Kravchenko Yuliia

The European Union Interoperability Governance: An Assessment of the European Union Interoperability Governance Model and Bottlenecks

Master Thesis

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Supervisor: Over Prof. dr. ir. Joep Crompvoets

Presented by: Yuliia Kravchenko

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Abstract

Interoperability issues are recognized as salient barriers to the development of e-services (Codagnone and Wimmer 2020). It follows that the European Union's stakes on interoperability are high, due to the advancements sought in the e-government development across EU Member States (Wimmer et al. 2018). This results in investments and development programs on interoperability at the Union level (Wimmer et al. 2018). Interoperability constitutes a barrier to e-government development in that it is characterized by gaps between plans and results (Codagnone and Wimmer 2020). Achieving interoperability demands addressing both technical and non-technical issues Janssen and Scholl (2007). Due to its multi-layered nature, interoperability encounters challenges on many levels (Janssen and Scholl 2007; Schonn and Klischewski 2007). Overall, interoperability governance assumes a pivotal role in addressing the multi-layered nature of interoperability and its challenges (Wimmer et al. 2018a).

However, knowledge on the governance of interoperability is scarce (Wimmer et al. 2018a). Therefore, this thesis addresses the need of presenting the holistic perspective on the governance of interoperability on the macro and micro level identifying elements that exist and the current developments on EU level. Consequently, the main research objective of this paper is to explore interoperability governance models on EU level and what are the bottlenecks on this level of governance. This research uses a model template that has already been tested to analyze the governance models, on both national and EU levels. Considering the constructed model from the gathered information the aim is to identify the bottlenecks using Governance Assessment Tool (Bressers et al 2013) and contextualize them against the Contextual Interaction Theory.

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Abbreviations

AI	Artificial Intelligence
CEF	Connected Europe Facility
CIO	Chief Information Officer
DG	Directorate General
DSI	Digital Service Infrastructure
DTA	Digital Transformation Accelerator
EC	European Comission
EDIH	European Digital Innovation Hub
EIF	European Interoperability Framework
EIRA	European Interoperability Reference Architecture
EU	European Union
GAT	Governance Assessment Tool
HPC	High-Performance Computing
ICT	Information and Communication Technologies
ISA	Interoperability Solutions for Public Administrations, Businesses and Citizens
IT	Information Technologies
MS	Member State
NIFO	National Interoperability Framework observatory

1 Introduction

Over the last 30 years, the public sector's innovation and the use of information and communication technologies have tremendously grown. Central to the use of ICT in the public sector is the delivery of public services by means of said technology (Ones and Janssen in Tambouris et al., 2015). However, the delivery of the so-called e-services is by no means straightforward to the use of ICT. Scholars identify interoperability as an essential factor in their development. Significantly, interoperability issues are recognized as salient barriers to the development of e-services (Codagnone and Wimmer 2020). Especially, interoperability constitutes a barrier to e-government development in that it is characterized by gaps between plans and results (Codagnone and Wimmer 2020). Achieving interoperability demands addressing both technical and non-technical issues Janssen and Scholl (2007). Due to its multi-layered nature, interoperability encounters challenges on many levels (Janssen and Scholl 2007; Schonn and Klischewski 2007). Overall, interoperability governance assumes a pivotal role in addressing the multi-layered nature of interoperability and its challenges (Wimmer et al. 2018a). It follows that European Union's stakes on interoperability are high due to the advancements sought in the e-government development across EU Member States (Wimmer et al. 2016). This results in investments and development programs on interoperability at the Union level (Wimmer et al. 2018). The EU put interoperability on the agenda for the first time in 2004 and developed programs over the following years (Kalogirou and Charalabidis 2019). It could be argued that it started getting more and more attention as its maturity grew, backed up by multiple iterations of EIF (European Commission 2004; European Commission 2010; European Commission 2017). ISA^2 has performed a certain role in interoperability governance at the EU level. With the end of it and interim evaluation concluding the goals set have not been achieved to their fullest, the question arises of what needs to be done for further improvement (European Commission 2019). However, knowledge of the governance of interoperability is scarce (Wimmer et al. 2018). It follows. This research draws from the considerations of the significance of interoperability for the delivery of e-services in the public sector. It considers the substantial challenges characterizing its development and the role of interoperability governance in addressing them. In this context, this thesis aims to contribute to extant knowledge by answering the call of Wimmer et al. (2018) about the need for data on interoperability governance. The governance of interoperability in the EU due to a variety of actors involved is constantly in transition; therefore, there are developments that are not yet captured in the research. Previously, governance models have been mapped for the countries and programs. However, there is a need to analyze the present governance approach at the EU level. Therefore, this thesis addresses the need to present a holistic perspective on the governance of interoperability on the macro and micro level,

