.	Percentage	e-Government Benchmark
National Interoperability Framework (NIF)	Indicator showing whether the country has implemented an EIF-based NIF. The value 1 is assigned from the year in which the country implemented the NIF onward; otherwise, the value 0 is assigned in years where the country does/did not have a NIF. However, the analysis differentiates between a complete adoption and an incomplete adoption of the EIF. In particular, two variables are considered: • **NIF 'complete'**, which encompasses countries that have adopted an EIF-based NIF. • **NIF 'incomplete'**, which encompasses countries that have endorsed an EIF-based NIF, as well as a partial adoption of the EIF in their NIF.	Dummy 0-1	Author's elaboration based on the findings presented in **Annex VI.2**
Control variables			
R&D government (R&D_gov)	Government spending to support applied research and experimental development related to general public services undertaken by non-government organisations such as research institutes and universities.	Millions of EUR	Eurostat
General public services (Gen_pub_serv)	Government spending to support broader activities, that is executive and legislative organs, financial and fiscal affairs, external affairs; foreign economic aid; general services; basic research; R&D related to general public services; general public services; public debt transactions, transfers of a general character between different levels of government.	Millions of EUR	Eurostat
Real GDP per capita (GDP_cap)	This variable captures economic discrepancies between countries. It is used as a proxy for the development in a country's material living standard.	Ratio of real GDP to the average population	Eurostat

Variable	Description	Type	Source
Government effectiveness (gov_eff)	Government Effectiveness captures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.	Estimate gives the country's score on the aggregate indicator in units of a standard normal distribution. The index ranges from approximately -2.5 to 2.5.	World Bank[133]
Infrastructure (infra)	This variable captures the level of infrastructure to access the Internet for each country. Total communication refers to the total access to telephone lines, total fixed broadband, mobile subscribers.	Total communication access paths per 100 inhabitants	OECD

Source: *Supporting study for the evaluation of the EIF*

Table 4: Descriptive statistics of the variables

Variables		Observations	Mean	Standard deviation	Min	Max
Online public services use (index_PA)		249	42.46	17.25	4	80
e-Government indicators (index_egov)		256	60.74	16.53	22	95
National Interoperability Framework (NIF)	**NIF 'incomplete'**	256	0.30	0.46	0	1
	NIF 'complete'	256	0.34	0.47	0	1
R&D government (R&D)		205	100.93	162.25	0	762
General public services (Gen_pub_serv)		217	31 289.51	47 558.62	532.8	189 065

133 Kaufmann Daniel, Aart Kraay and Massimo Mastruzzi (2010), 'The Worldwide Governance Indicators: Methodology and Analytical Issues', World Bank Policy Research Working Paper No. 5430.

Variables	Observations	Mean	Standard deviation	Min	Max
Real GDP per capita (GDP_cap)	256	28 071.72	18 220.32	5 350	83 640
Government effectiveness (gov_eff)	256	1.14	0.58	-0.31	2.22
Infrastructure (infra)	189	187.72	26.31	119.65	242.85

Source: *https://op.europa.eu/en/publication-detail/-/publication/29d694d4-4696-11ec-89db-01aa75ed71a1/language-en/format-PDF/source-search*.

Before carrying out the analysis, it is important to ensure that the independent variables (i.e. the explanatory variables) are not highly correlated with each other. The simultaneous introduction of two highly correlated variables in the model (i.e. collinearity issue) could lead to erratic results. For this purpose, the correlations should be lower than 0.8[134]. Table 5 presents the pairwise correlations between the variables used in the analysis. Beyond ensuring the soundness of the results, the table also shows how variables are linked to one another (whether they evolve in the same or opposite direction, or whether they are independent). In Table 5, three values illustrate important positive correlations:

- The correlation between the online interaction between citizens and public administrations (index_pa) and government effectiveness (gov_eff). However, the online interaction between citizens and public administrations variable is not an independent variable, but a dependent variable (i.e. the explained variable). Therefore, the two variables are not simultaneously introduced in the explanatory side of the model.
- The correlation between the two binary variables (NIF 'complete' and NIF 'incomplete''). It is no surprise, since these two variables are built on similar criteria, one following stricter assumptions than the other. These two variables are introduced alternatively (see regressions (1), (2), (3) and (4)) in order to test for the soundness of the results. Furthermore, the low values of the correlation with the other variables can be explained by the nature of the variable, which is binary.
- The correlation between the government effectiveness (gov_eff) and the real GDP per capita (GDP_cap). Although the value is slightly below 0.8, additional regressions are performed to ensure the robustness of the results when the two variables are dropped from the model (see **Table 5**, regressions (1), (2), (3) and (4)).

Table 5: Correlation matrix

	index_pa	index_egov	R&D_gov	Gen_pub_serv	GDP_cap	infra	gov_eff	NIF 'complete'	NIF 'incomplete'
index_pa	1								
index_ego	0.57*	1							

[134] This criterion is suggested in Kennedy P.A. (2003), A Guide to Economics, 5th ed., MIT Press, Cambridge, MA.

	index_pa	index_egov	R&D_gov	Gen_pub_serv	GDP_cap	infra	gov_eff	NIF 'complete'	NIF 'incomplete'
v									
R&D_gov	-0.23*	-0.29*	1						
Gen_pub_serv	-0.03	-0.03	0.35*	1					
GDP_cap	0.65*	0.24*	-0.06	0.13*	1				
infra	0.17*	0.14	0.20*	0.30*	0.40*	1			
gov_eff	0.78*	0.48*	-0.33	0.15*	0.77*	0.37*	1		
NIF 'complete'	-0.05	0.12	0.15*	-0.18*	-0.16*	0.03	-0.18*	1	
NIF 'incomplete'	-0.05	0.10	0.14*	-0.01	-0.22	0.09	-0.17*	0.77*	1

*Notes: All significance levels are at the p>0.05, except where denoted by: *=p<0.05.*
Source: Supporting study for the evaluation of the EIF

The analysis tests two hypotheses:

- NIFs foster the use of online public services;
- Better e-Government services encourage citizens to interact with their public administration via the Internet.

By testing these relationships using a fixed-effects model and ensuring that the independent variables meet the assumptions required to run the model, the results of the analysis support the above two hypotheses. Table 6 presents the results of the main model specification when the two variables, NIF 'complete' and NIF 'incomplete', are alternatively included as explanatory variables. To ensure the soundness of the results, additional results from different model specifications are provided in **Table 6**.

Table 6: Results of fixed effects model

Variables	index_PA Comparison of NIF variables	
NIF 'incomplete'	5.110*** (1.438)	
NIF 'complete'		2.367* (1.357)
index_egov	0.146**	0.169**

Variables	index_PA Comparison of NIF variables	
	(0.055)	(0.066)
R&D_gov	0.010** (0.005)	0.013*** (0.005)
GDP_cap	4.15E-4 (2.86E-4)	5.06E-4 (3.63E-4)
gov_eff	-2.011 (7.366)	-1.729 (7.659)
infra	-0.133 (0.129)	-0.104 (0.134)
Gen_ pub_serv		
Constant	48.98** (18.48)	40.15* (21.56)
Number of countries	**25**	**25**

Notes: Robust standard errors in parentheses
**** p<0.01, ** p<0.05, * p<0.1*
Source: Supporting study for the evaluation of the EIF

Table 7 also presents the results of the analysis when new countries are introduced (see regressions (5) and (6)). This is essential in supporting the robustness of the results. Specifically, regression (5) drops the variable capturing the level of infrastructure, which constrains the model to 168 data observations. By removing this variable, four new countries can be introduced into the analysis. Finally, regression (6) replaces the variable capturing government spending on research and development to support the development of general public services with a broader variable, namely total government spending on general public services, thus introducing an additional country into the analysis.

Table 7: Robustness tests (fixed effects model)

Variables	index_PA Potential collinearity problem (i)		Potential collinearity problem (ii)		Introduction of new countries	
NIF 'incomplete'	5.118*** (1.411)		5.436*** (1.390)		3.629** (1.376)	5.229*** (1.431)
NIF 'complete'		2.472* (1.317)		2.654* (1.296)		
index_egov	0.145**	0.169**	0.184***	0.219***	0.118**	0.143***

Variables	index_PA					
	Potential collinearity problem (i)		Potential collinearity problem (ii)		Introduction of new countries	
	(0.055)	(0.066)	(0.058)	(0.067)	(0.046)	(0.047)
R&D_gov	0.010** (0.005)	0.013*** (0.005)	0.010** (0.005)	0.014*** (0.005)	9.51e-05 (0.010)	
GDP_cap	4.31E-4 (2.75E-4)	33.05** (15.25)			4.28E-4 (3.2E-4)	4.28** (2.91E-4)
gov_eff			-3.577 (7.010)	-3.620 (7.331)	-6.212 (5.458)	-1.657 (6.244)
infra	-0.136 (0.121)	-0.107 (0.127)	-0.133 (0.133)	-0.102 (0.139)		-0.123 (0.095)
Gen_ pub_serv						2.97E-5 (9E-5)
Constant	46.41** (21.33)	-37.94* (23.47)	61.35*** (18.35)	54.72** (20.81)	29.56** (12.82)	48.31*** (15.84)
Number of countries	**25**	**25**	**25**	**25**	**29**	**26**

Notes: Robust standard errors in parentheses
**** p<0.01, ** p<0.05, * p<0.1*
Source: Supporting study for the evaluation of the EIF

Main limitations

The mix of primary data and information, obtained through consultation activities, and secondary data and information, mainly obtained through desk research, was crucial in allowing to draw conclusions and, more importantly, to provide estimates of costs and benefits. Nevertheless, the following limitations may affect the main findings:

1. The **scarcity and difficult comparison of data for assessing the costs and benefits** of transposing the EIF into national frameworks. The voluntary nature of the framework reflects a heterogeneous uptake of the framework across the EU, limiting the availability of data and making the comparison between countries difficult, as the framework is adopted on an ad hoc basis. Furthermore, the implementation of the EIF has not followed the same timeline in the different countries. To overcome this limitation, the Study Team contacted the national public authorities that responded to the consultation activities and indicated their availability to participate in a follow-up interview in order to gain insight on the time spent (in terms of person-days) on the transposition of the EIF, or part of it, into their national framework.
2. **The overarching scope of the EIF hinders the assessment of the direct costs and benefits stemming from its implementation**. Costs and benefits deriving from the EIF do not just pertain to the implementation of the framework, as costs and benefits

depend on the levels of digitalisation of the Member States or on the different degrees of centralisation and varying organisational structures involved in delivering public services. The costs related to interoperability initiatives are borne at different levels of administration in several countries.

3. The conclusions drawn in the Impact Assessment are built upon the EIF Evaluation, which evaluates the latest implementation of the EIF (i.e. from 2017 to 2020). However, the framework seeks to achieve overarching goals and impacts that **require time to show results**.

Another limitation may be the potential **'consultation fatigue'** of respondents. In particular, this Impact Assessment was carried out in a context in which the feedback of stakeholders may have been sought for several relevant developments: the end of the ISA² programme, the rollout of the new Digital Europe Programme, the 2030 Digital Compass and the new policy initiatives related to digitalisation in the EU.

Annex III. Evaluation framework for the EIF evaluation

Evaluation questions	Success/judgment criteria	Indicators	Data sources	Data collection / analysis methods
Evaluation criterion #1: Effectiveness				

• To what extent has the EIF reached its objectives?
  • What are the factors that have influenced positively and negatively the achievement observed? What obstacles remain?
• Are there aspects or recommendations of the EIF that are more or less effective than others, and if so, what lesson can
	• Degree of alignment between actual and expected results and objectives of the EIF.[135]
	• Impact of external factors on the achievements of the EIF.
	• Measurement of the indicators summarising the outputs of the EIF.
	• Identification of direct and indirect benefits of the EIF and their distribution across stakeholders' groups.
		• Share of stakeholders confirming the alignment between actual and expected results of the EIF.
		• Share of stakeholders confirming the alignment between the objectives and actual results of the EIF.
		• Share of stakeholders identifying external factors contributing to/jeopardising the achievements of the EIF.
		• Qualitative assessment of the alignment between objectives, expected and actual results of the EIF.
		• Qualitative assessment of factors contributing to/jeopardising the achievements of the EIF.
		• Quantitative assessment of performance indicators of outputs.
			• Primary information on actual results and contribution to the EIF's objectives from the following categories of stakeholders:
			  • Governance of ISA² and the EIF.
			  • ISA² action owners.
			  • ISA² solution users – European Commission.
			  • ISA² solution users – Member States.
			  • Stakeholders
				• Desk research.
				• Interviews with the following categories of stakeholders:
				  • Governance of ISA² and the EIF.
				  • ISA² action owners.
				  • Stakeholders responsible for linked EU policies / initiatives.
				  • Key national interoperability actors.
				• Online surveys/ written

[135] Results include outputs, outcomes, and impacts, with the caveat that impacts are longer term results that may only become noticeable after a more significant period of time.

Evaluation questions	Success/judgment criteria	Indicators	Data sources	Data collection / analysis methods
be drawn from this? • What are the benefits of the EIF implementation and how beneficial are they for the various stakeholders?		• Qualitative assessment of direct and indirect benefits of the EIF. • Qualitative assessment of the distribution of EIF benefits across stakeholders' groups. • Assessment of costs savings stemming from the EIF.	responsible for linked EU policies / initiatives. • Key national interoperability actors. • Standardisation organisations. • Experts. • Indirect beneficiaries and wider public. • Secondary information from operational documents and other official documents, such as: • EIF Monitoring Mechanism • Digital Government Factsheets. • Digital Economy and Society	questionnaires targeted to the following categories of stakeholders: • Governance of ISA² and the EIF. • ISA² action owners. • ISA² solution users – European Commission. • ISA² solution users – Member States. • Stakeholders responsible for linked EU policies / initiatives. • Key national interoperability actors. • Standardisation organisations.

Evaluation questions	Success/judgment criteria	Indicators	Data sources	Data collection / analysis methods
			Index. • Study on Member States' Single Digital Gateway Regulation readiness. • Data from the IMAPS assessments carried out as part of ISA². • OECD Open Government Data. • UN e-Government Development Index (EGDI). • IMD World Digital Competitiveness ranking.	• Public consultation. • Case studies (success stories/lessons learnt). • Quantitative assessment of responses to interviews and surveys (Likert scale). • Qualitative assessment of responses to interviews and surveys and data and information collected via desk research. • Multicriteria analysis. • Cost of non-Europe approach for cost savings. • Expert assessment.
Evaluation criterion #2: Efficiency				

Evaluation questions	Success/judgment criteria	Indicators	Data sources	Data collection / analysis methods

• Have the benefits been achieved at a reasonable cost?
  • Is there evidence that the implementation of the EIF has caused unnecessary regulatory burdens?
• If there are significant differences in costs (or benefits) between Member States, what is causing them?
	• Comparison between benefits and costs of the EIF.
	• Differences in benefits among Member States.
	• Differences in compliance costs and administrative burdens among Member States.
		• Compliance costs linked to the implementation of the EIF.
		• Administrative burdens linked to the implementation of the EIF.
		• Qualitative comparison between the benefits detected under the 'effectiveness' criterion and costs stemming from the EIF.
		• Comparative assessment of benefits detected in different Member States.
		• Comparative assessment of the compliance costs and administrative burdens incurred in different Member States.
			• Primary information on costs from the following categories of stakeholders:
			  • Governance of ISA² and the EIF.
			  • Stakeholders responsible for linked EU policies / initiatives.
			  • Key national interoperability actors.
			• Secondary information from operational documents and other official documents, such as:
			  • EIF Monitoring Mechanism.
			  • Digital Government
				• Desk research.
				• Interviews with the following categories of stakeholders:
				  • Governance of ISA² and the EIF.
				  • Stakeholders responsible for linked EU policies / initiatives.
				  • Key national interoperability actors.
				• Online surveys/ written questionnaires targeted to the following categories of stakeholders:
				  • Governance of ISA² and the EIF.
				  • Stakeholders

Evaluation questions	Success/judgment criteria	Indicators	Data sources	Data collection / analysis methods
			Factsheets. • Digital Economy and Society Index. • Study on Member States' Single Digital Gateway Regulation readiness. • Data from the IMAPS assessments carried out as part of ISA². • OECD Open Government Data. • UN E-Government Development Index (EGDI) • IMD World Digital Competitiveness ranking.	responsible for linked EU policies / initiatives. • Key national interoperability actors. • Case studies (success stories/lessons learnt). • Quantitative assessment of responses to surveys (Likert Scale). • Qualitative assessment of responses to interviews and surveys and data and information collected via desk research. • Standard cost model.
Evaluation criterion #3: Coherence				

Evaluation questions	Success/judgment criteria	Indicators	Data sources	Data collection / analysis methods
• To what extent are the elements of the EIF coherent between themselves? (internal coherence) • To what extent is the EIF and its governance consistent with other EU legislation or initiatives (external coherence)? Are there any inconsistencies, overlaps or gaps?	• Degree of coherence between the three main components of the EIF (principles, layered interoperability model, conceptual model for interoperable public services) • Degree of coherence between the EIF and relevant existing EU initiatives and policies. o E.g.: DSM Strategy, European Cloud initiative, EU eGovernment Action Plan 2016-2020, Single Digital Gateway, the revised Directive on the re-use of Public Sector Information, INSPIRE Directive, eIDAS	• Share of stakeholders identifying inconsistencies/synergies/overlaps between the main components of the EIF • Qualitative assessment of the inconsistencies/synergies/ overlaps between the main components of the EIF • Share of stakeholders identifying inconsistencies/synergies/overlaps between the EIF and relevant existing EU initiatives, policies, and programmes. • Qualitative assessment of inconsistencies/synergies/overlaps between the objectives of the EIF and relevant existing EU initiatives, policies, and programmes. • Qualitative assessment of inconsistencies/synergies/ overlaps between the objectives of the EIF and proposed EU initiatives and programmes. • Qualitative assessment of inconsistencies/synergies/overlaps between the objectives of the EIF and EU data initiatives in digital	• Primary information on external coherence from the following categories of stakeholders: • Governance of ISA² and the EIF. • ISA² action owners. • ISA² solution users – European Commission. • ISA² solution users – Member States. • Stakeholders responsible for linked EU policies / initiatives. • Key national interoperability actors. • Standardisation	• Desk research. • Interviews with the following categories of stakeholders: • Governance of ISA² and the EIF. • ISA² action owners. • Stakeholders responsible for linked EU policies / initiatives. • Key national interoperability actors. • Online surveys/ written questionnaires targeted to the following categories of stakeholders: • Governance of ISA² and the

Evaluation questions	Success/judgment criteria	Indicators	Data sources	Data collection / analysis methods
	Regulation, Data Strategy. • Degree of coherence between the EIF and relevant existing EU programmes. o E.g.: CEF, SRSP, Horizon 2020, ESF, ERDF, Country-Specific Recommendations, National Reform Programmes. • Degree of coherence between the EIF and proposed EU programmes and initiatives. o E.g.: Digital Europe Programme, Horizon Europe. • Degree of coherence between the EIF and selected EU data initiatives in specific sectors (e.g. the degree of coherence	healthcare and connected and automated vehicles.	organisations. • Experts. • Indirect beneficiaries and wider public. • Secondary information from operational documents and other official documents, such as: • EIF Communication (COM/2017/134) and accompanying documents (Annexes to the Communication and Staff Working Documents). • EIF Monitoring Mechanism and relevant outputs of the NIFO action providing an overview of	EIF. • ISA² action owners. • ISA² solution users – European Commission. • ISA² solution users – Member States. • Stakeholders responsible for linked EU policies / initiatives. • Key national interoperability actors. • Standardisation organisations • Public consultation. • Quantitative assessment of responses to interviews and surveys (Likert scale).

Evaluation questions	Success/judgment criteria	Indicators	Data sources	Data collection / analysis methods
	with respect to the announced data spaces in the fields of healthcare and mobility).		interoperability initiatives • eGovernment Action Plan 2016 – 2020 • Study on the role of eGovernment and interoperability in the European Semester. • The study 'The nature of interoperability in digital public services. Deconstructing interoperability'. • Mid-term review of the Digital Single Market Strategy. • Legal texts establishing other relevant programmes accompanying documents.	• Qualitative assessment of responses to interviews and surveys and data and information collected via desk research. • Expert assessment.

Evaluation questions	Success/judgment criteria	Indicators	Data sources	Data collection / analysis methods
			• Legal texts devising other relevant EU policies and accompanying documents. • Interim Evaluation of ISA². • Mid-term Evaluation of CEF. • Other interim/final evaluations of EU programmes and policies.	
Evaluation criterion #4: EU added value				
• What is the additional value resulting from the implementation of the EIF, compared to what could reasonably have been expected	• Achievement of objectives that could not be otherwise attained with national or sub-national interventions. • Achievement of objectives at a cost lower than what	• Share of stakeholders confirming the need for an EU intervention to achieve the objectives of the EIF. • Share of stakeholders confirming that an EU intervention is able to achieve the objectives of the EIF at cost lower than costs of national/sub-national or international interventions.	• Primary information on cross-border interoperability and EU added value from the following categories of stakeholders: • Governance of ISA² and the	• Desk research. • Interviews with the following categories of stakeholders: • Governance of ISA² and the EIF. • ISA² action

Evaluation questions	Success/judgment criteria	Indicators	Data sources	Data collection / analysis methods
from Member States acting at national, regional and/or local levels or activities on international level (e.g. standardisation activities)?	could be attained via national or sub-national interventions. • Achievement of objectives that could not be otherwise attained with international activities. • Achievement of objectives at a cost lower than what could be attained with international activities. • Achievement in terms of cross-border interoperability. • Contribution to the advancement of common EU policies.	• Share of stakeholders' providing positive feedback on achievements in terms of cross-border interoperability. • Qualitative assessment of the contribution to the advancement of common EU policies. • Qualitative assessment of the value generated by the EIF compared to international activities in the field.	EIF. • ISA² action owners. • ISA² solution users – European Commission. • ISA² solution users – Member States. • Stakeholders responsible for linked EU policies / initiatives. • Key national interoperability actors. • Standardisation organisations. • Experts. • Indirect beneficiaries and wider public. • Secondary information from operational	owners. • Stakeholders responsible for linked EU policies / initiatives. • Key national interoperability actors. • Online surveys/written questionnaires targeted to the following categories of stakeholders: • Governance of ISA² and the EIF. • ISA² action owners. • ISA² solution users – European Commission. • ISA² solution users – Member States.

Evaluation questions	Success/judgment criteria	Indicators	Data sources	Data collection / analysis methods
			documents and other official documents, such as: • EIF Communication (COM/2017/134) and accompanying documents (Annexes to the Communication and Staff Working Documents). • Digital Government Factsheets. • Digital Economy and Society Index. • eGovernment Action Plan 2016 – 2020. • eGovernment Benchmark Report. • Study on the role of eGovernment	• Stakeholders responsible for linked EU policies / initiatives. • Key national interoperability actors. • Standardisation organisations. • Public consultation. • Case studies (success stories/lessons learnt). • Quantitative assessment of responses to interviews and surveys (Likert scale). • Qualitative assessment of responses to interviews and surveys and of data and information collected via desk

Evaluation questions	Success/judgment criteria	Indicators	Data sources	Data collection / analysis methods
			and interoperability in the European Semester. • The study 'The nature of interoperability in digital public services. Deconstructing interoperability'. • Mid-term review of the DSM Strategy. • National Interoperability Frameworks. • Interim Evaluation of ISA². • OECD Open Government Data • UN E-Government Development Index (EGDI)	research. • Expert assessment.

Evaluation questions	Success/judgment criteria	Indicators	Data sources	Data collection / analysis methods
			• IMD World Digital Competitiveness ranking	
Evaluation criterion #5: Relevance				

• To what extent do the initial objectives of the EIF still correspond to the current needs of the stakeholders at the EU, national or sub-national level?
How has the demand for cooperation, common rules and EU actions around interoperability changed?
	• Degree of alignment between stakeholders' perception of needs and problems at national and sub-national levels and the objectives of the EIF.
	• Degree of alignment between stakeholders' perception of needs and problems at EU level and the objectives of the EIF.
	• Degree of alignment between the needs and problems originally addressed by the EIF and stakeholders'
		• Share of stakeholders confirming the alignment between the objectives of the EIF and current needs and problems at national and sub-national levels.
		• Share of stakeholders confirming the alignment between the objectives of the EIF and current needs and problems at EU level.
		• Share of stakeholders confirming the alignment between the needs and problems addressed by the EIF and current needs and problems.
		• Share of stakeholders demanding more cooperation, common rules and EU actions in the field of interoperability.
		• Qualitative assessment of the alignment between the objectives of the EIF and current needs and problems.
			• Primary information on needs and problems from the following categories of stakeholders:
			  • Governance of ISA² and the EIF.
			  • ISA² action owners.
			  • ISA² solution users – European Commission.
			  • ISA² solution users – Member States.
			  • Stakeholders responsible for linked EU policies /
				• Desk research.
				• Interviews with the following categories of stakeholders:
				  • Governance of ISA² and the EIF.
				  • ISA² action owners.
				  • Stakeholders responsible for linked EU policies / initiatives.
				  • Key national interoperability actors.
				• Online surveys/ written questionnaires

Evaluation questions	Success/judgment criteria	Indicators	Data sources	Data collection / analysis methods
	perception of current needs and problems. Demand for cooperation, common rules and EU actions in the field of interoperability.	• Qualitative assessment of the alignment between needs and problems addressed by the EIF and current needs and problems. • Qualitative assessment of changes in demand for cooperation, common rules and EU actions in the field of interoperability.	initiatives. • Key national interoperability actors. • Standardisation organisations. • Experts.[136] • Indirect beneficiaries and wider public.[137] • Secondary information on needs and problems from operational documents, other official documents, and relevant literature, such as: • EIF Communication (COM/2017/134) and accompanying documents	targeted to the following categories of stakeholders: • Governance of ISA² and the EIF. • ISA² action owners. • ISA² solution users – European Commission. • ISA² solution users – Member States. • Stakeholders responsible for linked EU policies / initiatives. • Key national interoperability actors. • Standardisation

136 The 'expert' category includes, *inter alia*, academia and open-source communities.

137 The category 'wider public' includes, among others, IT representatives and representatives of the GovTech sector.

Evaluation questions	Success/judgment criteria	Indicators	Data sources	Data collection / analysis methods
			(Annexes to the Communication and Staff Working Documents). • EIF Monitoring Mechanism • Digital Government Factsheets. • Digital Economy and Society Index. • eGovernment Action Plan 2016 – 2020. • eGovernment Benchmark Report. • Study on the role of eGovernment and interoperability in the European Semester. • The study 'The nature of	organisations. • Indirect beneficiaries and wider public • Public consultation. • Quantitative assessment of responses to interviews and surveys (Likert scale). • Qualitative assessment of responses to interviews and surveys and data and information collected via desk research. Expert assessment.

Evaluation questions	Success/judgment criteria	Indicators	Data sources	Data collection / analysis methods
			interoperability in digital public services. Deconstructing interoperability'. • Data on the digital economy from Eurostat. • Mid-term review of the DSM Strategy. • Interim Evaluation of ISA². • Mid-term Evaluation of CEF. Publications and surveys on demand for interoperability.	

Source: *Study supporting the evaluation of the implementation of the EIF*

Annex IV. Overview of benefits and costs

Table 8: Overview of costs and benefits identified in the evaluation

	Citizens		Businesses		Public administrations	
	Quantitative	**Comment**	**Quantitative**	**Comment**	**Quantitative**	**Comment**
	Costs					
Direct compliance costs: Implementation of the EIF (one-off costs)	No direct compliance costs applicable.	No direct compliance costs applicable.	No direct compliance costs applicable.	No direct compliance costs applicable.	EUR 24 000 – EUR 169 000, corresponding respectively to 150 and 550 person-days.	The costs of implementation of the EIF vary depending on whether the Member State updates drafts of existing national documents and strategies based on the EIF or designs national documents and strategies based on the EIF without relying on any other prior such documents. For further details, see Section 3.1.2 on Efficiency.
	General comment: The costs of implementing the EIF are borne by public administrations only.					
	Benefits					

	Citizens		Businesses		Public administrations	
	Quantitative	**Comment**	**Quantitative**	**Comment**	**Quantitative**	**Comment**
Direct benefits: additional EU users of the Internet to interact with their public administrations (recurrent benefits, but expected to decrease over the time)	A 10% improvement in the quality of online public services would encourage approximately 4.3 million to 5 million more EU citizens per year	This result is part of an econometric analysis run on 21 EU Member States, Iceland, Norway, Switzerland and the UK. See Section 3.1.1 on Effectiveness for further information.				
	General comment: It is important to note that although no benefits are quantified for businesses and public administrations, the evaluation supports qualitatively that benefits exceed the costs for public administrations and bring substantial benefits to both businesses and citizens.					

Source: Study supporting the evaluation of the implementation of the EIF

Annex V. Stakeholder consultation

Summary of the stakeholder strategy

A continuous and active stakeholder consultation strategy was designed and followed in preparation for the Impact Assessment on the EU public sector interoperability policy. It was complemented by active communication activities on our dedicated social media channels (Twitter, LinkedIn, YouTube).

A broad range of activities were put in place to ensure that all interested parties and stakeholders would have the opportunity to provide feedback on the various policy options that the Commission has identified with regard to its initiative, and their likely impacts, as well as on the relevance, effectiveness, efficiency and the added value of the initiative. In that context, the Commission reached out to a broad range of stakeholders, including Member State national authorities, non-governmental organisations, professional associations, business organisations and individual citizens.

To involve a broader range of stakeholders the following **consultation activities** were conducted:

- Public consultation on the **inception impact assessment (15/10/21):** The key ideas for the review of the European Interoperability Framework and a future policy were outlined in an Inception Impact Assessment (IIA). The published IIA informed citizens and stakeholders about the Commissions' plans in order to allow them to provide feedback on the intended initiative. This fed into the subsequent consultation activities that ensured an inclusive process with all interested parties being actively invited to contribute.
- **Online kick-off workshop** 'How interoperability can achieve seamless data flows and services for the EU's public sector', conducted on 3 December 2020. It aimed at raising awareness about the EIF evaluation and the impact assessment process and engaging stakeholders in the process.
- **Online survey** (19 January – 7 March 2021), targeting specific stakeholder groups.
- **In-depth interviews** (1 February – 8 March 2021) with 19 selected stakeholders to collect detailed data and information contributing to the EIF evaluation (12 stakeholders) and the impact assessment (7 stakeholders), respectively. The interviews are complemented by expert assessments conducted by independent experts who were tasked with, *inter alia*, completing the questionnaire that served as the basis for the in-depth interviews[138].
- A 12-week long, Internet-based **public consultation** (1 February – 26 April 2021), open to the wider public and available in English, German, and French.
- Validation workshop in the **digitalALL conference**[139] on 22 April 2021 presenting and validating the outcome of the consultation activities with 126 registered participants.
- An innovative co-creation, co-design process has been put in place with the **interoperability expert group with Member States**. Workshops and roundtables following design-thinking methodologies and participatory practices were led with the

[138] Five independent experts provided their assessment for the EIF evaluation and four for the impact assessment.

[139] Further information can be found at https://app.swapcard.com/event/digitall-public/planning/UGxhbm5pbmdfMzk2Mzcw

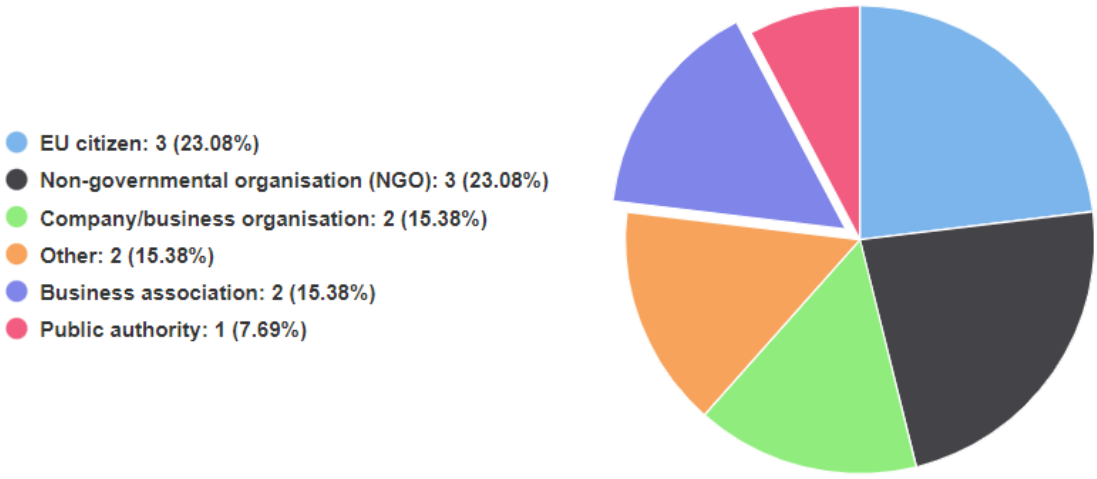
experts to discuss and develop the needs for a future interoperability policy: 5 brainstorming sessions with more than 200 representatives from Member States, 5 formal expert group meetings with also more than 200 participants overall, 18 position papers issued by the Member States, 26 Member States bilaterals throughout the summer of 2021.

- The topic was also presented and discussed in two **meetings of the Chief Information Officers network** organised by the Presidencies of the European Council (Portugal - May 2021, Germany - December 2020) and presented to the digital attachés in the Telecom Working Party of the Council in April and November 2021. Member States have provided us with positive and constructive feedback which has been taken into account in the construction of the proposal.

Summary of the feedback on the Inception impact assessment

In total there were 13 feedback replies on the IIA from 8 different EU countries (3 from Germany, 2 from Spain and Belgium, 1 from each Sweden, Italy, Greece, France and Finland) and one non-EU country (Norway) and different stakeholder groups (see Figure 14)

Figure 14: Feedback on the IIA by category of respondent



Source: Have Your Say Portal

The input was relevant for the formulation of problem and objectives as well as for the policy options and the impacts.

On the **problems** stakeholders highlighted the effects of competing and non-open standards. One stakeholder suggested that the EIF evaluation should include an analysis on the reasons that led to some recommendations to be better implemented than others. This suggestion was taken up in the EIF evaluation.

On the **objectives** several stakeholders draw links to public values beyond digitalisation as such. They suggested to highlight the value of interoperability for the democratisation of public knowledge, civil rights, digital involvement of all citizens and diversity.

One stakeholder suggested to strengthen the ambition of EIF beyond guaranteeing the necessary state tasks, public services should support the optimal processing and easy usage of digital data. In general, most stakeholders advocate to strengthen the principle of openness for the reuse of technical solutions as a core principle. One suggests including **codified design principles** and to encourage an **API centric approach**. Another stakeholder suggests that the EIF should more explicitly be also addressed to regions and sectors.

Eight of the 13 contributions mention explicitly the **need for agreed and open standards.** Two stakeholders request to include specific reference to interoperability between blockchains into the EIF with a clear definition and open standards. One stakeholder highlights that this should include standards around metadata, another the importance of unique and trusted digital identifiers. Two stakeholders ask for more and **coordinated involvement of the public sector in standardisation organisations**.

Five stakeholders bring forward the idea of **fostering and EU-wide sharing and reuse** of mature, reusable and open source interoperable solutions for public administrations. One stakeholder asks to facilitate the multiple use of the same privacy by design infrastructure at no extra cost. The future policy should incentivise the sharing of design costs around usable, **trusted and secure solutions** also between public and private stakeholders.

Three stakeholders mention the need for **more guidance** on the use of open standards and open source, including clear definitions. One stakeholder asks for a dedicated task force for immediate, middle term and long-term **technical assistance** at all levels to support any interoperability action, including relevant training resources in the Interoperability Academy. One stakeholder asks for a certification programme for interoperability trainers.

Three stakeholders highlight the importance of **making the interoperability policy consistent** with other EU policies like the EU AI strategy. Two stakeholders brought forward the idea of a reference implementation on the city level published under a free software license which would act as formal specification and can be implemented directly. This idea is mentioned linked to EU policies but also to EIF standards, that should come with at least one Open-Source implementation to confirm its implementability.

For the **policy instrument** two stakeholders suggest a more binding instrument, one of them a consolidated EU Regulation while another sees the risk that a strict legal framework might hinder interoperability – but harmonisation of organisational procedures could be beneficiary.

One stakeholder highlights the importance for the different sectors on the example of author's rights. It asks not only for effective cooperation mechanism but also for effective safeguards to ensure their respect. Another stakeholder has a similar idea in developing a **process** for assessing compliance with the EIF.

Stakeholders highlighted the potential impact of a holistic transformation of (digital) public services on the private ICT sector with the potential to create an ecosystem of related apps and services.

Consultation activities for the EIF evaluation and Impact assessment

The consultation activities led by the contractor targeted several groups of stakeholders. The following grouping is used to analyse the feedback to the consultation activities:

- Civil society;
- Companies and business associations;
- EU and non-EU citizens;
- EU public authorities;
- Experts and academia (including the independent expert assessments);
- National and sub-national public authorities in the Member States.

The questionnaires used throughout the consultation activities mainly used Likert scale responses, referring to a scale from (1) to (5), (-2) to (2) or (--) to (++), depending on the type of question[140]:

3. (1) – not at all; (2) – to a limited extent; (3) – to some extent; (4) – to a great extent; or (5) – completely;
4. (-2) – definitely would not; (-1) – probably would not; (1) – probably would; (2) – definitely would;
5. (--) – very negative; (-) – negative; (+) – positive; (++) – very positive.

With **a total of 112 respondents for the EIF Evaluation and 134 respondents for the Impact Assessment for a Future Interoperability Strategy**, the consultation activities reached all types of stakeholders described in Table 9. In what follows, the feedback received during the consultation activities are presented according to the type of consultation, i.e. public versus targeted consultation[141]. Feedback received during in-depth interviews are grouped together with those from the targeted online survey since both consultation activities were based on the same questionnaire; only more qualitative feedback was sought in the in-depth interviews.