identifying elements that exist and the current developments on the EU level. Consequently, the main research objective of this paper is to explore the interoperability governance model at the EU level and what are the bottlenecks at this level of governance. Hence, the main research question of this thesis is the following:

What bottlenecks could be identified in the interoperability governance model at the EU level?

Two sub-questions are necessary to address this question:

1. *What elements of interoperability governance could be identified at the EU level?*

The answer to this question allows identifying the elements of the interoperability governance model on the EU level and their position in the model. This, in turn, allows describing in detail the context of interoperability governance at the EU level and contextualizing the interoperability governance model for this level of governance. In order to examine the current state of interoperability governance at the EU level, the following sub-question is necessary:

2. *What are the most recent developments on interoperability governance at the EU level?*

Here the goal is to identify elements of the model that are currently developing although are not yet in place. It can be argued to be a part of the current state of EU interoperability governance. Yet one believes they have to be split as changes, whether significant or not, may occur. The answer to this sub-question illustrates the transition and the direction of developments. It is required in order to aid the main question, as one could potentially identify the bottlenecks in transition from one model to another or arrive at the conclusion that bottlenecks are already being addressed.

To answer the research sub-question, this research uses a model template that has already been tested to analyze the governance models on both national and EU levels (Wimmer et al, 2018a). This step is essential to identify what bottlenecks exist. European Union's high-level interoperability governance model is based on the framework proposed by Wimmer, Boneva & di Giacomo (2018a), using the most recent data trying to capture the vision of decision-makers in the EU using legislative acts, papers, and interviews. Creating such a view will bring us a step closer to spotting current or potential bottlenecks that have to be addressed.

Considering the constructed model from the gathered information, the aim is to identify the bottlenecks using Governance Assessment Tool (Bressers et al 2016).

This paper aims to add to the pool of existing knowledge using the EU as a case. Albeit it is not straightforward, such initiatives as Digital Single Market require common policy responses that require coordination on the EU level, hence requiring EU level governance model.

This thesis is structured as follows. Section one is the introduction to the topic outlining the goal and the research questions. Section two will present a literature review discussing definitions and frameworks related to the topic of this thesis, including e-government, e-governance, interoperability, and interoperability governance. These concepts will be explored in the context of the European Union, discussing the programs related to interoperability governance at the EU level. The structure of the literature review is organized to provide an overview moving from general concepts and perspectives and narrowing it down to specific programs that deal with interoperability governance. The chapter will be concluded with the introduction of the theoretical approach that is used to discuss the governance model identifying the bottlenecks.

Section three provides a detailed overview of the methodology utilized for the research. A thorough description of the template that is used to analyze governance is presented as well as a theoretical framework that is used to identify bottlenecks. Methods of data collection and analysis are described in detail, including the codes used to analyze the obtained data.

Section four outlines results obtained during the course of the research for this thesis, aided by the insights from the interviews. Subsequently, the data is discussed in a separate section. Finally, in section five, conclusions will be drawn in the last part, identifying whether the research questions have been answered, pointing towards future research areas, and identifying the limitations recognized.

Section six concludes the thesis with a brief outline of the findings and limitations of the research, as well as pointing toward future research opportunities.

2 Literature review

In order to address the goal and questions set in this thesis, it is first necessary to analyze existing literature that has already covered the concepts used in this thesis. The focus of this part is split between theoretical concepts as well as studies that have analyzed existing initiatives related to interoperability governance in the EU. Therefore, the literature review is divided into two main parts: a discussion of main concepts and ideas to build a narrative and a context for the second part, the cross-border interoperability governance in the EU. To keep the line of logic, these parts are not clearly separated but rather form a narrative, one flowing into another.

2.1 E-Government

E-government, both as a concept and as practical implementation, has been under for a while under the microscope of researchers. Notwithstanding, peer-reviewed literature, even when it comes to its definition, has not reached definitive answers. Vagueness in the interpretation of it, however, can be explained by the nature of the concept, as research assigns it a quality of "combinatorial complexity" (Ramaprasad et al. 2015). Due to this reasoning, researchers tend to describe it from one angle at a time, discussing separate aspects of it - ranging from a technology perspective to a radical change perspective (Grigalashvili 2022). Hence, this affects the definitions they put forward. In order to illustrate this point, one presents several of them. For example, Gartner`s Group's definition of e-government is "the continuous optimization of service delivery, constituency participation, and governance by transforming internal and external relationships through technology, the Internet, and new media," which implies a transformation of the relationship between actors through constant advancement (Gartner Group 2000). On the other hand, Davies (2015), in his in-depth analysis report produced for the European Parliament, defines e-government as "efforts by public authorities to use information and communication technologies (ICTs) to improve public services and increase democratic participation" therefore concentrating on the provision of services and actor involvement. Apart from those, many research papers present diverse frameworks to define and understand the concept and its development (Coursey and Norris 2008; Siau and Long 2005; Lee 2010).

Exploring the concept is an extensive topic on its own; therefore, one will not go into detail in this thesis. However, it is necessary to briefly account for the existing views on the matter at hand as this constitutes the background of this research. This is deemed relevant in order to understand the complexity and multi-dimensionality of e-government, which is the field of study of this thesis. For this reason, in this thesis, the focus on the

service delivery and their improvement put forward by the European Parliament, and the Gartner's Group as core elements of e-government is highlighted. The following subsection builds on this highlight and dives deeper into the concept of e-governance.

2.2 E-Governance and its relation to e-government

E-governance and e-government often go hand in hand in the literature, with scholars using them as synonyms and some arguing for one being a part of another (Cook et al. 2002; Pina et al. 2007). Others, however, agree that both have to be treated as separate notions (Grigalashvili 2022). Consequentially, there is no single definitive interpretation for both. E-governance (as similarly shown for e-government) is assigned different properties by scholars. Council of Europe`s definition states that e-governance "is about the use of information technology to raise the quality of the services governments deliver to citizens and businesses" (Council of Europe n.d.). It could be argued improving the quality encompasses the reinforcement of collaboration within (administration to administration) and with (administration to business and administration to citizen) public sector organizations. Interoperability, in that case, is an agreed "basic prerequisite" (Janssen and Scholl 2007) for efficient collaboration and coordination. Yet, this approach covers only one of three conceptualizations that could be derived from existing literature: "e-governance as customer satisfaction, e-governance as processes and interactions, and e-governance as tools" (Finger and Pecoud 2003).

This subsection provides an overview of the relationship between e-governance and e-government. As the delivery of public services in an electronic fashion is highlighted in the concept of e-government (Gartner Group 2000), the collaboration between public sector organizations increases in importance (Janssen and Scholl 2007). Therefore, the understanding of "e-governance as processes and interactions" (Finger and Pecoud 2003) is highlighted in this thesis. Drawing from this, the following subsection aims to position interoperability in this context, highlighting its role in e-governance and e-government.