Table 9: Overview of responses to the EIF Evaluation (EIF) and the Impact Assessment (IA) by stakeholder group

Consultation	In-depth interview		Online survey		Public consultation		TOTAL	
Stakeholder	EIF	IA	EIF	IA	EIF	IA	EIF	IA
Civil society (all other stakeholders)	-	1	2	1	7	8	**9**	**10**
Companies and business associations	-	-	3	5	14	13	**17**	**18**
EU and non-EU citizens	-	-	2	4	18	31	**20**	**35**
EU public authorities	5	3	8	10	-	-	**13**	**13**
Experts and academia	6*	6*	4	3	4	5	**14**	**14**
National and sub-national public authorities	2	-	25**	28**	12	16	**39**	**44**
TOTAL	**13**	**10**	**44**	**50**	**55**	**73**	**112**	**134**

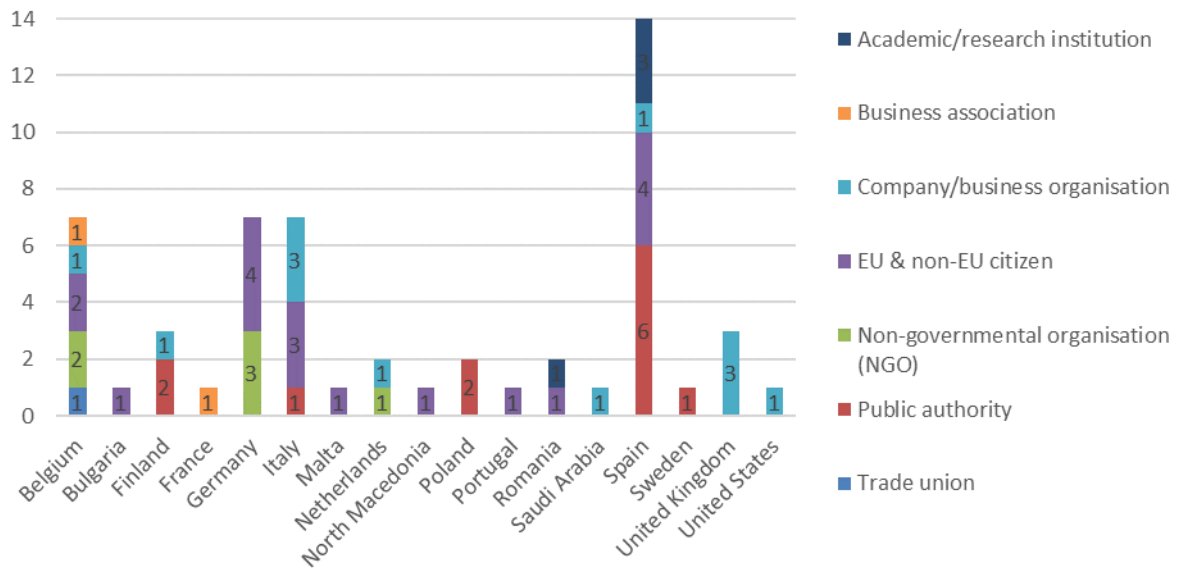
140 For each question, the respondent also had the possibility to select the answer 'don't know/no opinion'.

141 Averages do not account for respondents answering 'don't know/no opinion'.

**The six in-depth interviews include the five expert assessments.*
***One follow-up interview to the targeted online survey was conducted in the scope of the EIF Evaluation and one was conducted in the scope of the Impact Assessment.*
Source: Study supporting the impact assessment for a future interoperability strategy

In the public consultations, feedback was received from 13 Member States, with the highest number of received answers from Spain (see Figure 15). In addition, six respondents are non-EU citizens. For the work with the Expert Group all 27 Member States provided input.

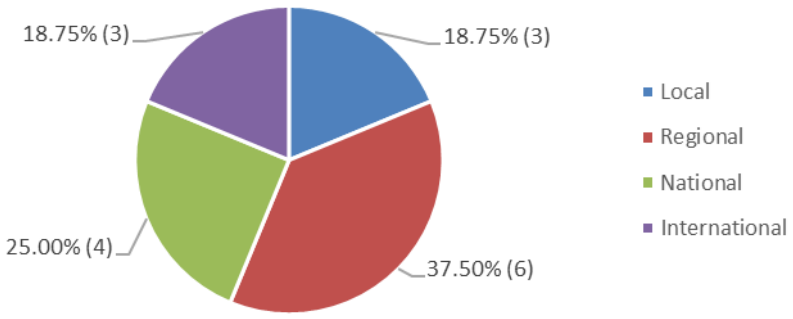
Figure 15: Geographical distribution per stakeholders' category



Source: Study supporting the impact assessment for a future interoperability strategy

The group of respondents to the public consultations from public authorities includes a mix of administrations exercising at the international (3 respondents), national (4 respondents), regional (6 respondents) and local (3 respondents) levels (see Figure 16).

Figure 16: Scope of public authorities (share of respondents and number of respondents in brackets)

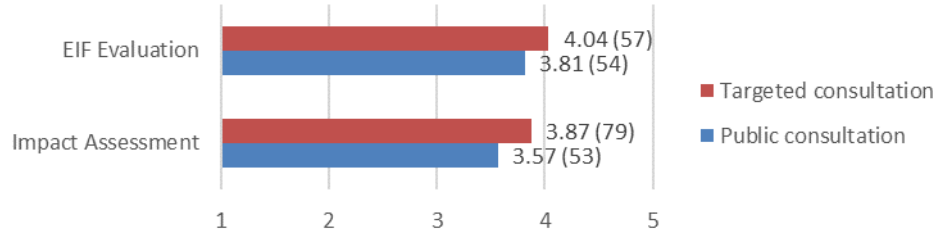


Source: Study supporting the impact assessment for a future interoperability strategy

On average, respondents have a good level of knowledge in the field, noting they are familiar to a great extent with digital public services and interoperability (see Figure 17). When it comes to specific knowledge about the EIF, the difference between the respondents to the targeted consultation and those contributing to the public consultation is more pronounced, with respondents to the public consultation reflecting a relatively lower level of knowledge

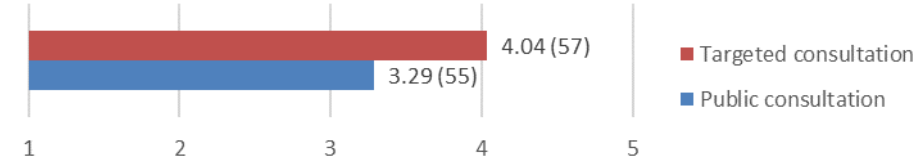
(see Figure 18). Nevertheless, the consulted stakeholders are on average familiar at least to some extent with the EIF.

Figure 17: Knowledge of digital public services and interoperability (breakdown by type of consultation; average score and number of respondents)



Score: (1) not at all; (2) to a limited extent; (3) to some extent; (4) to a great extent; or (5) completely.
Source: Study supporting the impact assessment for a future interoperability strategy

Figure 18: Knowledge of the EIF (breakdown by type of consultation; average score and number of respondents)

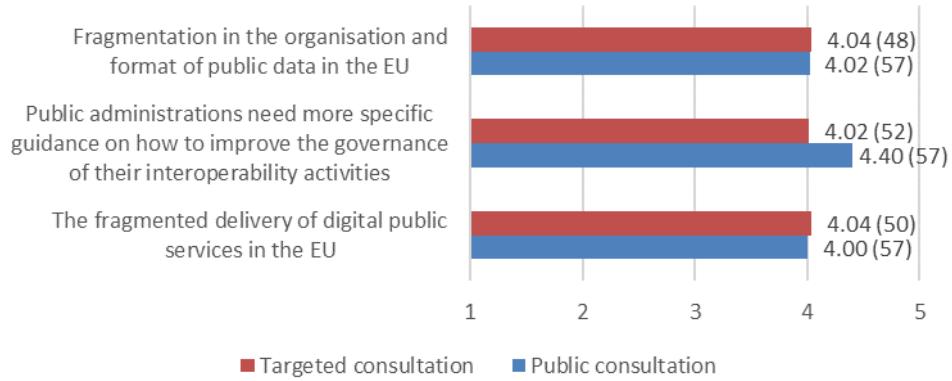


Score: (1) not at all; (2) to a limited extent; (3) to some extent; (4) to a great extent; or (5) completely.
Source: Study supporting the impact assessment for a future interoperability strategy

Results: EIF Evaluation

The framework is deemed to be **relevant** to some extent. The needs and problems originally identified by the EIF continue to be experienced across the relevant stakeholders and the framework has only partially addressed them (see Figure 19). Respondents to the targeted consultations call for more guidance for public administrations to improve the governance of their interoperability activities and address the problems linked to the fragmentation in the delivery of digital public services and the organisation and format of public data. Public administrations particularly point to the need for more cooperation, especially in specific sectors (e.g., health). Several other needs were highlighted, such as the need to increase awareness, for staff with IT skills in public administrations and to build investment capacity to keep pace with rapid technological change and bridge technological barriers.

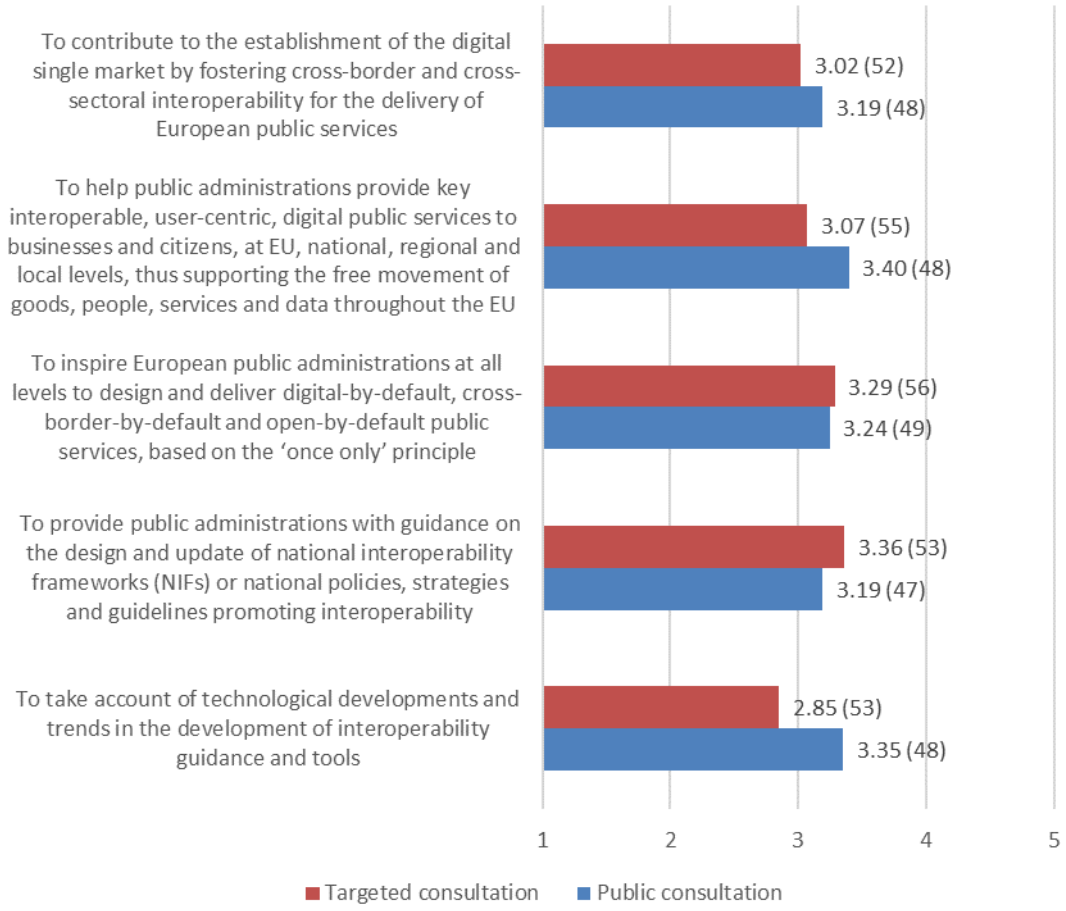
Figure 19: Extent to which the following needs and problems are currently experienced by European public administrations, businesses and/or citizens (breakdown by type of consultation; average score and number of respondents)



Score: (1) not at all; (2) to a limited extent; (3) to some extent; (4) to a great extent; or (5) completely.
Source: Study supporting the evaluation of the implementation of the EIF

Stakeholders participating in both consultations consider that the recommendations of the EIF have been **effective** to some extent in achieving the objectives (see Figure 20). However, the EIF has been seeking to achieve broad objectives and the recommendations require more granularity. The targeted consultation generally emphasises the contribution of the framework to raising awareness of the importance of cross-border interoperability, although more needs to be done at the sub-national level. The principles set out by the EIF have enhanced interoperable digital public services but are difficult to assess due to their abstract nature or still limited achievements. Stakeholders call for more clarification when it comes to transparency, technological neutrality and user-centricity. The layered interoperability and the conceptual model could be improved with more practical guidance for implementing the models. Overall, positive impacts have been experienced across stakeholders, in particular in enhancing the quality of services provided by public administrations and in fostering the free movement of goods, services, capital and workers across the EU. Nevertheless, more could be achieved to increase the direct and indirect benefits gained by stakeholders.

Figure 20: Extent to which the recommendations listed in the EIF have contributed so far to the achievement of the following objectives (breakdown by type of consultation; average score and number of respondents)

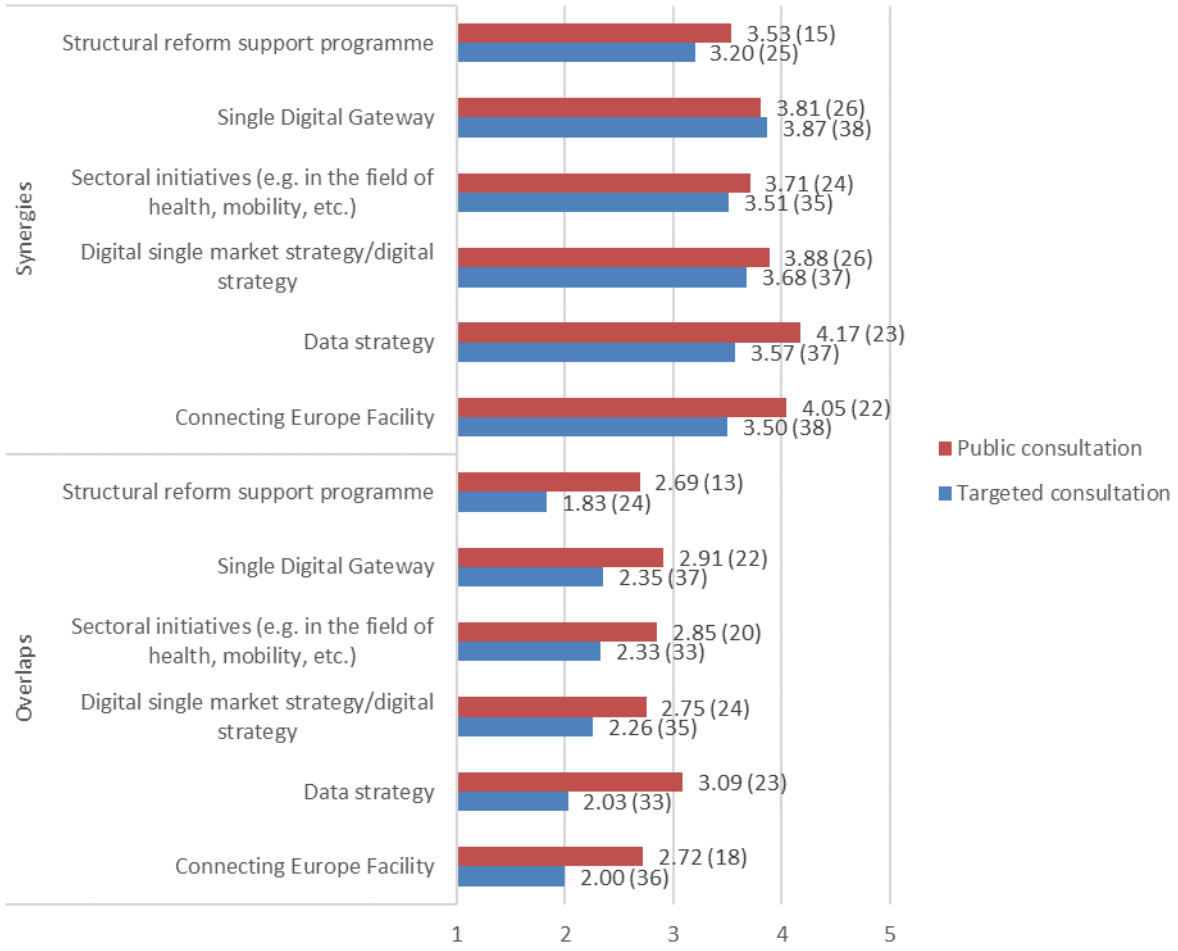


Score: (1) not at all; (2) to a limited extent; (3) to some extent; (4) to a great extent; or (5) completely.
Source: Study supporting the evaluation of the implementation of the EIF

Although costs and benefits are difficult to assess due to a plethora of factors, stakeholders participating in the targeted consultation acknowledge that, in the long run, the EIF brings benefits that exceed the cost of implementation. The EIF results in **efficiency** gains by supporting data re-use, enabling synergies in implementing and designing new services and streamlining administrative procedures. A representative from a national public administration noted that the costs of several ICT projects have been eliminated due to timely considerations of interoperability. The costs of implementing the framework are relatively moderate, both at the national and EU levels; initial investments can be challenging, but over time the benefits outweigh the costs and expand beyond a single administration.

In terms of **internal coherence**, the respondents consider that the components of the EIF are generally synergetic (see Figure 21); the framework could be improved by better linking the conceptual model with the principles and the layered interoperability model. In addition, clarification of some thematically overlapping sets of recommendations would make the framework more actionable. At the level of **external coherence**, synergies are identified with the Single Digital Gateway, the Digital Single Market Strategy and the Data Strategy; overlaps and inconsistencies remain limited, but challenges may arise within own frameworks that are developed as part of sectoral initiatives (see Figure 21).

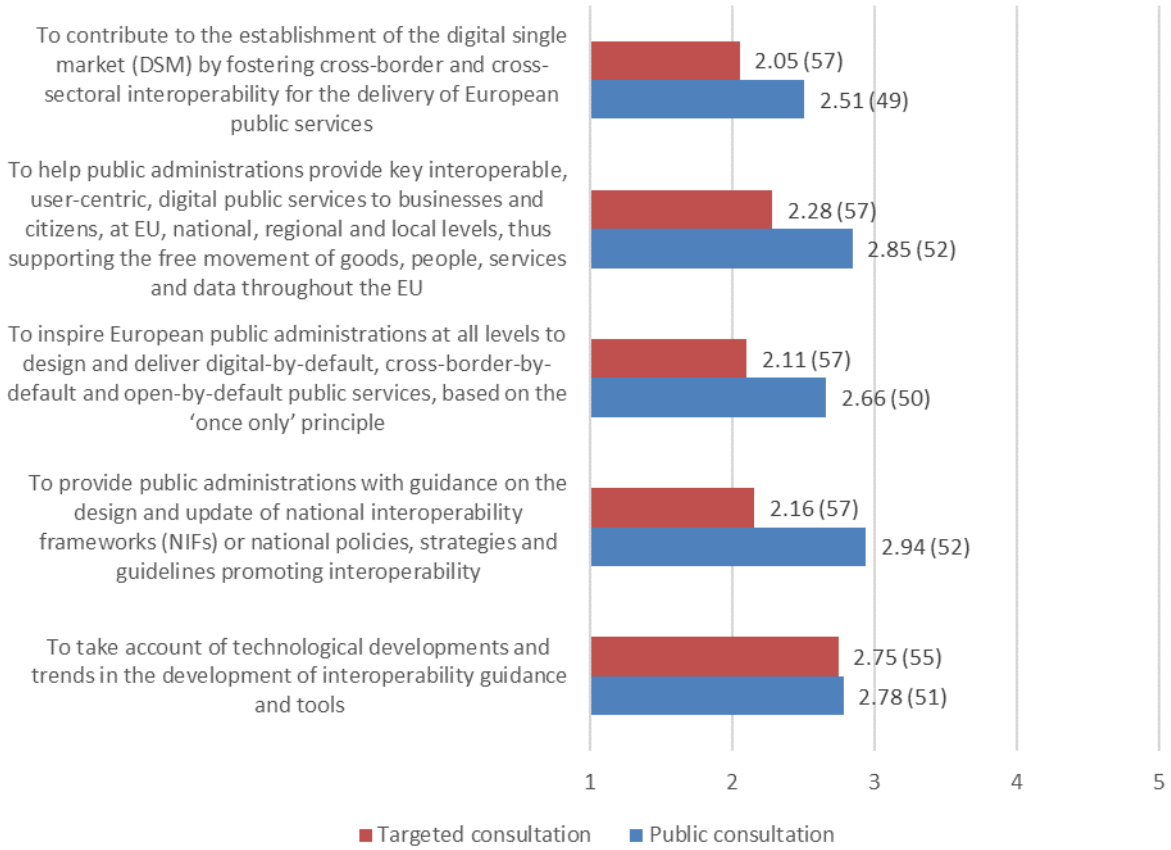
Figure 21: Extent to which there are synergies, overlaps between the EIF and other EU initiatives with similar objective (breakdown by type of consultation; average score and number of respondents)



Score: (1) not at all; (2) to a limited extent; (3) to some extent; (4) to a great extent; or (5) completely.
Source: Study supporting the evaluation of the implementation of the EIF

Finally, respondents to both types of consultations generally agree that national or sub-national initiatives would bring only limited contributions to the objectives pursued by the EIF, confirming its **EU added value** (see Figure 22). In particular, the cross-border dimension cannot be achieved solely by national or sub-national administrations. The EIF is not sufficiently used across areas and by Commission services. Furthermore, cross-border interoperability remains limited and is driven by specific sectoral needs.

Figure 22: Extent to which national or sub-national interventions (in the absence of the EIF) would be able to achieve the following objectives (breakdown by type of consultation; average score and number of respondents)



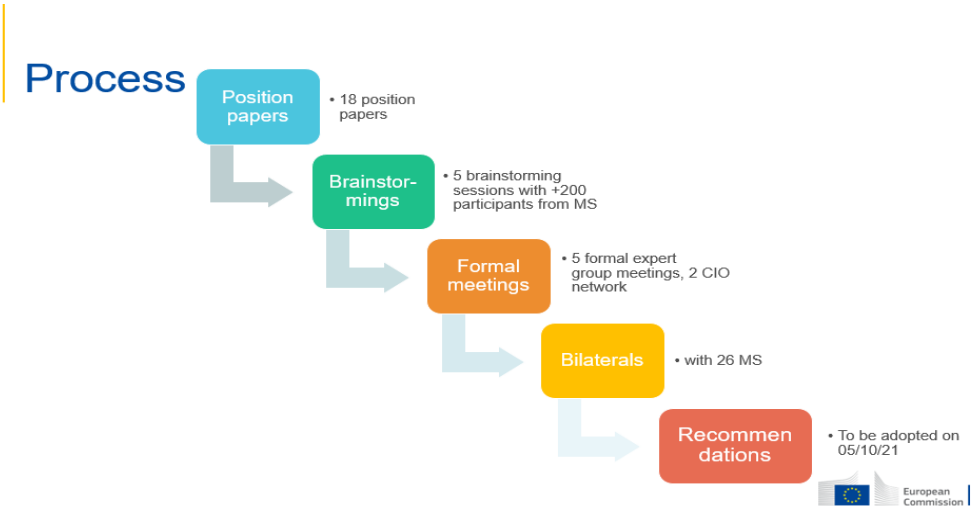
Score: (1) not at all; (2) to a limited extent; (3) to some extent; (4) to a great extent; or (5) completely.
Source: Study supporting the evaluation of the implementation of the EIF

Input of the Expert Group co-design process

We have put in place an innovative co-creation, co-design process with the interoperability expert group with Member States that encourages open cooperation and transparency. This has led to a constant increase in the engagement and interaction in meetings. Moving all discussions online since more than 18 months now has also led to an increase in the number of participants. In physical meetings we would have had 1 or maximum 2 representatives per Member State for a maximum of 35 approximately, whereas online we regularly have more than 54 participants. Workshops and roundtables follow design-thinking methodologies and participatory practices. We organised since mid-2020: 5 brainstorming sessions with more than 200 representatives from Member States, 5 formal expert group meetings with also more than 200 participants overall. Member States issued 18 position papers and we met them throughout the summer of 2021 in 26 bilaterals to discuss around the recommendations on the future policy.

The main result of this process with the expert group are the recommendations on a future interoperability policy. Other intermediate results can be interesting to understand the view of the stakeholders that are likely to be the most affected by the policy initiative.

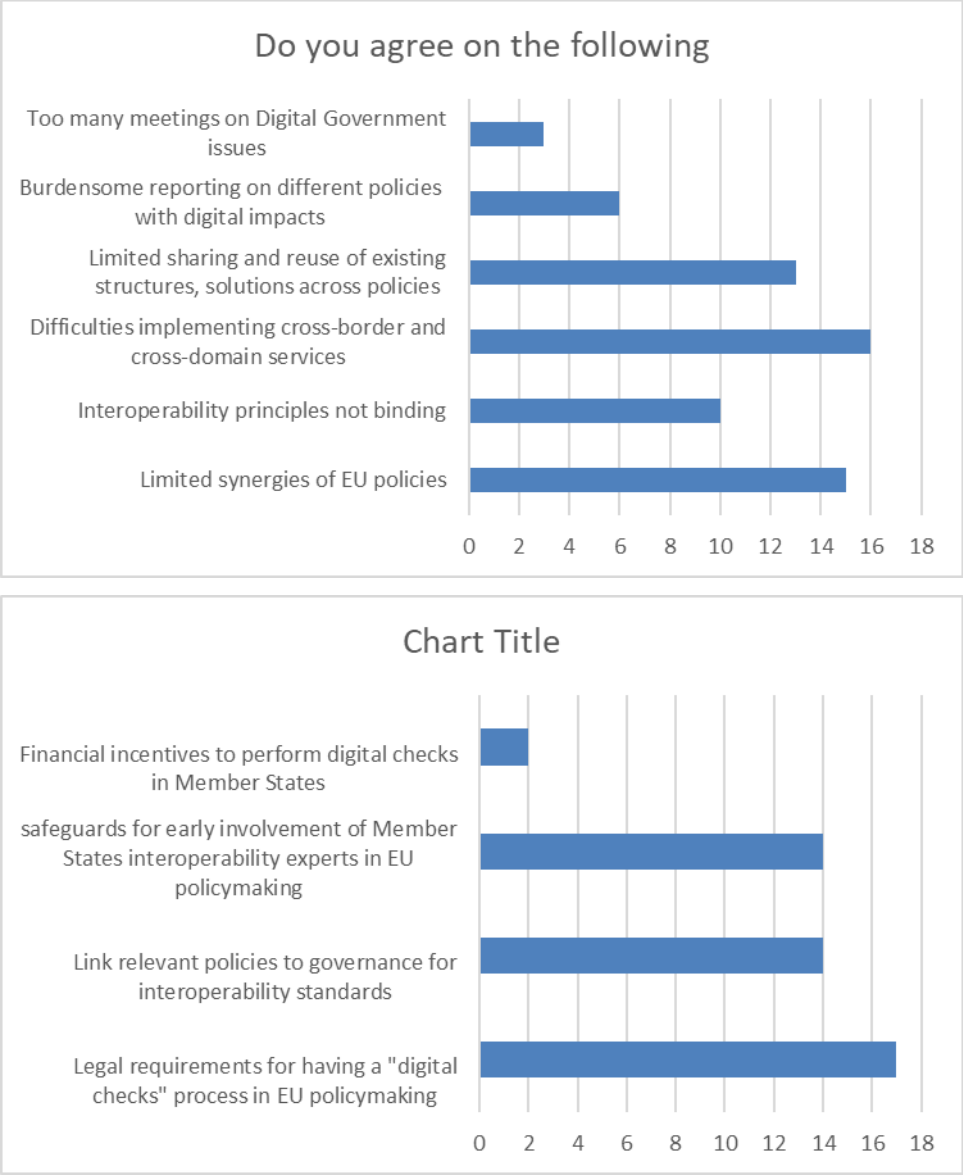
Figure 23: Co-design process with Expert Group



The co-design process with the expert group was structured around five work phases:

- **Position papers** from 18 Member States – CIOs office – In December 2020 the Commission kindly asked the members of the expert group to react on a short policy paper with some initial ideas for the next interoperability policy (vision, general approach, policy instruments, etc.). This was only on a voluntary basis, however two-third of the members replied positively and shared position papers explaining their views on the upcoming policy and the proposed instruments;
- **Co-creation workshops** – five informal discussion sessions took place between January and December 2021 (see the list below), involving around 40-45 members of EU national administrations each time. The working methodology was based on design-thinking principles, including 'diverge' and 'converge' working phases, and participants were sometimes asked to fill polls (e.g. see below a poll from the workshop on the 30th of April). These meetings were moderated using Chatham House rules (no recording, participants do not formally engage their country), in order to foster interactions between people and ideation. Several working papers were circulated to stabilize ideas along the process and the subjects of these workshops helped build the structure of the draft policy recommendations of the group (see point d.). All papers were available to all the participants and we encouraged transparent feedbacks directly on a Teams space.
    - 04/02/2021 – General debate on the policy approach for the next interoperability policy following the position papers (e.g. vision, priorities, etc.)
    - 14/04/2021 – Communities of Practitioners (e.g. topics, organisation and composition, etc.)
    - 30/04/2021 – Synergies and Funding (e.g. links with other EU digital policies, financial support to Member States for interoperability implementation)
    - 20/05/2021 – Digital Checks and digital-ready policy (e.g. experience from Member States, replicability at the EU institutional level)
    - 10/06/2021 – Governance (e.g. composition, structure and mandate of a strengthened EU interoperability governance)

Figure 24: ***Example of poll during the co-creation workshop on the 30th of April 2021***



- **Bilaterals** – the Commission organised 26 bilateral calls with 26 Member States between July and September 2021 (only one country did not reply because of a lack of internal resources at that time). Each of these informal discussions lasted between 45 and 120 minutes. They were very rich in terms of content and feedback received, while helping the Commission to identify points of tension, test ideas with the Member States and build mutual trust;
- **Policy recommendations** – this is the main outcome of the expert group since its creation in February 2020. They were formally endorsed by consensus of the whole group on the 5th of October 2021. The document includes 27 recommendations structured around three chapters, each of them reflecting the common ideas expressed by the Member States in the position papers, the co-creation workshops and the bilaterals:
    - Chapter 1 – A strengthened governance
    - Chapter 2 – Interoperability for better EU policies
    - Chapter 3 – Upgrade EU interoperable solutions

Those recommendations served as a basis to build the draft legal text and the two dedicated workshops;

- **Two workshops on the legal draft** – They took place in October and November 2021. The first one gathered around 40 external participants who expressed their views on the legal concepts introduced by the Commission and discussed the composition and mandate of the future strengthened EU interoperability governance. Following the first workshop, the Commission circulated a first draft of the legal text with the members of the expert group and organised a workshop to collect preliminary ideas and suggestions to be integrated in the impact assessment and the upcoming legal proposal. Member States provided written feedback by the 3rd of December 2021.

Annex VI. Supporting evidence from desk research

This annex presents a series of sub-annexes containing supporting evidence for the assessment of the EIF.

Annex VI.1. Scoreboards monitoring the implementation of the EIF

Table 10: Scoreboard 1: Principles of interoperability

Country	Principle 01	Principle 02	Principle 03	Principle 04	Principle 05	Principle 06	Principle 07	Principle 08	Principle 09	Principle 10	Principle 11	Principle 12
Austria	3	4	3	4	2	3	No data	4	2	4	4	4
Belgium	4	4	3	4	4	4	3	4	2	4	No data	3
Bulgaria	3	4	4	4	4	3	3	4	2	3	4	3
Croatia	3	4	4	4	2	3	3	4	3	3	4	3
Cyprus	4	4	3	4	4	4	3	4	3	4	4	3
Czech Rep.	4	4	3	4	4	4	3	4	3	4	4	3
Denmark	4	4	4	4	4	4	3	4	3	4	4	4
Estonia	3	4	4	4	4	4	3	4	3	4	4	2
Finland	3	2	4	4	4	4	2	4	4	4	4	3
France		No data		4	No data	No data	No data	No data	3	4	No data	No data
Germany	3	4	4	4	4	2	3	4	3	4	4	3

Country	Principle 01	Principle 02	Principle 03	Principle 04	Principle 05	Principle 06	Principle 07	Principle 08	Principle 09	Principle 10	Principle 11	Principle 12
Greece	3	4	3	4	4	3	1	4	2	3	4	2
Hungary	3	4	4	4	4	3	3	4	2	4	4	3
Ireland	4	4	4	3	3	4	3	4	3	4	4	1
Italy	3	4	2	4	4	2	No data	4	3	4	4	2
Latvia	4	4	3	4	4	4	3	4	4	4	4	4
Lithuania	3	2	4	3	4	4	3	4	3	4	4	3
Luxembourg	4	4	4	4	4	4	3	4	3	4	4	3
Malta	3	4	4	2	4	4		4	4	4	No data	3
Netherlands	4	4	3	4	4	4	3	4	3	4	4	4
Poland	3	4	3	3	4	3	3	4	2	4	4	3
Portugal	3	4	3	2	3	3	3		3	4	No data	2
Romania	3	4	2	2	3	2	3	4	2	2	1	2
Slovenia	3	4	3	4	4	4	3	4	3	4	4	4
Slovakia	3	4	4	4	4	3	3	4	2	4	4	3

Country	Principle 01	Principle 02	Principle 03	Principle 04	Principle 05	Principle 06	Principle 07	Principle 08	Principle 09	Principle 10	Principle 11	Principle 12
Spain	4	4	4	4	4	4	3	4	3	4	4	2
Sweden	4	4	4	4	3	4	No data	4	3	4	4	1

Note: The full description of the principles can be consulted in Annex 2 of the 2017 EIF Communication.
Source: Authors' elaboration based on the data available on Joinup concerning the EIF Monitoring Mechanism and the underlying database provided by DIGIT.D2.

Table 11: Scoreboard 2: Interoperability layers

Country	Interoperability governance	Integrated public service governance	Legal interoperability	Organisational interoperability	Semantic interoperability		Technical interoperability
Austria	3	4	4	4	3		4
Belgium	3	3	2	4	4		4
Bulgaria	4	4	4	4	4		4
Croatia	3	4	4	4	4		4
Cyprus	3	4	2	4	3		4
Czech Republic	4	4	4	4	3		4
Denmark	4	4	4	4	4		4
Estonia	2	3	4	4	4		4
Finland	3	3	3	4	4		1

Country	Interoperability governance	Integrated public service governance	Legal interoperability	Organisational interoperability	Semantic interoperability		Technical interoperability
France	No data	No data	No data	No data	No data		No data
Germany	4	4	4	2	2		4
Greece	3	4	4	2	2		4
Hungary	4	4	4	3	4		4
Ireland	3	4	1	2	4		4
Italy	3	4	2	4	4		4
Latvia	3	4	4	4	3		4
Lithuania	1	3	4	1	2		4
Luxembourg	4	4	4	4	4		4
Malta	4	3	3	4	3		4
Netherlands	4	4	4	4	4		4
Poland	3	3	3	2	4		4
Portugal	3	3	4	2	2		4
Romania	2	2	3	4	2		4

Country	Interoperability governance	Integrated public service governance	Legal interoperability	Organisational interoperability	Semantic interoperability		Technical interoperability
Slovenia	3	4	4	4	4		4
Slovakia	4	4	4	4	4		4
Spain	4	4	4	4	4		4
Sweden	1	4	2	4	4		4

Source: Authors' elaboration based on the data available on Joinup concerning the EIF Monitoring Mechanism and the underlying database provided by DIGIT.D2.

Table 12: Scoreboard 3: Conceptual model for integrated public services provision

Country	Conceptual model	Internal information sources and services	Base registries	Open data	Catalogues	External information sources and services	Security and Privacy
Austria	4	4	2	3	4	3	3
Belgium	4	4	3	4	3	2	4
Bulgaria	4	4	4	4	4	3	3
Croatia	3	4	3	4	4	3	2
Cyprus	4	4	4	4	4	3	3
Czech Republic	4	4	4	4	4	2	4
Denmark	4	4	4	4	2	4	3
Estonia	4	4	4	4	3	2	2

Country	Conceptual model	Internal information sources and services	Base registries	Open data	Catalogues	External information sources and services	Security and Privacy
Finland	3	4	4	4	4	3	3
France	No data	No data	No data	4	No data	No data	No data
Germany	3	1	3	3	2	1	4
Greece	4	4	3	3	3	3	3
Hungary	4	4	3	4	3	3	3
Ireland	1	1	4	4	2	4	3
Italy	4	4	4	4	4	3	4
Latvia	3	4	4	3	3	3	2
Lithuania	4	4	3	3	2	3	3
Luxembourg	3	4	4	3	4	4	3
Malta	3	4	4	3	4	2	3
Netherlands	3	4	4	4	4	4	4
Poland	4	4	3	4	1	3	3
Portugal	4	4	3	3	3	3	4
Romania	2	1	3	3	2	3	2

Country	Conceptual model	Internal information sources and services	Base registries	Open data	Catalogues	External information sources and services	Security and Privacy
Slovenia	4	4	4	4	3	4	4
Slovakia	4	4	3	3	4	3	4
Spain	4	4	4	4	2	4	4
Sweden	4	4	3	4	1	4	2

Source: Authors' elaboration based on the data available on Joinup concerning the EIF Monitoring Mechanism and the underlying database provided by DIGIT.D2.

Annex VI.2. Overview of the adoption of NIFs

Country	NIF in place or EIF-based strategy	Year of adoption[142]	Remarks
AT	Austrian interoperability Framework (AIFv1.0)	2015	The Austrian Interoperability Framework (AIFv1.0) was found to be almost perfectly aligned with the EIF (with an alignment score of 95%), improving the alignment compared to the previous strategy governing the national interoperability efforts in Austria (75% alignment).[143]
BE	Belgian Interoperability Framework (BelgIF)	2005	Interoperability in Belgian public services was initially addressed in 2005 when the first NIF was adopted. In 2017, BelgIF was adapted to the new EIF. The current Belgian Interoperability Framework relies on the 12 principles of the EIF as the basis on which the federal and regional public authorities define interoperability. The BelgIF endorses the 47 recommendations put forward in the 2017 version of the EIF.
BG	Bulgarian National Interoperability Framework (BNIF) – Draft	2006	The first version of the Bulgarian Interoperability Framework was adopted in 2006. The current Bulgarian National Interoperability Framework (BNIF, v1.2) is available in draft form and provides an update to the Bulgarian National Interoperability Framework for Governmental Information Systems adopted in 2006. The draft BNIF builds on the three main elements of the EIF (principles, interoperability levels, a conceptual model for public services), providing recommendations for the development of Bulgarian interoperable public services.
HR	Croatian Interoperability Framework	2010	The Croatian Interoperability Framework was developed based on the European Interoperability Framework 1.0 (published in 2004). A new interoperability framework has not been issued, but the subsequent revisions of the EIF are taken

142 This column refers to the first adoption of the National Interoperability Frameworks in the Member State. Years of adoption show the date when interoperability of public services was first taken into account by adopting the National Interoperability Frameworks. It should be noted that the data accuracy depends on the data availability online.