2.3 Interoperability and its relation to e-Government and e-Governance

E-Government deals with the provision of public services, whether it is to the citizens (G2C), to businesses (G2B), or to other government agencies (G2G). Such provision includes the respective communication and the exchange of information between the entities. Such exchange that previously has relied on ICT, however, did not transform the processes in a back office, processes within the public administrations. It has been recognized that by adapting those processes and making ICT systems interoperable bigger potential of the e-government can be achieved (Scholl and Klischewski 2007, Pardo et al. 2011).

Interoperability as a concept can be found in an array of disciplines and has been widely discussed from different angles. However, at the beginning of its development, most definitions concentrated on the technical aspect of it as, for example, defined in ISO/IEC 2382:2015 vocabulary – "capability to communicate, execute programs, or transfer data among various functional units in a manner that requires the user to have little or no knowledge of the unique characteristics of those units." This view has been elaborated by some scholars assigning the "capability to interoperate" to enterprise information systems (Zdravković et al. 2015). It has evolved to many other areas, including the provision of public services (Janssen and Scholl 2007). However, this perspective in the literature with a focus on a technological aspect has been acknowledged as barrier for the e-government interoperability (Pardo et al. 2011). Therefore, the need has risen to change to research perspective towards its overview as complex sociotechnical process (Peristeras et al. 2009) including management and policies to the previously dominant technological aspect. As a result, the capability view has evolved to include categories, almost all of which have multiple dimensions, such as: business architecture, governance and leadership (governance, leaders and champions and stakeholder engagement), strategic management (strategic planning and performance evaluation), operational management (project management and resource management), information policy (information policy and data requirements), cross-organizational collaboration (collaboration readiness and organizational compatibility), and technological readiness (secure environment, technology acceptance, technology knowledge and technology compatibility) (Pardo et al. 2011). This view has been developed by Pardo et al. (2011) creating the Framework of Multidimensional Capabilities for E-Government Interoperability. Such tool is essential to understand the complexity and variety of perspectives that have to be taken into account when one is researching or implementing interoperability in the e-government related projects. Additionally, the capability view adopted by Pardo et al. (2011) shows also the necessity to have an in depth understanding of said complexity and each of the diverse perspectives.

Having discussed the relevance of interoperability when it comes to public service provision, it has been recognized that certain areas require interoperability to provide a service properly (Pardlo and Burke 2008). Among those are efficient response during the emergency situations, security, and public safety as well as health services provision (Pardlo and Burke 2008). These areas without proper cooperation and lack of communication and data exchange between systems would not be able to properly function, especially in the multilevel context of European Union Pardlo and Burke 2008).

2.4   Governance

Drawing from Pardo et al. (2008), it is claimed here that governance capabilities have to be developed in order to implement or enhance interoperability. As this is the key area of interest of this thesis, this subsection addresses existing literature on the matter to provide an overview of existing perspectives on the concept.

When one examines the "interoperability governance" term, there is a clear combination of two terms: "interoperability" discussed above, and "governance". Evidentially, governance definition varies depending on the realm. Considering that, the discussion in this thesis will be limited to "information governance" and "data governance". This is consistent with the applications and objectives of interoperability as they relate to, for instance, data exchange (Wimmer et al. 2018). The dominant among scholars' approach to defining the aforementioned terms tends to be looking separately at "governance" adding the properties of a second part, "information" or "data" (Kooiman 2002).

Here it is needed to mention that also some scholars confuse the terms, even adding IT governance to the mix, all three have visible distinctions and should be studied as related however separate concepts (Smallwood 2019).

Kubicek et al. (2011) suggest looking at IT governance as e-government heavily relies on the use of ICT. Governance can be defined as specification of "the decision rights and accountability framework to encourage desirable behavior in using IT" (Weill and Ross 2004). Furthermore, on the operational side, it is described as "a set of mechanisms associated with the structure, processes, and relationships, which must be related to one or more objectives of the organization" (Van Grembergen et al. 2004). As more governments continue to invest in information technology in their pursuit to digitalize the provision of public services to citizens and governments, its governance has also came into focus. Most of the studies have concentrated on the private sector yet there is a rising interest to study the matter in the public sector considering variances between these two and difficulties to generalize findings from studies in the private sector to the public sector (Tonelli et al. 2017).