143 Further details on the alignment score is available here: https://joinup.ec.europa.eu/collection/nifo-national-interoperability-framework-observatory/news/austrias-renewed-interoperab

Country	NIF in place or EIF-based strategy	Year of adoption[142]	Remarks
			into account in the actions undertaken in the field of interoperability.[144]
CY	Cyprus National Interoperability Framework (eGIF)	2016	The Cyprus National Interoperability Framework (eGIF) v1.0 was adopted in 2016, and was updated by the Cyprus National Interoperability Framework (eGIF) v2.0. eGIF v2.0 was prepared in order to align the already existing national framework with the new EIF published in 2017. The eGIF v2.0 reflects the principles, interoperability layers and conceptual model of public services presented in the EIF.
CZ	-	-	The national interoperability framework currently supports legislative, organisational, technical and semantic interoperability in compliance with the European Interoperability Framework. It takes into account principles of eGovernment in the description of its 'National eGovernment Architecture of Public Administration', which was implemented based on the Information Concept Plan (adopted in 2018).
DK	The Common framework for Public Sector Digital architecture	2017	The Common framework for Public Sector Digital architecture (2017) takes into account interoperability layers and several interoperability principles of EIF. Also, it is built partly on the European Interoperability Reference Architecture (EIRA).
EE	Estonian Interoperability Framework (EIF)	2011	Estonia has addressed the interoperability of public services for a long time. The third version of the Estonian Interoperability Framework was published in 2011. The current version of the Estonian Interoperability Framework is aligned with the new European Interoperability Framework on the basis of terminology and general principles. It includes three layers of interoperability; technical interoperability, organisational and semantic interoperability.
FI	-	-	Finland does not have a NIF. The Information Management in Public Administration Act

144 As noted in the following strategic document: Ministry of Public Administration (2017), e-Croatia Strategy 2020, http://digarhiv.gov.hr/arhiva/1231/168420/uprava.gov.hr/UserDocsImages/e-Hrvatska/Strategija_e-Hrvatska_2020.pdf; https://uprava.gov.hr/UserDocsImages//Istaknute%20teme/e-Hrvatska//e-Croatia%202020%20Strategy%20(20.01.2016.).pdf

Country	NIF in place or EIF-based strategy	Year of adoption[142]	Remarks
			(906/2019) includes a requirement for government agencies to utilise datasets of other government agencies whenever possible, if they by law have access to such data via electronic interfaces.
FR	-	-	France adopted the General Interoperability Repository (2016) that refers to technical and semantic interoperability. The repository is a set of recommendations referencing norms and standards that promote interoperability within the public administration's information systems. The referencing of norms and standards is based on criteria developed by the European Commission (the Common Assessment Method for Standards and Specifications).
DE	-	-	The Federal Republic of Germany does not have a dedicated National Interoperability Framework. However, it does take EIF into account in the Architectural Guideline for Federal IT, which aims to help public administrations develop new public services by providing technical and semantic guidelines. The binding Architecture Guidelines were first adopted in 2017.
EL	Greek eGovernment Interoperability Framework (Greek eGIF)	2006	The Greek eGovernment Interoperability Framework has been developed in 2006, providing standards and specifications for the development of web-based services and guidelines for public administrations. The framework was officially adopted through state law in 2010.[145]
HU	-	-	Hungary does not have a dedicated National Interoperability Framework. However in the 'National Info Communication Strategy 2014 – 2020' several principles of EIF are addressed such as openness, technological neutrality and security.
IS	-	-	Iceland does not have a dedicated National Interoperability Framework. However, National bodies are involved in the development of the national interoperability framework that will include all government levels, public

145 See: Digital Public Administration Factsheet 2020: Greece, https://joinup.ec.europa.eu/sites/default/files/inline-files/Digital_Public_Administration_Factsheets_Greece_vFINAL.pdf

Country	NIF in place or EIF-based strategy	Year of adoption[142]	Remarks
			administrations and private entities.
IE	-	-	Ireland does not have a dedicated National Interoperability Framework.
IT	The New Interoperability Model	2020	In Italy, a New Interoperability Model is being developed in Italy, as a cornerstone for the IT plan for public administrations between 2020 – 2022. It provides guidelines and technological specifications and standards for Italian Public Administrations. The design for the new interoperability model is based on the principles of the European Interoperability Framework (the 2010 version).
LV	-	-	Latvia does not a dedicated National Interoperability Framework. However, the Conceptual Architecture of Public Administration Information Systems (2015) provides an architectural reference covering all aspects of public information systems, organisation, data, systems and technology. It provides 40 recommendations on the long-term vision for development of public services. Furthermore, the Latvian Cabinet of Ministers suggested that the Conceptual Framework needs to be more aligned with the current European Interoperability Framework.
LI	-	-	Liechtenstein has not adopted a National Interoperability Framework.
LT	-	-	The Republic of Lithuania does not have a dedicated National Interoperability Framework.
LU	The Luxembourg National Interoperability Framework (NIF)	2019	The Luxembourg National Interoperability framework is developed on the basis of the European Interoperability Framework. It consists of 11 principles and 48 recommendations, providing guidelines for development of interoperable public services in Luxembourg.
MT	National ICT Interoperability	2013	The National Interoperability Framework of Malta, developed by the Malta Information

Country	NIF in place or EIF-based strategy	Year of adoption[142]	Remarks
	Framework (NIF)		Technology Agency (MITA), was first published in 2013.[146] It provides guiding principles for public administrations to achieve full interoperability. The NIF is being revised to ensure full alignment with the European Interoperability Framework.
ME	National Interoperability Framework	2011	Montenegro had developed the first version of the Montenegrin Interoperability Framework in 2011, and a second version followed in 2013, defining rules and methods for enhancing the interoperability of public administrations. The current version of the Montenegrin National Interoperability Framework was developed in 2019 and is built on the three main elements (principles, interoperability layers and conceptual model for public services) of the current European Interoperability Framework.[147]
NL	Dutch Government Reference Architecture (NORA)	2006	The Dutch Government Reference Architecture (NORA), playing the role of a National Interoperability Framework, was first adopted in 2006. It provides in 10 basic principles and 38 derived principles for successful development of interoperable public services. In 2016 NORA was almost perfectly aligned with the previous version of the European Interoperability Framework.[148]
NO	Norwegian Interoperability Framework	2018	The Norwegian Interoperability Framework is considered as the national transposition of the European Interoperability Framework. The NIF is mandatory only for the national levels of public administrations, while for the local and regional levels it is strongly recommended. It is built on the three main elements (principles, interoperability layers and conceptual model for public services) of the European Interoperability Framework. Furthermore, it provides guidelines and recommendations on how to develop interoperable

146 See: NIFO Factsheet 2015 – Malta, https://joinup.ec.europa.eu/sites/default/files/inline-files/NIFO%20-%20Factsheet%20Malta_12_2015.pdf

147 See: Digital Public Administration factsheet 2020: Montenegro, https://joinup.ec.europa.eu/sites/default/files/inline-files/Digital_Public_Administration_Factsheets_Montenegro_vFINAL.pdf

148 Further details on the alignment score are available here: https://joinup.ec.europa.eu/sites/default/files/custom-page/attachment/2017-10/NIFO_Updated_Analytical%20Model_NETHERLANDS_2016_published.pdf

Country	NIF in place or EIF-based strategy	Year of adoption[142]	Remarks
			public service in Norway.
PL	-	-	Poland does not have a dedicated National Interoperability Framework. However, Poland set up the State Information Architecture (2018) which aims to ensure that IT activities and processes taking place in public administrations are consistent. The work undertaken in Poland, starting from the State Information Architecture, is carried out in accordance with the European Interoperability Reference Architecture and the European Interoperability Framework.[149]
PT	-	-	Portugal does not have a dedicated National Interoperability Framework. However, a platform for the interoperability of public administrations is available online (created in 2015). The platform provides tools enabling public administrations to provide interoperable electronic services.
MK	Macedonian Framework for Interoperability	2016	The North Macedonian Framework for Interoperability is developed on the basis of the previous European Interoperability Framework and it consists of 11 principles and 4 interoperability layers (legal, semantic, organisational and technical).
RO	Romanian Interoperability Framework (RIF)	2017	The Romanian Interoperability Framework, adopted in 2017, consists of the three main elements (principles, interoperability layers and conceptual model for public services) of the previous European Interoperability Framework, providing recommendations and guidelines for public administrations to develop interoperable public services.
SK	-	-	Slovakia does not have a dedicated National Interoperability Framework. However, the New National eGovernment Concept, approved in December 2021 and the updated one build on principles from the EIF.
SL	The Slovenian National	2012	While a Slovenian National Interoperability Framework exists, this has been established as a

149 See: Digital Public Administration factsheet 2020: Poland, https://joinup.ec.europa.eu/sites/default/files/inline-files/Digital_Public_Administration_Factsheets_Poland_vFINAL.pdf

Country	NIF in place or EIF-based strategy	Year of adoption[142]	Remarks
	Interoperability Framework (NIO)		portal for coordinated development of interoperable public services in Slovenia, rather than as a strategic document. The NIO portal provides guidelines, recommendations and sharing of best practices for relevant stakeholders. Furthermore, it enables exchange of information in interoperability with the relevant stakeholders through the connection with the JoinUp platform.[150] Interoperability is considered in strategic documents such as the 'Public Administration Development Strategy 2015–2020'.
SP	Spanish National Interoperability Framework (EIN)	2010	The Spanish National Interoperability Framework (EIN) was first published in 2010 and was aligned in 2018 with the new European Interoperability Framework.
SE	-	-	The National Standardisation Strategy (Regeringens strategi för standardisering) was adopted in July 2018, being aligned to the EIF
CH	-	-	Switzerland does not have a dedicated National Interoperability Framework.
TR	-	-	Turkey does not have a dedicated National Interoperability Framework
UK	-	-	The United Kingdom does not have a dedicated National Interoperability Framework. However, the United Kingdom has adopted the 'The Digital Service Standard' and the 'Technology Code of Practice'. Both of these documents are aligned with the current European Interoperability Framework. The UK has had a series of ICT strategies to improve the delivery of public services, including a strategy adopted in 2011 (Government ICT Strategy), the 2012 Government Digital Strategy, and the 2017 Government Transformation Strategy.
UA	-	-	Ukraine does not have a dedicated National Interoperability Framework.

150 Further details about the NIO platform are available here: https://nio.gov.si/nio/cms/page/purpose?lang=en

Source: *Study supporting the evaluation of the implementation of the EIF* based on the Digital Public Administration Factsheets and official national documents and portals.

Annex VI.3. Overview of the mentions of EIF in a sample of EU pieces of legislation and policy documents

Initiative / Piece of legislation	Does it mention the EIF?	Does it mention any of the interoperability layers?	Does it mention the EIF conceptual model?	Does it mention the principles for interoperable public services?
A counter Terrorism Agenda for the EU - Proposal (Communication)	**Yes.**	Indirect reference to technical and semantic interoperability (p. 13 and p 17)	No.	No.
Berlin Declaration on Digital Society and Value-based Digital Government	**Yes.**	Indirect reference to technical and semantic interoperability (p. 12)	No.	• Principle 3) Transparency • Principle 4) Reusability • Principle 6) User centricity • Principle 7) Inclusion and accessibility • Principle 8) Security and privacy
Commission Implementing Regulation (EU) No 821/2014[151]	**Yes.**	Indirect reference to technical and semantic interoperability. (p. 8)	No.	No.
Digital Services Act - Proposal	**No.**	Indirect reference to technical interoperability (p. 52)	No.	• Principle 1) Subsidiarity and proportionality • Principle 3) Transparency • Principle 8) Security and privacy
eIDAS Regulation	**No**.	• Direct reference to technical Interoperability • Indirect reference to	No.	• Principle 1) subsidiarity and proportionality • Principle 8) security and privacy

151 Commission Implementing Regulation (EU) No 821/2014 of 28 July 2014 laying down rules for the application of Regulation (EU) No 1303/2013 of the European Parliament and of the Council as regards detailed arrangements for the transfer and management of programme contributions, the reporting on financial instruments, technical characteristics of information and communication measures for operations and the system to record and store data

Initiative / Piece of legislation	Does it mention the EIF?	Does it mention any of the interoperability layers?	Does it mention the EIF conceptual model?	Does it mention the principles for interoperable public services?
		semantic interoperability (in case of Attributes)		• Principle 11) preservation of information
EU Government Action plan (Communication)	**Yes.**	No.	No.	• Principle 2) openness • Principle 3) transparency • Principle 8) security and privacy
EU Single Window Environment for Customs – Proposal	**Yes.**	Direct reference to technical interoperability (p. 19)	No.	No.
European Cloud Initiative (Communication)	**No**.	No.	No.	• Principle 5) data portability
European Data Governance – Proposal	**Yes.**	Indirect reference to semantic interoperability (p.31)	No.	• Generally referenced to EIF principles
A European strategy for data (Communication)	**Yes.**	Indirect: Semantic interoperability and technical interoperability (p.12 and p.33)	No.	• Principle 1) proportionality • Principle 3) transparency • Principle 4) reusability
INSPIRE Directive	**No.**	Indirect: Technical interoperability (p. 3)	No.	No.
Open Source Software Strategy 2020 - 2023 (Communication to the Commission)	**Yes.**	Indirect reference to technical interoperability (p.10).	No.	• Principle 2) Openness • Principle 4) Reusability • Principle 8) Security and privacy
Regulation (EU) 2019/1149	**Yes.**	No.	No.	• General reference to the EIF principles (p.25)

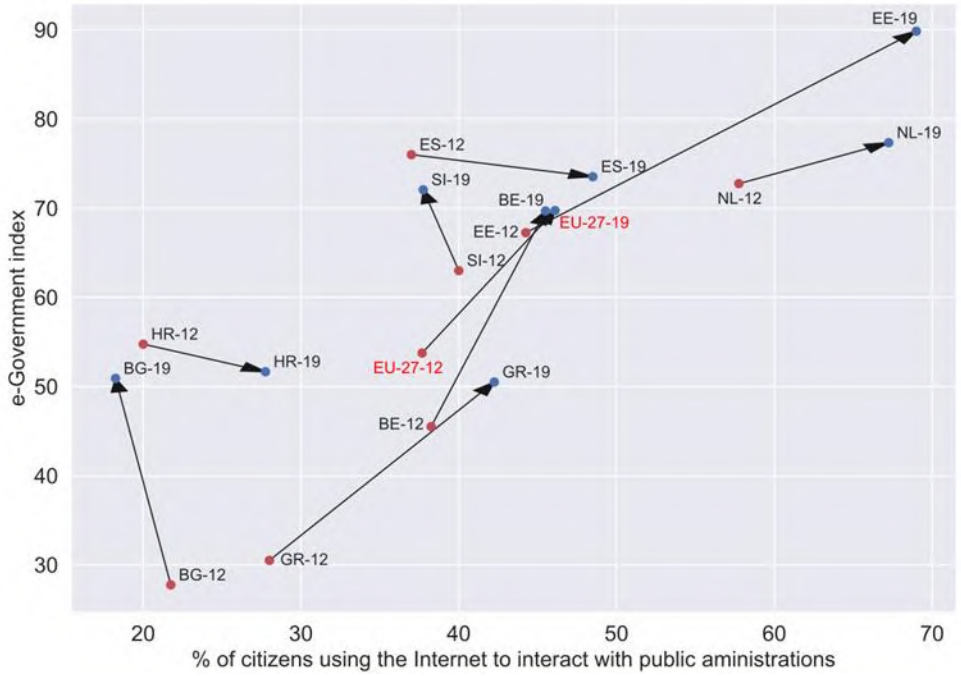
Initiative / Piece of legislation	Does it mention the EIF?	Does it mention any of the interoperability layers?	Does it mention the EIF conceptual model?	Does it mention the principles for interoperable public services?
establishing a European Labour Authority				
Single Digital Gateway Regulation	**No.**	Indirect reference to semantic and technical layers of interoperability (p. 21).	No.	• Principle 1) Subsidiarity • Principle 2) Openness • Principle 3) Transparency • Principle 6) User centricity

Source: Study supporting the evaluation of the implementation of the EIF

Annex VI.4. Evolution of the quality of digital public services and citizens' use of the Internet to interact with public administrations between 2012 and 2019

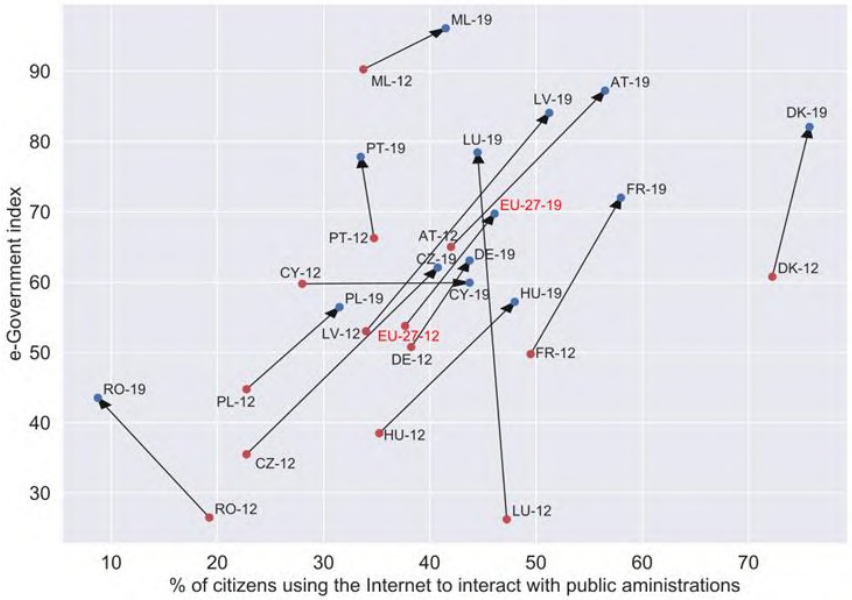
This annex presents the evolution of both the quality of digital public services, captured by the e-Government index, and the share of citizens using the Internet to interact with public administrations between 2012 and 2019 depending on whether countries adopted the NIF.

Figure 25: Evolution of the e-Government index and the use of the Internet to interact with public administration among citizens between 2012 and 2019 for Member States that have adopted the NIF before 2012



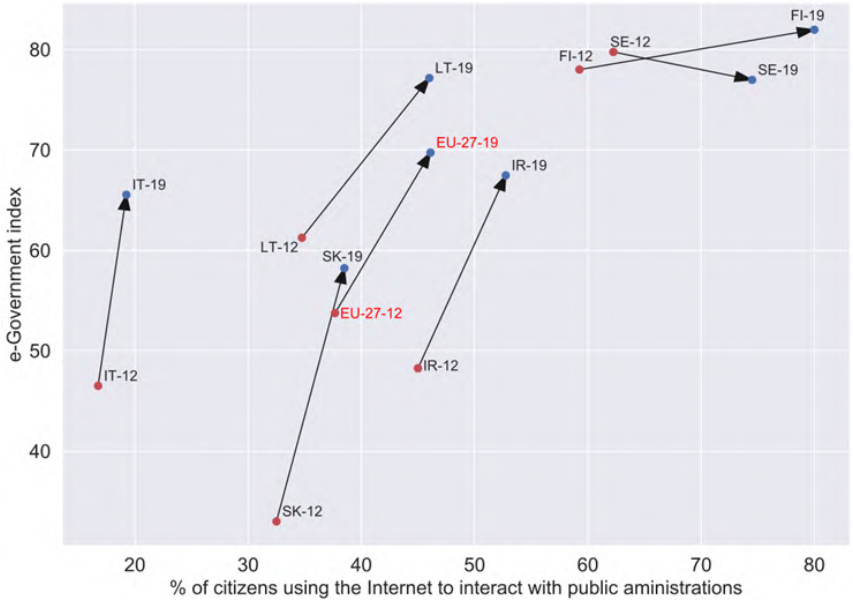
Source: *Study supporting the evaluation of the implementation of the EIF* based on data on the maturity level of online public services (e-Government benchmark) and the share of citizens using the Internet to interact with public administrations (Eurostat).

Figure 26: Evolution of the e-Government index and the use of the Internet to interact with public administration among citizens between 2012 and 2019 for Member States that have adopted the NIF after 2012, but before 2019



Source: *Study supporting the evaluation of the implementation of the EIF* based on data on the maturity level of online public services (e-Government benchmark) and the share of citizens using the Internet to interact with public administrations (Eurostat).

Figure 27: Evolution of the e-Government index and the use of the Internet to interact with public administration among citizens between 2012 and 2019 for Member States that did not adopt the NIF over the studied period



Source: Study supporting the evaluation of the implementation of the EIF based on *data on the maturity level of online public services (e-Government benchmark) and the share of citizens using the Internet to interact with public administrations (Eurostat).*

Annex VI.5. Academic and grey literature outlining the needs and problems in the field of interoperability

This annex presents a synthetic overview of the academic and grey literature supporting the assessment of the needs and problems addressed by the EIF and experienced more generally

in the field of interoperability in the EU's public sector, thus contributing to the evaluation of the relevance criterion.

Table 13: Literature review: needs and problems related to the EIF in the field of interoperability

EIF identified needs and problems	Sources
Public administrations need more specific guidance on how to improve the governance of their interoperability activities	• **Halmos (2018),** *Cross-border digital public services, Cross Border Review 2018 Central European Service for Cross-Border Initiatives;* • **Krimmer et. al. (2018)**, *Contributing to a Digital Single Market for Europe: Barriers and Drivers of an EU-wide Once-Only Principle.* Proceedings of the 19th Annual International Conference on Digital Government Research; • **Andrews et. al. (2016),** *Making a success of digital government.* Institute for Government UK • **Masciotta (2019),** *A strategy on the interoperability issue within the P.A. from the Italian constitutional perspective.* ITALIAN J. PUB. L. 689 (2019); • **Kourabali and Katehakis (2019)**, *The new European interoperability framework as a facilitator of digital transformation for citizen empowerment.* Journal of Biomedical Informatics 94 • **Wimmer et. al. (2018)**, *Interoperability Governance: A Definition and Insights from Case Studies in Europe*. Proceedings of the 19th Annual International Conference on Digital Government Research;
Fragmentation in the organisation and format of public data in the EU	• **Kalvet et. al (2018),** *Cross-border e-Government Services in Europe: Expected Benefits, Barriers and Drivers of the Once-Only Principle;* In Proceedings of the 11th International Conference on Theory and Practice of Electronic Governance (ICEGOV 18) • **Capgemini et. al. (2013**) *Study on Analysis of the Needs for Cross-Border Services and Assessment of the Organisational, Legal, Technical and Semantic Barriers.* Publications Office of the European Union; • **Masciotta (2019)**, *A strategy on the interoperability issue within the P.A. from the Italian constitutional perspective.* ITALIAN J. PUB. L. 689 (2019); • **Sallamo et. al. (2020)**, *Recommendations for organising and governing integrated public services.* Publications Office of the European Union;

EIF identified needs and problems	Sources
	• **JRC (2020)**, *Assessing the impacts of digital government transformation in the EU.* Publications Office of the European Union; • **Kalogirou and Charalabidis (2019)**, *The European Union Landscape on Interoperability Standardisation: Status of European and National Interoperability Frameworks.* In K. Popplewell et al. (eds.), Enterprise Interoperability VIII, Proceedings of the I-ESA Conferences 9;
The fragmented delivery of digital public services in the EU	• **Kalvet et. al (2018),** *Cross-border e-Government Services in Europe: Expected Benefits, Barriers and Drivers of the Once-Only Principle.* In Proceedings of the 11th International Conference on Theory and Practice of Electronic Governance (ICEGOV 18) • **Sallamo et. al. (2020)**, *Recommendations for organising and governing integrated public services.* Publications Office of the European Union; • **Kalogirou and Charalabidis (2019),** *The European Union Landscape on Interoperability Standardisation: Status of European and National Interoperability Frameworks*. In K. Popplewell et al. (eds.), Enterprise Interoperability VIII, Proceedings of the I-ESA Conferences 9;
The need for 'cultural interoperability' and increased awareness	• **Halmos (2018),** *Cross-border digital public services, Cross Border Review 2018 Central European Service for Cross-Border Initiatives;* • **Capgemini et. al. (2013**) *Study on Analysis of the Needs for Cross-Border Services and Assessment of the Organisational, Legal, Technical and Semantic Barriers.* Publications Office of the European Union; • **Krimmer et. al. (2018)**, *Contributing to a Digital Single Market for Europe: Barriers and Drivers of an EU-wide Once-Only Principle.* Proceedings of the 19th Annual International Conference on Digital Government Research; • **Cave et. al. (2017**), *EU-wide digital Once-Only Principle for citizens and businesses: Policy options and their impacts.* Publications Office of the European Union; • **Nauta (2019)**, *The influence of national culture on the interoperability of cross-border IT systems.* IC Institute • **Sallamo et. al. (2020)**, *Recommendations for organising and governing integrated public services.* Publications Office of the European

EIF identified needs and problems	Sources
	Union;
The need to address the shortage of human resources in public sector IT departments and to build investment capacity to keep pace with rapid technological change and bridge technological barriers	• **Misuraca et. al. (2020)**, *Exploring Digital Government Transformation.* Publications Office of the European Union; • **Krimmer et. al. (2018)**, *Contributing to a Digital Single Market for Europe: Barriers and Drivers of an EU-wide Once-Only Principle*; Proceedings of the 19th Annual International Conference on Digital Government Research; • **Cave et. al. (2017**), *EU-wide digital Once-Only Principle for citizens and businesses: Policy options and their impacts.* Publications Office of the European Union; • **Andrews et. al. (2016),** *Making a success of digital government.* Institute for Government UK • **Chinn et. al. (2020)** *The future is now: Closing the skills gap in Europe's public sector.* McKinsey & Company

Source: Study supporting the evaluation of the implementation of the EIF

Annex VII. Solutions contributing to the EIF implementation

Package	Action name	Contribution to the EIF and the IAP
1. Key and generic interoperability enablers	Trusted Exchange Platform (e-TrustEx)	e-TrustEx is a platform offered to public administrations at European, national and regional levels to undertake secure exchange of natively digital documents or scanned documents from system to system via standardised interfaces. Contribution to the EIF: The action thus contributes particularly to Recommendation 15 of the revised EIF, through enabling the secure exchange of documents.
1. Key and generic interoperability enablers	Catalogue of Services	The Catalogue of Services is one of the interoperability enablers for integrated public services according to the conceptual model defined by the revised EIF. To that end, the action has defined a technical specification, the data model, CPSV AP [152]adopted by several MS to catalogue their data and linked them up at cross-border level for example to support the implementation of the Single Digital Gateway Regulation. Also a set of proof of concept of some tools to facilitate the creation of catalogue of public services have been produced. Contribution to the EIF: The action addresses Recommendation 44 of the revised version of the EIF on the catalogue of public services.
2. Semantic interoperability	SEMIC: Promoting Semantic Interoperability Amongst the European Union EU countries	The Action supports the implementation of the EIF by promoting semantic interoperability, through the definition and use of common specifications such as the Core Vocabularies, or DCAT AP used by the European Open Data Portal and other MS portals to catalogue their data and linked them up across borders. Contribution to the EIF: The action contributes primarily to Recommendation 16 of the revised EIF. In addition, the action covers the following underlying principles of the EIF: Reusability, Multilingualism, Openness, Semantic interoperability, Technical interoperability and Standardisation.

152 https://joinup.ec.europa.eu/collection/catalogue-services/open-specifications-cpsv-ap-and-sdg-services-model-describing-procedures

Package	Action name	Contribution to the EIF and the IAP
2. Semantic interoperability	Public Multilingual Knowledge Management Infrastructure for the Digital Single Market	The creation of a Public Multilingual Knowledge Infrastructure aims to support EU public administrations in creating services that can be accessible and shareable independently from the language actually used, as well as allowing SMEs to sell goods and service cross-border in a DSM. Contribution to the EIF: The action is based on several recommendations (primarily Recommendation 16 on taking into account multilingualism in the setting up of European public services) and principles of the new EIF, in particular those concerning multilingualism, accessibility, administrative simplification, transparency, and reusability of the solutions.
3. Access to data/data sharing/open data	Big Data for Public Administrations	This action will facilitate the sharing of open data between public administrations through the support to the execution of analytics projects on Big Data; increase the transparency of decision-making in public administrations by supporting knowledge sharing on evidence-based policy-making practices; support the re-use of open source data analytics tools developed by EU countries of EU Institutions; and provide public administrations with the opportunity to test (open source) technologies in this domain before making a decision on the technical way forward. Contribution to the EIF: This action contributes to several EIF principles including 'openness', 'transparency', 'reusability' and 'technological neutrality'.
3. Access to data/data sharing/open data	Sharing Statistical Production and Dissemination Services and Solutions in the European Statistical System	This action contributes to several areas: developing, maintaining and promoting interoperable solutions for the production and dissemination of statistics by EU public administrations (including the EC) and 2) developing, maintaining and promoting a) a specification of the EIRA to support better interoperability and cooperation for the production and dissemination of Official Statistics in the European Statistical System; b) a common infrastructure for the exposure and consumption of shared statistical services. In addition, the proposal contributes significantly to the realisation of the ESS Vision 2020 objectives in the domain of sharing tools and improving statistical dissemination. Contribution to the EIF: Through its focus on aligning infrastructures for shared statistical services, the action builds on the principles and recommendations of the EIF, in particular Recommendation 36.

Package	Action name	Contribution to the EIF and the IAP
3. Access to data/data sharing/open data	Development of an Open Data Service, Support and Training Package in the Area of Linked Open Data, Data Visualisation and Persistent Identification	The action supports open data initiatives by facilitating data re-use and sharing and offering tools to visualise data effectively. Contribution to the EIF: The action contributes to the new EIF, namely the interoperability principles: openness, transparency, reusability, user–centricity and multilingualism, accessibility.
3. Access to data/data sharing/open data	Provision of these services via data.europa.eu, the official portal for European data.	The action supports open data initiatives by facilitating data re-use and sharing and offering tools to visualise data effectively. Contribution to the EIF: The action contributes to the new EIF, namely the interoperability principles: openness, transparency, reusability, user–centricity and multilingualism, accessibility.
4. Geospatial solutions	European Location Interoperability Solutions for e-Government (ELISE)	ELISE has aimed to deepen the understanding of location interoperability enablers and barriers related to the transition towards digital government. Contribution to the EIF: ELISE builds on several areas of the EIF including openness, reusability, technological neutrality, user-centricity, multilingualism, and administrative simplification.
5. eProcurement/ eInvoicing - Supporting instruments	European Public Procurement Interoperability Initiative	This action supports several activities designed to simplify procurement and facilitate the participation in online procurement as well the re-use of data in the field. Contribution to the EIF: The action builds in particular on Recommendations 28 and 30 of the EIF, as well as facilitating the implementation of the once-only principle in the area of public procurement.
6. Decision making and legislation - Supporting	Legal interoperability (former ICT Implications of EU Legislation)	The 'Legal Interoperability' action supports policymaking across policy areas, bringing to the forefront the importance of considering potential digital impacts and the role of interoperability when developing new legislation. Contribution to the EIF: The action implements Recommendation 27 on legal interoperability of

Package	Action name	Contribution to the EIF and the IAP
instruments		the new EIF.
6. Decision making and legislation - Supporting instruments	Inter-Institutional Register of Delegated Acts (RegDel)	This action focused on developing an IT tool setting up the Inter-Institutional Register of Delegated Acts, increasing transparency around delegated acts and thus responding to the 2016 commitment of the Commission in this sense. Contribution to the EIF: This action contributes primarily to the transparency principle of the EIF and to Recommendation 5 of the new EIF by providing a transparent overview of delegated acts.
8. Supporting instruments for public administrations	Joinup – European Collaborative Platform and Catalogue	The action facilitates the sharing and re-use of solutions for public administrations and provides the stakeholders with the means to collaborate via a collaborative platform. Contribution to the EIF: 'Joinup' builds especially on the reusability principle of the EIF, facilitating access and supporting the re-use of available interoperable solutions.
8. Supporting instruments for public administrations	National Interoperability Framework Observatory	The NIFO action has monitored interoperability initiatives in the Members and developed the Monitoring Mechanism to keep track of the implementation of the EIF Recommendations by EU countries. NIFO has also developed an EIF Toolbox [153]to support EU countries in the implementation of the EIF with concrete solutions addressing specific aspects of the EIF, and guidance on relevant best practice examples, pieces of legislation and open specifications. Contribution to the EIF: NIFO provides an overarching contribution to the EIF, by helping monitor the alignment of national initiatives with the EIF and the implementation of the EIF in the EU countries. The action responds to the commitment from the 2017 EIF Communication that called for the development of a framework for monitoring the implementation of the EIF. This was achieved with the development of the EIF Monitoring Mechanism as part of the NIFO action.

153 https://joinup.ec.europa.eu/collection/national-interoperability-framework-observatory/eif-toolbox

Package	Action name	Contribution to the EIF and the IAP
8. Supporting instruments for public administrations	European Interoperability Architecture (EIA)	This action helps define the needs and shortcomings with relation to a common interoperability architecture for European public services and contribute to defining such an architecture as well as map reusable solutions and guidelines services as interoperability building blocks. Contribution to the EIF: The 'EIA' actions contribute in particular to Recommendation 23 of the EIF and to overall interoperability governance.
8. Supporting instruments for public administrations	EUSurvey	EUSurvey contributes primarily to the multilingualism principle of the EIF.
8. Supporting instruments for public administrations	IMAPS	This action supports tools for the assessment of the interoperability maturity level of digital public services, helping to identify improvement priorities. Since 2019[154], the focus of the work of the IMAPS action evolves around raising awareness on IMAPS and assisting public administrations in EU Member States in the uptake of IMAPS by their organisation, through capability-building and sharing of relevant knowledge, insights and good practices. Contribution to the EIF: This action contributes to the principles of reusability and user-centricity (in particular, Recommendation 12 of the EIF) by creating a mechanism for analysis, design, assessment and further development of the European Public Services.
8. Supporting instruments for public administrations	Standard-Based Archival Data Management, Exchange and Publication	The action contributes to supporting data standards in the field of archival information management, studying among others how Open Data formats can be used in this area. Contribution to the EIF: The action builds on several principles of the EIF including openness, transparency, reusability, technological neutrality, preservation of information, user-centricity.
8. Supporting instruments for public	Interoperability Academy	This action was established in order to help increase awareness of interoperability, the EIF and the solutions developed under ISA2. The action facilitates access to information and learning

[154] https://joinup.ec.europa.eu/collection/imaps-interoperability-maturity-assessment-public-service/about

Package	Action name	Contribution to the EIF and the IAP
administrations		material in this sense. Contribution to the EIF: This action promotes the principle of reusability. In addition, it provides an overall contribution to the EIF, by promoting the principle, models, and recommendations of the Framework and facilitating access to information about implementing the EIF.
9. Accompanying measures	Raising Interoperability Awareness – Communication Activities	Contribution to the EIF: This action contributes to the principles of inclusion, accessibility and transparency by disseminating information about interoperability and the work of ISA2.

Annex VIII. Mapping of legal initiatives to the EIF

Name of the legal initiative (with hyperlink)	Short description	EIF Core Topics	EIF pillar
Short title: Open Data Directive Title: Directive 2019/1024 on open data and the re-use of public sector	Open data (Art.1) Specific high-value datasets and arrangements for publication and re-use, formats of data and metadata, investments made by the Member States in open data approaches (Art.14)	EIF Conceptual model	Recommendation 41 Recommendation 42 Recommendation 43

Name of the legal initiative (with hyperlink)	Short description	EIF Core Topics	EIF pillar
information (Recast)	Art. 1 - Open data ('In order to promote the use of open data and stimulate innovation in products and services, this Directive establishes a set of minimum rules governing the re-use and the practical arrangements for facilitating the re-use of: (…)') Art. 5: 'public sector bodies and public undertakings shall make their documents available in any pre-existing format or language and, where possible and appropriate, by electronic means, in formats that are open, machine-readable, accessible, findable and re-usable, together with their metadata. Both the format and the metadata shall, where possible, comply with formal open standards.'	EIF Principles	Recommendation 2 Recommendation 4
	Art. 7: Transparency Art. 7(3): 'Public sector bodies shall ensure that applicants for re-use of documents are informed of available means of redress relating to decisions or practices affecting them.'	EIF Principles	Recommendation 5
	Art. 1: reuse of documents Art. 3: 'Subject to paragraph 2 of this Article, Member States shall ensure that documents to which this Directive applies in accordance with Article 1 shall be re-usable for commercial or non-commercial purposes in accordance with Chapters III and IV.'	EIF Principles	Recommendation 7
	Art. 9: 'Member States shall, in cooperation with the Commission, continue efforts to simplify access to datasets, in particular by providing a single point of access'	EIF Principles	Recommendation 11
	Art 9: 'Where possible, Member States shall facilitate the cross-linguistic search for documents, in particular by enabling metadata aggregation at Union level.'	EIF Principles	Recommendation 16

Name of the legal initiative (with hyperlink)	Short description	EIF Core Topics	EIF pillar
	Art. 9: 'Member States shall also encourage public sector bodies to make practical arrangements facilitating the preservation of documents available for re-use.'	EIF Principles	Recommendation 18
	Art. 5: 'public sector bodies and public undertakings shall make their documents available in any pre-existing format or language and, where possible and appropriate, by electronic means (…) The high-value datasets, as listed in accordance with Article 14(1) shall be made available for re-use in a machine readable format, via suitable APIs and, where relevant, as a bulk download.' Chapter V - High-value datasets	Interoperability Layers	Recommendation 30
	Art. 5: 'Both the format and the metadata shall, where possible, comply with formal open standards.' Art. 14: 'The arrangements may include terms applicable to re-use, formats of data and metadata and technical arrangements for dissemination.'	Interoperability Layers	Recommendation 33
	Art. 9: 'Member States shall make practical arrangements facilitating the search for documents available for re-use, such as asset lists of main documents with relevant metadata, accessible where possible and appropriate online and in machine-readable format, and portal sites that are linked to the asset lists. [...] Member States shall, in cooperation with the Commission, continue efforts to simplify access to datasets, in particular by providing a single point of access.'	Interoperability Layers	Recommendation 36
Short title: INSPIRE DIRECTIVE Title: Directive 2007/2/EC on establishing an	Art. 7(3) - Member States shall ensure that all newly collected and extensively restructured spatial data sets and the corresponding spatial data services are available Art. 14 - Data made available Art 17(5) - The arrangements for the sharing of spatial data sets and services provided for in paragraphs 1, 2 and 3 shall be open, on a reciprocal and equivalent	EIF Principles	Recommendation 2