Scholars and practitioners have formed different views on information governance. According to Gartner Glossary (2000) it is a "specification of decision rights and an accountability framework to ensure appropriate behavior in the valuation, creation, storage, use, archiving and deletion of information … [it] includes the processes, roles and policies, standards and metrics that ensure the effective and efficient use of information in enabling an organization to achieve its goals". Khatri and Brown (2010), on the other hand, define it as a "framework comprising data principles, data quality,

metadata, data access, and data lifecycle". Another scholar defines information governance as "the totality of interactions between agents who achieve their objectives using the information they have in common, with the establishment of a normative basis for all activities" (Rascão 2022). The variety of approaches distinctly shows there is no one perspective on information governance but rather each definition concentrates on a certain aspect of it.

A similar difficulty is faced when authors made an attempt to explore data governance. Recognizing this as an obstacle, Abraham et al. (2019) provided a definition of data governance based on a literature review and analysis of the definitions of data governance. The authors conclude that a definition of data governance can be formulated as follows: "Data governance specifies a cross-functional framework for managing data as a strategic enterprise asset. In doing so, data governance specifies decision rights and accountabilities for an organization's decision-making about its data. Furthermore, data governance formalizes data policies, standards, and procedures and monitors compliance" (Abraham et al. 2019). Data governance is also argued to be a new term that has a novelty of implications for data being an asset (Alhassan et al. 2016).

Ultimately, IT governance, information governance, and data governance are different in their scope yet a relationship and overlap between the abovementioned definitions can be observed. Specifically, all three primary perspectives on governance examined -I.e., IT governance, information governance, and data governance- include, inter alia, the use of instruments such as frameworks, processes, and structures to ensure effective decision-making and the achievement of organizational objectives (Abraham et al. 2019; Gartner Glossary 2000; Rascão 2022; Van Grembergen et al. 2004; Weill and Ross 2004). Drawing from this overview of the concept of governance applied to IT, information, and data, the following subsection revolves around the concept of interoperability governance.

2.5 Defining interoperability governance

Following the perspective of taking into account data governance and information governance perspectives Wimmer et al. (2018a) define interoperability governance as "as a governance, which provides the enabling framework, processes, managerial and steering functions such as reference architecture and support instruments for decision making". The authors specify that EIF and European Interoperability Reference Architecture (EIRA) are prominent instruments of interoperability governance (Wimmer et al. 2018b). Moving from such considerations, Wimmer et al. (2018b) developed a model template for interoperability governance. The primary scope of the model envisioned by the authors is to study interoperability governance models (Wimmer et al.

2018b). Further in the literature review, this instrument will be discussed in great detail as one will use the developed model to present the results obtained during the research work for the purpose of this thesis.

To study interoperability governance Wimmer et al. (2018b) developed a framework where they defined levels (political, strategic, tactical, and operational), actors (institutions and the roles they perform), and elements that influence the governance. The framework will be discussed in detail further in the methodology part.