Name of the legal initiative (with hyperlink)	Short description	EIF Core Topics	EIF pillar
Infrastructure for Spatial Information in the European Community	basis		
	Chapter IV, Article 11- Network services: 'discovery services making it possible to search for spatial data sets and services', 'view services', 'download services'	EIF Principles	Recommendation 5
	Sharing of data (Chapter V Data sharing, art. 17) Article 20 - 'The implementing rules referred to in this Directive shall take due account of standards adopted by European standardisation bodies'	EIF Principles	Recommendation 7
	Article 5: These rules shall take account of relevant, existing international standards and user requirements, in particular with relation to validation metadata. Article 7: users, (...) shall be given the opportunity to participate in preparatory discussions on the content of the implementing rules Article 11: Those services shall take into account relevant user requirements and shall be easy to use, available to the public and accessible via the Internet or any other appropriate means of telecommunication. Article 18 - identification of user needs	EIF Principles	Recommendation 10 Recommendation 12
	Article 11: Those services shall take into account relevant user requirements and shall be easy to use, available to the public and accessible via the Internet or any other appropriate means of telecommunication.	EIF Principles	Recommendation 14
	Article 20 - shall take due account of standards adopted by European standardisation bodies (…), as well as international standards. Chapter III - INTEROPERABILITY OF SPATIAL DATA SETS AND SERVICES, Article 7	Interoperability Layers	Recommendation 20 Recommendation 21

Name of the legal initiative (with hyperlink)	Short description	EIF Core Topics	EIF pillar
			Recommendation 22
	Chapter VI COORDINATION AND COMPLEMENTARY MEASURES 'Member States shall ensure that appropriate structures and mechanisms are designated for coordinating, across the different levels of government, the contributions of all those with an interest in their infrastructures for spatial information.'	Interoperability Layers	Recommendation 25
	Chapter IV - Network services Chapter VI – Coordination Article 19 – Contact point: 'Each Member State shall designate a contact point, usually a public authority, to be responsible for contacts with the Commission in relation to this Directive.'	Interoperability Layers	Recommendation 28
	Article 20 – shall take due account of standards adopted by European standardisation bodies (…), as well as international standards.	Interoperability Layers	Recommendation 27
	Chapter II – Metadata Art. 1 – for the purposes of Community environmental policies and policies or activities which may have an impact on the environment. Art. 4 – evolving needs for spatial data in support of Community policies that affect the environment.	Interoperability Layers	Recommendation 31 Recommendation 32
	Art. 7 – laying down technical arrangements for the interoperability Art. 10 - including data, codes and technical classifications	Interoperability Layers	Recommendation 33

Name of the legal initiative (with hyperlink)	Short description	EIF Core Topics	EIF pillar
	Article 15 – 2. Member States shall provide access to the services referred to in Article 11(1) through the Inspire geo-portal	Conceptual model	Recommendation 36
	Creation of a common model for the unique identification of spatial objects, (Chapter Interoperability of Spatial Data Sets and Services, art. 8, 11)	Conceptual model	Recommendation 35
	Metadata (Chapter II Metadata Art. 5, 1 and 3)	Conceptual model	Recommendation 42
Short title: General Data Protection Regulation (GDPR) Title: Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data.	Member State law which shall be proportionate to the aim pursued (Art. 9, g) Proportionality of the processing operations (Art. 35, b)	EIF Principles	Recommendation 1
	Processed lawfully, fairly and in a transparent manner in relation to the data subject (Art. 5, 1. a) Section 1 - Transparency and modalities, Article 12 Transparent information	EIF Principles	Recommendation 5
	Art. 20 - Right to data portability	EIF Principles	Recommendation 9
	Appropriate security of the personal data (Art. 5, 1. f) Processing of special categories of personal data: social security and social protection law (Art. 9, b) Security of personal data - Security of processing - ensure a level of security appropriate to the risk (Art. 32, 1)	EIF Principles	Recommendation 15
	Art. 30 - Records of processing activities	EIF Principles	Recommendation 18

Name of the legal initiative (with hyperlink)	Short description	EIF Core Topics	EIF pillar
	Standardised icons, machine-readable (Art. 12, 7)	Interoperability Layers	Recommendation 30
	Publicly accessible sources (Art. 14)	Conceptual model	Recommendation 36
	Standardised icons, machine-readable (Art. 12, 7) Right to data portability - structured, commonly used and machine-readable format (Art. 20, 1)	Conceptual model	Recommendation 42
	Data protection and protection of free movement of data (Art. 98) Processing of special categories of personal data (Art. 9, g) Data protection by design and by default (Art. 25) Data protection impact assessment and prior consultation (Section 3, Art. 35) Article 37 Designation of the data protection officer (Section 4, Art. 37) Appropriate security of the personal data (Art. 5, f) Security of personal data, security of processing (Section 2, Art. 32)	Conceptual model	Recommendation 46
Short title: Web accessibility directive Title: Directive (EU) 2016/2102 of the European Parliament and of the Council of 26 October 2016 on	Article 5(1): Member States shall ensure that public sector bodies apply the accessibility requirements set out in Article 4 to the extent that those requirements do not impose a disproportionate burden on the public sector bodies for the purposes of that Article.	EIF Principles	Recommendation 1
	Art 7 – benefits to users and to owners of websites and mobile applications, and of the possibility of giving feedback in the case of any failure	EIF Principles	Recommendation 12

Name of the legal initiative (with hyperlink)	Short description	EIF Core Topics	EIF pillar
the accessibility of websites and mobile applications of public sector bodies, and work launched by the Commission on a 'European Accessibility Act'	Art 1 – (…) thereby enabling those websites and mobile applications to be more accessible to users, in particular to persons with disabilities.	EIF Principles	Recommendation 14
	Periodically monitor the compliance of websites and mobile applications of public sector bodies with the accessibility requirements - monitoring methodology (Art. 8)	EIF Principles	Recommendation 8
	Article 5 – Member States shall ensure that public sector bodies apply the accessibility requirements set out in Article 4 to the extent that those requirements do not impose a disproportionate burden on the public sector bodies for the purposes of that Article.	EIF Principles	Recommendation 17
	Article 6 – Content of websites and mobile applications that meets harmonised standards	Interoperability Layers	Recommendation 22
	Art 7 – the accessibility statement shall be provided in an accessible format, Provide data […] in a format which can be used by public sector bodies (Art. 8)	Interoperability Layers	Recommendation 30
Shor title: Data Governance Act Title: Proposal for a Regulation of the European Parliament and of the Council on European data governance COM(2020) 767 final	The re-use of data (Art. 4, 1) Conditions for reuse (Art 5) Conditions for re-use [of data] shall be non-discriminatory, proportionate and objectively justified (Art. 5, 2)	EIF Principles	Recommendation 7
	Public sector bodies (...) shall make publicly available the conditions for reuse (Art. 5, 1) The award of an exclusive right (…) shall be transparent and be made publicly available online (Art 4.6)	EIF Principles	Recommendation 5

Name of the legal initiative (with hyperlink)	Short description	EIF Core Topics	EIF pillar
	A single information point (Art. 8, 1)	EIF Principles	Recommendation 11
	Public sector bodies may impose obligations (a)to access and re-use the data within a secure processing environment (Art 5)	EIF Principles	Recommendation 15
	a European Data Innovation Board should be established, in the form of an expert group. Committee (Art. 29) Chapter III on requirements for providers of data sharing services	Interoperability Layers	Recommendation 29
	Security measures (Art. 11) The public sector body (...) shall take all reasonable technical, legal and organisational measures in order to prevent transfer or access to non-personal data held in the Union where such transfer or access would create a conflict with Union law or the law of the relevant Member State, (Art 30)	Conceptual model	Recommendation 46
Short title: Regulation on the free flow of non-personal data Title: Regulation (EU) 2018/1807 of the European Parliament and of the Council of 14 November 2018 on a framework for the free flow of non-personal data in the	availability of data (Art.1) Access to data by competent authorities (Art.5.1)	EIF Principles	Recommendation 2
	The single points of contact shall provide users with general information on this Regulation, including on the codes of conduct. (Art. 7)	EIF Principles	Recommendation 11
	Data localisation requirements shall be prohibited, unless they are justified on grounds of public security in compliance with the principle of proportionality.(Art 4)	Conceptual model	Recommendation 46

Name of the legal initiative (with hyperlink)	Short description	EIF Core Topics	EIF pillar
European Union			
Short title: eProcurement Directive Title: Directive 2014/24/EU of the European Parliament and of the Council of 26 February 2014 on public procurement and repealing Directive 2004/18/EC	shall not restrict economic operators' access (Art.22.1) completely electronic process, and shall be open (Art.34) unrestricted and full direct access free of charge (Art.22.5, Art.54.1)	EIF Principles	Recommendation 3
	transparency (Art.56.3, 76.1)	EIF Principles	Recommendation 5
	non-discriminatory, generally available (Art 22.1) suitable alternative means of access, alternative channel for electronic submission (Art. 22.5) principles of equal treatment (Art.56.3, 76.1)	EIF Principles	Recommendation 14
	shall specify the level of security required for the electronic means of communication in the various stages of the specific procurement procedure; (Art.22.6)	EIF Principles	Recommendation 15
	electronic tools, building information electronic modelling tools (Art.22.4) electronic auction (Art.35) format of an electronic catalogue (Art.36)	Interoperability Layers	Recommendation 33
	Title IV - Governance, enforcement (Art.83) format of standard forms (Art.51, Annex VIII)	Interoperability Layers	Recommendation 25
	level of security (Art.22.6)	Conceptual model	Recommendation 46

Name of the legal initiative (with hyperlink)	Short description	EIF Core Topics	EIF pillar
	Electronic catalogues (Art.22, 7) Electronic catalogues (Art.36)	Conceptual model	Recommendation 44
Short title: eIDAS Regulation Title: Regulation (EU) No 910/2014 of the European Parliament and of the Council of 23 July 2014 on electronic identification and trust services for electronic transactions in the internal market and repealing Directive 1999/93/EC	technology neutral and does not discriminate (Art.12.3a)	EIF Principles	Recommendation 8
	accessible for persons with disabilities (Art.15)	EIF Principles	Recommendation 14
	processing of [only those] identification data that are adequate, relevant and not excessive (clause 11) personal data breaches (clause 31) adequate level of security of electronic identification (Art.1) Processing of personal data (Art.5.1) breached or partly compromised (Art.10.1) principle of privacy by design (Art.12.3c) personal data is processed (Art.12.3d)	EIF Principles	Recommendation 15
	Article 34 - Qualified preservation service for qualified electronic signatures Article 40 - Validation and preservation of qualified electronic seals	EIF Principles	Recommendation 18
	shall be recognised (Art.6.1) interoperable (Art.12.1) interoperability framework (Art.12.2;3)	Interoperability Layers	Recommendation 20
	Art. 1c ‘establishes a legal framework for electronic signatures, electronic seals, electronic time stamps, electronic documents, electronic registered delivery services and certificate services for website authentication.’	Interoperability Layers	Recommendation 27

Name of the legal initiative (with hyperlink)	Short description	EIF Core Topics	EIF pillar
	Art. 17 - Supervisory body: 'Member States shall designate a supervisory body established in their territory or, upon mutual agreement with another Member State, a supervisory body established in that other Member State. (…)' Art 18. - Mutual assistance: 'Supervisory bodies shall cooperate with a view to exchanging good practice'	Interoperability Layers	Recommendation 29
	Minimum technical requirements (Art.12.4a) common operational security standards (Art.12.4g)	Interoperability Layers	Recommendation 33
	Adequate level of security of electronic identification means and trust services (Chapt 1, Art.1) Trust services (Art. 4) the technical and security specifications of the issued electronic identification means (Art. 8, 3, F) Security breach (Art. 10) Security standards (Art. 12) Supervisory bodies to inform about breaches of security (Art. 17) Security requirements applicable to trust service providers (Art. 19) security and personal data protection rules (Art. 24) electronic signature at a higher security level (Art. 27) security evaluation process carried out in accordance with one of the standards for the security assessment of information technology products (Art. 30, 3 (a)) The security of the duplicated datasets must be at the same level as for the original	Conceptual model	Recommendation 46 Recommendation 47

Name of the legal initiative (with hyperlink)	Short description	EIF Core Topics	EIF pillar
	datasets (Annex II, 4. (a)) implementation of the principle of privacy by design (Art.12)		
Short title and title: Commission Implementing Decision (EU) 2015/296 - eIDAS Regulation	Article 1 – cooperation: 'procedural arrangements for facilitating cooperation between Member States, as is necessary in order to ensure the interoperability and security of electronic identification schemes'	Interoperability Layers	Recommendation 20
	Article 3 – Points of single contact	EIF Principles	Recommendation 11
Short title and title: Commission	Article 3: Minimum technical requirements related to the assurance levels Article 12: Technical specifications	Interoperability Layers	Recommendation 21

Name of the legal initiative (with hyperlink)	Short description	EIF Core Topics	EIF pillar
Implementing Regulation (EU) 2015/1501 - eIDAS Regulation	Article 7: Data integrity and authenticity for the communication Article 9: Management of security information and metadata Article 10: Information assurance and security standards	EIF Principles	Recommendation 15
	Article 8: Message format for the communication	Interoperability Layers	Recommendation 30
	Article 9: Management of security information and metadata Article 10: Information assurance and security standards	Conceptual model	Recommendation 46
Short title: European Directive on patients' rights Title: Directive 2011/24/EU of the European Parliament and of the Council of 9 March 2011 on the application of patients' rights in cross-border healthcare	ICT and other forms of cross-border cooperation (Art.10.2) development of European Reference Networks (Art.12.1) support and facilitate cooperation and the exchange of information (Art.14.1; 15.1) health technology assessment network (Art.15) assisted by a Committee (Art.16)	Interoperability Layers	Recommendation 29
	Member States shall facilitate cooperation in cross-border healthcare provision at regional and local level as well as through ICT and other forms of cross-border cooperation. (Art.10)	Interoperability Layers	Recommendation 20
	The objectives of the eHealth network shall be to (…) support Member States in developing common identification and authentication measures to facilitate transferability of data in cross-border healthcare. (Article 14) provision of objective, reliable, timely, transparent, comparable and transferable	EIF Principles	Recommendation 9

Name of the legal initiative (with hyperlink)	Short description	EIF Core Topics	EIF pillar
	information (Article 15)		
	National contact points shall provide patients on request with contact details of national contact points in other Member States. (Art 6)	EIF Principles	Recommendation 11
	The principle of non-discrimination with regard to nationality shall be applied to patients from other Member States. (Art. 4) easily accessible; formats accessible to people with disabilities (Art.6.5) easily accessible; objectively and impartially (Art.9.2)	EIF Principles	Recommendation 14
	the fundamental right to privacy with respect to the processing of personal data is protected (Art. 4) due respect of data protection (Art. 11.2a) principles of data protection (Art. 14.2)	EIF Principles	Recommendation 15
	standards and guidelines on quality and safety (Chapter II, Art. 4, 1 (b)) guidelines supporting the Member States in developing the interoperability of ePrescriptions (Art. 11, 2 (b)) produce good practice guidelines and to implement outcome measures and quality control (Art. 12, 4 (a)) Draw up guidelines on (...) (Art. 14, 2 (b))	Conceptual model	Recommendation 44

Name of the legal initiative (with hyperlink)	Short description	EIF Core Topics	EIF pillar
	achieving a high level of trust and security, enhancing continuity of care and ensuring access to safe and high-quality healthcare (Art. 14) privacy with respect to the processing of personal data (Chap II, Art. 4, 2 (e))	Conceptual model	Recommendation 46
Short title: Regulation on Interoperability in the field of police and judicial cooperation, asylum and migration. Title: Regulation (EU) 2019/818 of the European Parliament and of the Council of 20 May 2019 on establishing a framework for interoperability between EU information systems in the field of police and judicial cooperation, asylum and migration and amending Regulations (EU) 2018/1726, (EU)	Art. 27 - The multiple-identity detection shall only be launched in order to compare data available in one EU information system with data available in other EU information systems	EIF Principles	Recommendation 6Recommendation 7
	in accordance with their access rights (Art.6.1; 7;8;18.3) Full access to the data (Art.22.3) access shall be granted to (Art. 26) not result in discrimination (Art.5)	EIF Principles	Recommendation 14
	search data related to persons or their travel documents (Art.7.5) only for data protection monitoring (Art.10.2) minimum data quality standard (Art.13.3) only for as long as the corresponding biometric data are stored (Art.15; 35) data retention provisions (Art.23.1) regularly verified by the competent supervisory authority (Art.24.4) security of processing (Art.42) compliance of data processing (Art.44) right of access to, rectification and erasure of personal data (Art.48) audit of personal data processing operations (Art.52)	EIF Principles	Recommendation 15
	clear and plain language, in a linguistic version the person concerned understands or is reasonably expected to understand (Art.47.2)	EIF Principles	Recommendation 16
	keep logs (Art.10; Art.16; 24; 36) the data [..] shall be stored (Art.15; 35)	EIF Principles	Recommendation 18
	Art 13 - 4. The storage of the data referred to in paragraph 1 shall meet the quality	Interoperability	Recommendation

Name of the legal initiative (with hyperlink)	Short description	EIF Core Topics	EIF pillar
2018/1862 and (EU) 2019/816	standards referred to in Article 37(2).	Layers	22
	data quality control mechanisms and common data quality indicators (Art.37.1) interoperability components (Art. 1.2) data quality requirements (art. 1.3) improving data quality and harmonising the quality requirements for the data (Art. 2.2c) automated quality check of the biometric data (Art.13) technically impossible because of a failure of the CIR (Art.17) implement mechanisms for evaluating the accuracy (37.2)	Interoperability Layers	Recommendation 33
	universal message format (UMF) (Art.1.3; 38)	Interoperability Layers	Recommendation 30

Name of the legal initiative (with hyperlink)	Short description	EIF Core Topics	EIF pillar
	area of freedom, security and justice (Chap I, Art. 1) to contribute to a high level of security within the area of freedom, security and justice (Art. 2 , 1(a)) strengthening, simplifying and making more uniform the data security and data protection conditions (Art. 2, 2 (e)) ensuring data security (Art. 16, 3) The CIR shall reply in such a way that the security of the data is not compromised. (Art.22, 2) security rules applicable to the repository (Art. 39, 5) Security of processing (Art. 42) Security incidents (Art. 43) with the conditions of security, availability, quality and performance (Art. 54, 2) compliance with the rules of each EU information system regarding the security and integrity of personal data (Art. 56, 1(h)) security training - appropriate training programmes concerning data security, data quality, data protection rules, the procedures applicable to data processing and the obligations (Art. 72) Monitoring and evaluation - security and quality of service (Art. 74) an assessment of the security of the interoperability components (Art. 74, (e))	Conceptual model	Recommendation 46