The version of the European Interoperability Framework presented in 2010 was the first to include the definition of interoperability governance, which, through revisions, has later evolved with the following versions of the framework in 2017 into "decisions on interoperability frameworks, institutional arrangements, organizational structures, roles and responsibilities, policies, agreements, and other aspects of ensuring and monitoring interoperability at national and EU levels" (European Commission 2017a). In the framework document, there is a whole section that is devoted to interoperability governance as presented in Fig. 1:
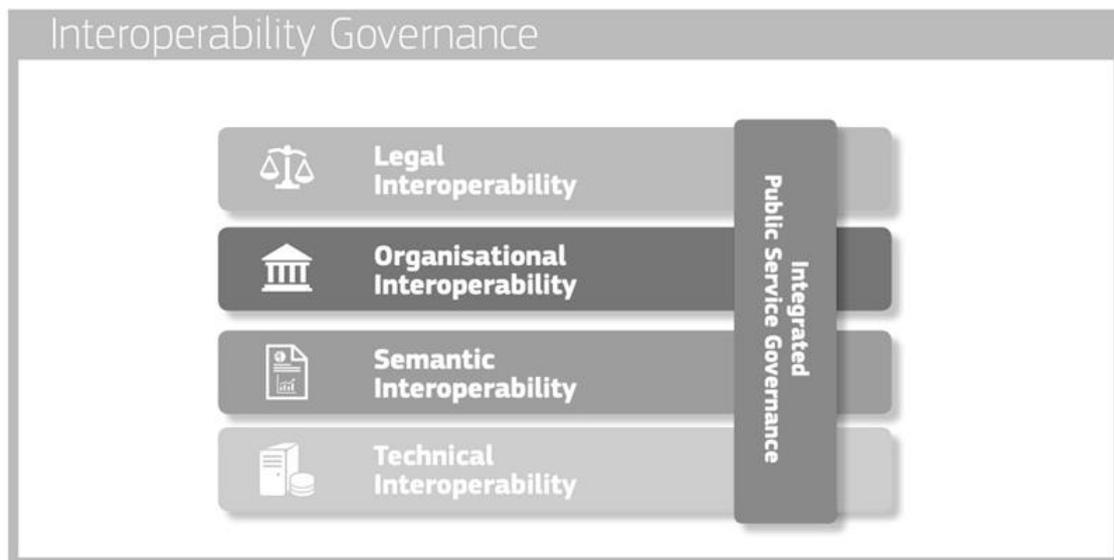
Source: European Commission EIF 2017a

Fig. 1   Interoperability governance model

According to this model, four levels should be considered when it comes to Interoperability governance. Legal interoperability refers to the need for the existence of necessary legislation and agreements which allow public administrations to work together despite operating in different legal frameworks (European Commission 2017a). Organizational interoperability requires the alignment of business processes, responsibilities, and expectations among various public administrations (European Commission 2017a). Another layer, semantic operability addresses the need to have a

shared understanding of data and information (European Commsion 2017a). EIF specifies semantic (meaning of data elements) and syntactic (format of data and information) aspects (European Commission 2017a). Finally, technical interoperability deals with the infrastructure that allows to link systems and services (European Commission 2017a). All 4 levels should be addressed to develop the capability to interoperate. If one of the layers is behind it will hinder the interoperability.

Proposal for a European Interoperability Framework for Smart Cities and Communities (EIF4SCC) (European Commission 2021a) builds on the EIF 2017, adding however a cultural dimension to the holistic perspective on interoperability. Cultural interoperability refers to organizational cultural differences that influence the behavior of organizations and individuals in response to interoperability challenges. To illustrate how it fits in the context of interoperability governance, the authors present the following figure (Fig. 2):

Source: European Commission, EIF4SCC, 2021a

Fig. 2   Interoperability model from EIF4SCC proposal

The visible difference between EIF 2017 interoperability model and EIF4SCC 2021 proposal, on top of the additional element, is the positioning of the elements. In the case

of EIF 2017 there is a rather hierarchical positioning of the elements of integrated service provision. Whereas, the latter, EIF4SCC proposal illustrates a rather equal share. For both, however, interoperability governance is a necessary element in bringing the levels together for the holistic approach to interoperability (European Commission 2021a).