Name of the legal initiative (with hyperlink)	Short description	EIF Core Topics	EIF pillar
Short title: Privacy and Electronic Communications Directive Title: Directive 2002/58/EC of the European Parliament and of the Council of 12 July 2002 concerning the processing of personal data and the protection of privacy in the electronic communications sector (Directive on privacy and electronic communications)	protection of personal data, privacy (Art. 1.1;3) security of its services, network security (Art.4.1) personal data, security policy (Art.4.1a) breach of the security of the network (Art.4.1) personal data breach (Art.4.3) confidentiality of communications and the related traffic data (Art.5) erased or made anonymous when it is no longer needed (Art.6.1) for the duration necessary (Art. 6.3; 9) anonymous, or with the consent (Art.9.1)	EIF Principles	Recommendation 15
	transparent procedures (Art.10)	EIF Principles	Recommendation 5
	Member States shall ensure that no mandatory requirements for specific technical features are imposed on terminal or other electronic communication equipment which could impede the placing of equipment on the market and the free circulation of such equipment in and between Member States. (Art 14)	EIF Principles	Recommendation 8
	Member States shall ensure that subscribers are informed, free of charge and before they are included in the directory, about the purpose(s) of a printed or electronic directory of subscribers available to the public or obtainable through directory enquiry services, in which their personal data can be included and of any further usage possibilities based on search functions embedded in electronic versions of the directory. (Art 12)	Conceptual model	Recommendation 36
	Privacy (Art. 1)	Conceptual	Recommendation

Name of the legal initiative (with hyperlink)	Short description	EIF Core Topics	EIF pillar
	Privacy (Art. 7)	model	46
Short title: Cybersecurity Act Title: Regulation (EU) 2019/881 of the European Parliament and of the Council of 17 April 2019 on ENISA (the European Union Agency for Cybersecurity) and on information and communications technology cybersecurity certification and repealing Regulation (EU) No 526/2013	Data protection and privacy (Chapter II, Art. 5, (5)c) Article 41: Protection of personal data A European cybersecurity certification scheme shall be designed to achieve, as applicable, at least the following security objectives: (a) to protect stored, transmitted or otherwise processed data against accidental or unauthorised storage, processing, access or disclosure during the entire life cycle of the ICT product, ICT service or ICT process; (Art 51)	Conceptual model	
Short title: NIS Directive Title: Directive (EU) 2016/1148 of the European Parliament and of the Council of	necessary ; relevant and proportionate (Art.1.5) appropriate and proportionate (Art.14.1; 16.1)	EIF Principles	Recommendation 1
	without imposing or discriminating in favour of the use of a particular type of technology (Art.19.1)	EIF Principles	Recommendation 8

Name of the legal initiative (with hyperlink)	Short description	EIF Core Topics	EIF pillar
6 July 2016 concerning measures for a high common level of security of network and information systems across the Union	security of network and information systems (Art.1.7; 7.1; 14.1; 14.2; 16.1; 16.2; 19.1) adequate protection of data (Art.13) confidentiality of the information (Art.14.5; 16.6) personal data breaches (Art.15.4)	EIF Principles	Recommendation 15
	Art. 20 - Voluntary notifications shall only be processed where such processing does not constitute a disproportionate or undue burden on Member States concerned	EIF Principles	Recommendation 17
	Article 19 - Standardisation: encourage the use of European or internationally accepted standards and specifications relevant to the security of network and information systems.	Interoperability Layers	Recommendation 22
	Cooperation Group (Art.5.6; 11.1) designate one or more national competent authorities (Art.8.1) CSIRTs (Art.9) cooperate (Art.10.1) network of the national CSIRTs (Art.12.1) in close cooperation with (Art.15.4) Network and Information Systems Security Committee (Art.22)	Interoperability Layers	Recommendation 29
	Issuing guidelines in order to facilitate the convergence of operational practices (Art. 12, 3, j) Guidelines (Art. 14.7)	Conceptual model	Recommendation 44
	Security and privacy of data (Art. 1) National data protection authorities (Art. 8) Ensure adequate protection of data (Art. 12) The competent authority shall work in close cooperation with data protection authorities (Art.15)	Conceptual model	Recommendation 46

Name of the legal initiative (with hyperlink)	Short description	EIF Core Topics	EIF pillar
Short title: European Electronic Communications Code Title: Directive (EU) 2018/1972 of the European Parliament and of the Council of 11 December 2018 establishing the European Electronic Communications Code	Member States shall ensure that in carrying out the regulatory tasks specified in this Directive, the national regulatory and other competent authorities take all reasonable measures which are necessary and proportionate for achieving the objectives set out in paragraph 2. (Art 3)	EIF Principles	Recommendation 1
	Member States shall ensure that, where national regulatory or other competent authorities intend to take measures in accordance with this Directive, they give interested parties the opportunity to comment on the draft measure within a reasonable period (Art 23 - Transparency mechanism)	EIF Principles	Recommendation 5
	Member States shall encourage the use of the standards or specifications referred to in paragraph 1 for the provision of services, technical interfaces or network functions, to the extent strictly necessary to ensure interoperability of services, end-to-end connectivity, facilitation of provider switching and portability of numbers and identifiers, and to improve freedom of choice for users. (Art 19.2 standardisation)	Interoperability Layers	Recommendation 23
	Guidelines publication (Art. 12) Issue guidelines to assist national regulatory and/or other competent authorities on the consistent implementation (Art. 22, 7) Guidelines (Art. 32) Guidelines (Art. 63)	Conceptual model	Recommendation 44

Name of the legal initiative (with hyperlink)	Short description	EIF Core Topics	EIF pillar
	security of networks (Art. 1, subject matter) by maintaining the security of networks and services, by ensuring a high and common level of protection for end-users (Art. 3, 2 (d)) Security of networks and services - SECURITY TITLE V (Art. 40) provide information needed to assess the security of their networks and services (Art. 41, 2 (a)) submit to a security audit (Art. 41, 2 (b))	Conceptual model	Recommendation 46
Short title: Single Digital Gateway Regulation Title: Regulation (EU) 2018/1724 of the European Parliament and of the Council of 2 October 2018 establishing a single digital gateway to provide access to information, to procedures and to assistance and problem-solving services and amending Regulation	user-centric, user-friendly (Art. 9.1; 10.1; Art. 25.1; 26.1) 'once-only' principle (Art. 1.1b; 14) easy online access through different channels (Art. 7.1) clear and plain language (Art.9.1) easy to use (Art. 18.4a) not contain any unnecessary full or partial duplication and overlaps (Art. 19.6) common assistance service finder (Art. 20) feedback tool (Art. 25)	EIF Principles	Recommendation 10 Recommendation 11 Recommendation 12 Recommendation 13
	provide citizens and businesses with easy access (Art.1.1a) easy, online access on (Art. 4.1; 4.2) can access and complete any of the procedures (Art. 6.1) in discrimination against (Art. 6.3) accessed and completed online by cross-border users, non-discriminatory way (Art. 13.1) without discrimination (Art. 16c) easily found (Art. 23)	EIF Principles	Recommendation 14
	coordination group (clause 68; 29;30) national coordinator (Art. 28.1) Committee (Art. 37)	Interoperability Layers	Recommendation 29

Name of the legal initiative (with hyperlink)	Short description	EIF Core Topics	EIF pillar
(EU) No 1024/2012	accessible in all official languages of the Union (Art.2.3) additional languages (Art. 11.1e) translations (Art. 12.1)	EIF Principles	Recommendation 16
	technical system (Art. 14) common user interface (Art.18)	Interoperability Layers	Recommendation 33
	accessible online through various electronic devices (Art. 18.4b) developed and optimised for different web browsers (Art. 18.4c)	EIF Principles	Recommendation 9
	Those data shall be made available to the public in an open and commonly used, machine-readable format (Art. 24,3)	Conceptual model	Recommendation 42
	it includes references, links to legal acts, technical specifications and guidelines (Art. 9, 1 (c))	Conceptual model	Recommendation 44
	ensure a high level of security for the transmission and processing of evidence (Art. 14, 3 (h)) security and hosting of the following ICT applications (Art. 21, 1) discuss the application of the principles of security by design and privacy by design in the context of this Regulation (Art. 30, 1 (l))	Conceptual model	Recommendation 47
	Art. 33 - Protection of personal data Art. 6 - Procedures to be offered fully online	EIF Principles	Recommendation 5
	Article 6(1) - digitisation: users can access and complete any of the procedures listed in Annex II fully online (…)	EIF Principles	Recommendation 17
	Chapter VII - Governance of the Gateway	Interoperability	Recommendation

Name of the legal initiative (with hyperlink)	Short description	EIF Core Topics	EIF pillar
	Articles 28, 29, 30, 31: governance bodies	Layers	25
	Article 10: the type and format of evidence to be submitted	Interoperability Layers	Recommendation 30
Short title: eInvoicing Directive Title: Directive 2014/55/EU of the European Parliament and of the Council of 16 April 2014 on electronic invoicing in public procurement	Article 7 Receipt and processing of electronic invoices Member States shall ensure that contracting authorities and contracting entities receive and process electronic invoices which comply with the European standard on electronic invoicing whose reference has been published pursuant to Article 3(2) and with any of the syntaxes on the list published pursuant to Article 3(2).	Interoperability Layers	Recommendation 22
	Article 4 Formal objections to the European standard 1. Where a Member State or the European Parliament considers that the European standard on electronic invoicing and the list of syntaxes do not entirely satisfy the requirements set out in Article 3(1)	Interoperability Layers	Recommendation 30
	data protection, principle of the protection of privacy (Art. 8)	EIF Principles	Recommendation 15
	special security measures in accordance with the laws, regulations or administrative provisions In force and transposed in a Member State (Art. 1) Data protection and the principle of the protection of privacy (Art. 8, 3)	Conceptual model	Recommendation 46

Name of the legal initiative (with hyperlink)	Short description	EIF Core Topics	EIF pillar
Short title: Services Directive Title: Directive 2006/123/EC of the European Parliament and of the Council of 12 December 2006 on services in the internal market	Article 6 1. a) including applications for inclusion Article 5 1. Member States shall examine the procedures and formalities applicable to access to a service activity and to the exercise thereof. 3. that they are easily accessible at a distance and by electronic means and that they are kept up to date. Article 8 1. Member States shall ensure that all procedures and formalities relating to access to a service activity and to the exercise thereof may be easily completed, Article 9 1. Member States shall not make access to a service activity or the exercise thereof subject to an authorisation scheme unless the following conditions are satisfied: Article 10 2. g) transparent and accessible. and 4. The authorisation shall enable the provider to have access to the service activity. Article 13 2. . They shall be easily accessible and any charges which the applicants may incur from their application Article 14 Prohibited requirements. Member States shall not make access to, or the exercise of, a service activity in their territory subject to compliance with any of the following. Article 16 1. The Member State in which the service is provided shall ensure free access to and free exercise of a service activity within its territory Article 20 2. Member States shall ensure that the general conditions of access to a service, which are made available to the public at large by the provider Article 21 1. (a) general information on the requirements applicable in other Member States relating to access to, and exercise of, service activities, in particular those relating to consumer protection;	EIF Principles	Recommendation 14

Name of the legal initiative (with hyperlink)	Short description	EIF Core Topics	EIF pillar
	Article 22 2. (b) is easily accessible to the recipient at the place where the service is provided or the contract concluded; and (c) can be easily accessed by the recipient electronically by means of an address supplied by the provider; Article 26 2. Member States shall ensure that information on the significance of certain labels and the criteria for applying labels and other quality marks relating to services can be easily accessed by providers and recipients. Article 32 3. Any information in question which is public shall be accessible to consumers. Article 37 2. Member States shall ensure that the codes of conduct referred to in paragraph 1 are accessible at a distance, by electronic means[2]		

Name of the legal initiative (with hyperlink)	Short description	EIF Core Topics	EIF pillar
	- Article 13 (2) Authorisation procedures and formalities shall not be dissuasive and shall not unduly complicate or delay the provision of the service. They shall be easily accessible and any charges which the applicants may incur from their application shall be reasonable and proportionate to the cost of the authorisation procedures in question and shall not exceed the cost of the procedures. - Article 10 2. The criteria referred to in paragraph 1 shall be: (c) proportionate to that public interest objective; - Article 15 about legal system of Member States 2 c) proportionality: requirements must be suitable for securing the attainment of the objective pursued; they must not go beyond what is necessary to attain that objective and it must not be possible to replace those requirements with other, less restrictive measures which attain the same result. - Article 16 1. c) proportionality: the requirement must be suitable for attaining the objective pursued, and must not go beyond what is necessary to attain that objective. - Article 18 1. d) the measures are proportionate. - Article 24, 2. Professional rules on commercial communications shall be non-discriminatory, justified by an overriding reason relating to the public interest and proportionate. - Article 31 4. are not motivated by the fact that the provider is established in another Member State and are proportionate.	EIF Principles	Recommendation 1
	Article 10 2. (g) transparent and accessible. Article 12 1. which provides full guarantees of impartiality and transparency, including, in particular, adequate publicity about the launch, conduct and completion of the procedure.	EIF Principles	Recommendation 5

Name of the legal initiative (with hyperlink)	Short description	EIF Core Topics	EIF pillar
	CHAPTER II is on ADMINISTRATIVE SIMPLIFICATION Article 5 Simplification of procedures. 1. Member States shall examine the procedures and formalities applicable to access to a service activity and to the exercise thereof. Where procedures and formalities examined under this paragraph are not sufficiently simple, Member States shall simplify them.	EIF Principles	Recommendation 17
	Article 26 1.Member States shall (...) take accompanying measures to encourage providers to take action on a voluntary (...) (a) certification or assessment of their activities by independent or accredited bodies; and 4. 4. Member States shall, in cooperation with the Commission, take accompanying measures to encourage the development of independent assessments.	EIF Principles	Recommendation 19
	Article 7 1. Member States shall ensure that the following information is easily accessible to providers and recipients through the points of single contact Art. 6: Points of single contact	EIF Principles	Recommendation 11

Name of the legal initiative (with hyperlink)	Short description	EIF Core Topics	EIF pillar
Short title: Law Enforcement Directive Title: Directive (EU) 2016/680 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data by competent authorities for the purposes of the prevention, investigation, detection or prosecution of criminal offences or the execution of criminal penalties, and on the free movement of such data, and repealing Council Framework	processing of personal data (Art.1.1; 1.2; 2.1; 2.2; 4; 9.1; 9.2; 10) protection of personal data (Art. 1.2) erasure of personal data (Art. 5; 16) data subjects (Art. 6; 14.1; 17.1; 20.1; 22.1) processing to be lawful (Art. 8.1) data protection principles, data minimisation (Art. 20) by default (Art. 20.2) level of security (Art. 29.1) personal data breach (Art. 30;31) appropriate safeguards (Art 36; 370	EIF Principles	Recommendation 15
	Article 21 1. They shall, in a transparent manner, determine their respective responsibilities for compliance with this Directive Article 43 1. Member States shall provide for each member of their supervisory authorities to be appointed by means of a transparent procedure	EIF Principles	Recommendation 5
	Chapter 2, Article 4 2. (b) processing is necessary and proportionate to that other purpose in accordance with Union or Member State law Article 13 3. constitutes a necessary and proportionate measure in a democratic society. Article 57 The penalties provided for shall be effective, proportionate and dissuasive	EIF Principles	Recommendation 1

Name of the legal initiative (with hyperlink)	Short description	EIF Core Topics	EIF pillar
Decision 2008/977/JHA	concise, intelligible and easily accessible form, using clear and plain language (Art. 12.1; 31.2)	EIF Principles	Recommendation 14
	Article 5 Time-limits for storage and review Member States shall provide for appropriate time limits to be established for the erasure of personal data or for a periodic review of the need for the storage of personal data. Procedural measures shall ensure that those time limits are observed. logs to be kept (Art. 25)	EIF Principles	Recommendation 18
	cooperate with the supervisory authority (Art. 26)	Interoperability Layers	Recommendation 29
	standardised format (Art. 50.6)	Interoperability Layers	Recommendation 33
	Information to be made available or given to the data subject (Art. 13) That information shall be made available to the supervisory authorities (Art. 15) makes available to the controller all information necessary (Art. 22, 3, (e))	Conceptual model	Recommendation 37
	processed in a manner that ensures appropriate security of the personal data (Art. 4, 1 (f)) general description of the technical and organisational security measures (Art. 24, 1 (i)) ensuring the integrity and security of the personal data (Art. 25) Section 2 Security of personal data Article 29 Security of processing	Conceptual model	Recommendation 46

Name of the legal initiative (with hyperlink)	Short description	EIF Core Topics	EIF pillar
Short title: Regulation on Interoperability in the field of justice, freedom and security Title: Regulation (EU) 2019/817 of the European Parliament and of the Council of 20 May 2019 on establishing a framework for interoperability between EU information systems in the field of borders and visa and amending Regulations (EC) No 767/2008, (EU) 2016/399, (EU) 2017/2226, (EU) 2018/1240, (EU) 2018/1726 and (EU) 2018/1861 of the	Art. 27 - The multiple-identity detection shall only be launched in order to compare data available in one EU information system with data available in other EU information systems	EIF Principles	Recommendation 6 Recommendation 7
	in accordance with their access rights (Art.6.1; 7;8;18.3) Full access to the data (Art.22.3) access shall be granted to (Art. 26) not result in discrimination (Art.5)	EIF Principles	Recommendation 14
	search data related to persons or their travel documents (Art.7.5) only for data protection monitoring (Art.10.2) minimum data quality standard (Art.13.3) only for as long as the corresponding biometric data are stored (Art.15; 35) data retention provisions (Art.23.1) regularly verified by the competent supervisory authority (Art.24.4) security of processing (Art.42) compliance of data processing (Art.44) right of access to, rectification and erasure of personal data (Art.48) audit of personal data processing operations (Art.52)	EIF Principles	Recommendation 15
	clear and plain language, in a linguistic version the person concerned understands or is reasonably expected to understand (Art.47.2)	EIF Principles	Recommendation 16
	keep logs (Art.10; Art.16; 24; 36) the data [..] shall be stored (Art.15; 35)	EIF Principles	Recommendation 18
	Art 13 - 4. The storage of the data referred to in paragraph 1 shall meet the quality standards referred to in Article 37(2).	Interoperability Layers	Recommendation 22

Name of the legal initiative (with hyperlink)	Short description	EIF Core Topics	EIF pillar
European Parliament and of the Council and Council Decisions 2004/512/EC and 2008/633/JHA	data quality control mechanisms and common data quality indicators (Art.37.1) interoperability components (Art. 1.2) data quality requirements (art. 1.3) improving data quality and harmonising the quality requirements for the data (Art. 2.2c) automated quality check of the biometric data (Art.13) technically impossible because of a failure of the CIR (Art.17) implement mechanisms for evaluating the accuracy (37.2)	Interoperability Layers	Recommendation 33
	universal message format (UMF) (Art.1.3; 38)	Interoperability Layers	Recommendation 30
	area of freedom, security and justice (Chap I, Art. 1) to contribute to a high level of security within the area of freedom, security and justice (Art. 2 , 1(a)) strengthening, simplifying and making more uniform the data security and data protection conditions (Art. 2, 2 (e)) ensuring data security (Art. 16, 3) The CIR shall reply in such a way that the security of the data is not compromised. (Art.22, 2) security rules applicable to the repository (Art. 39, 5) Security of processing (Art. 42) Security incidents (Art. 43) with the conditions of security, availability, quality and performance (Art. 54, 2) compliance with the rules of each EU information system regarding the security and integrity of personal data (Art. 56, 1(h)) security training - appropriate training programmes concerning data security, data	Conceptual model	Recommendation 46

Name of the legal initiative (with hyperlink)	Short description	EIF Core Topics	EIF pillar
	quality, data protection rules, the procedures applicable to data processing and the obligations (Art. 72) Monitoring and evaluation - security and quality of service (Art. 74) an assessment of the security of the interoperability components (Art. 74, (e))		