2.6   Development of interoperability in EU

It is generally agreed among scholars that e-government and e-governance can bring a variety of benefits such as increased efficiency and cost savings for governments (MacLean and Titah 2021). European Union has been including the element of digital transformation in the legislation as well as established various initiatives. Interoperability has been developing alongside. It can be argued that the concept was introduced into EU policy with the launch of CADDIA program way back in 1985 (Kalogirou et al. 2022). Since then, many initiatives, communications, strategies, and legislation have been launched that either directly refers to interoperability or promotes it at EU level. Among the recent ones there are and the regulations that are currently in force are:

● Regulation (EU) No 1025/2012 on European standardization

● Regulation (EU) No 910/2014 on electronic identification and trust services for electronic transactions in the internal market

● A Digital Single Market Strategy for Europe COM/2015/0192

● Tallin Declaration 2017 (European Commission 2017b)

● Regulation (EU) 2018/1724 establishing a single digital gateway to provide access to information, to procedures and to assistance and problem-solving services

● Berlin Declaration 2020 (European Commission 2020a)

● Regulation (EU) 2021/1153 establishing the Connecting Europe Facility

● Regulation (EU) 2021/694 of the European Parliament and of the Council of 29 April 2021 establishing the Digital Europe Programme and repealing Decision (EU) 2015/2240

● Regulation (EU) 2022/868 of the European Parliament and of the Council of 30 May 2022 on European data governance

Provision of cross-border digital public services has been at the core of the strategies as well as following the once-only and interoperability-by-default principles. An example

of this is Article 14 of a Single Digital Gateway Regulation that requires Member States by December 2023 to ensure exchange between administrations (entity requesting the data and entity holding the necessary data) even in the different Member States. For that to happen certain conditions have to be met that require changes to happen on all four levels of interoperability defined in the European Interoperability Framework (European Commission 2017a).

It is important to mention that there is other documentation that is dealing with interoperability and data exchange in specific areas such as, for example, border control and judicial cooperation:

● Regulation (EU) 2019/817 on establishing a framework for interoperability between EU information systems in the field of borders and visa

● Regulation (EU) 2019/818 on establishing a framework for interoperability between EU information systems in the field of police and judicial cooperation, asylum and migration

● REGULATION (EU) 2022/850 on a computerized system for the cross-border electronic exchange of data in the area of judicial cooperation in civil and criminal matters (e-CODEX system)

As a result, such EU-wide systems for security and migration are operational:

● Schengen information system (SIS) – information on missing or wanted persons (EU 2018/1862)

● EURODAC – database of fingerprints of asylum seekers (EU 603/2013)

● Visa information system (VIS) – exchange information on visas between Schengen Members (EU 2021/1133)

● European criminal records information system (ECRIS) – exchange of data on convictions (EU 2019/884)

Two more, entry/exit system (EU 2017/2226) and European travel information and authorization system (ETIAS) (EU 2018/1240) are not operational yet. All above mentioned IT-wide systems, apart from ECRIS, are operated by EU-LISA agency (EU-LISA n.d.). Architecture, if put simply of these systems, varies from centralized (VIS, SIS, EURODAC) to decentralized (ECRIS).

In this context Internal Market Information (IMI) System has to be mentioned. IMI is a tool that allows public administrations across EU to exchange information on the request therefore allowing for G2G data exchange between competent authorities (EU 1024/2012). As of now it covers 17 different policy areas ranging from exchange and authenticity check of public documents to information on cross-border casers regarding data protection. IMI is stated to be fully secure and can accommodate any national administrative structure (European Commission IMI n.d.).

2.7 European Interoperability Frameworks iterations

EIF (2004) and EIF 2.0 (2010)

Prior to developing the current version of EIF two more have been published. The first version has been published in 2004 under the IDABC program. It identified organizational, semantic, and technical layers for interoperability governance. Eight general principles have been noted: accessibility, multilingualism, security, privacy, subsidiarity, use of open standards, assessing the benefits of Open-Source Software, and use of Multilateral Solutions. It also contained 17 recommendations for national interoperability frameworks (European Commission, 2004). EIF 2.0 (2010) contained 12 principles and 25 recommendations. Additionally, it contained previously not included in EIF conceptual model for public service provision (Fig. 3).
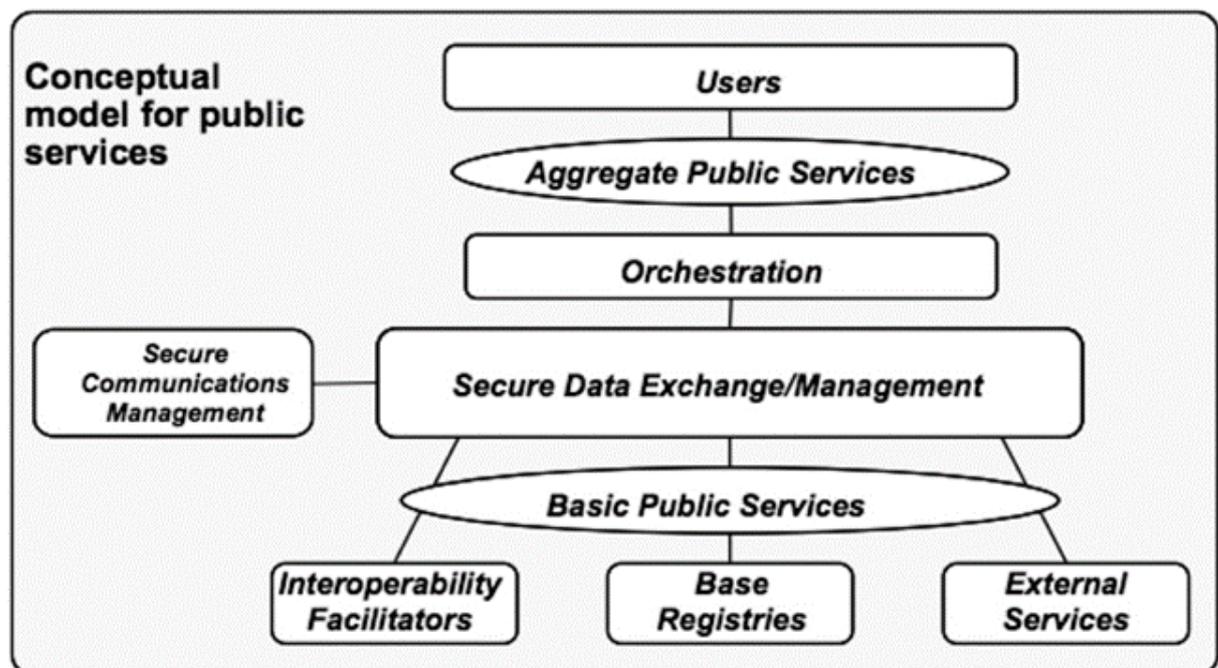
Source: European Commission, EIF 2010

Fig. 3   Conceptual model for public service provision for public services

EIF 3.0

As has been explained prior, the current version of the European Interoperability Framework is not the first one developed. The first edition was presented way back in 2004. Since then, there have been many developments in the realm of interoperability, such as 2010 EIF, and eventually, in order to address ever-changing challenges, the 2017 or 3.0 version has been adopted. The aim was to expand on previous versions and make sure that it is up to date considering the legislation that has been adopted since the last release. Following that, it has become a reference point for public administrations on national and local levels when developing their e-services. It has also become of interest to practitioners in other fields as well as researchers.

EIF 2017 had a general objective – "to help public administrations provide key interoperable, user-centric, digital public services to businesses and citizens, at EU, national, regional and local levels, thus supporting the free movement of goods, people, services and data throughout the Union" (European Commission 2017a) – as well as 4 specific objectives (European Commission 2017a). In order to fulfill those, a set of 12 principles aligned with 47 recommendations have been developed addressing the context for EU actions on interoperability, core interoperability principles, those related to generic user needs and expectations as well as foundation principles for cooperation among public administrations:

- Subsidiarity and proportionality
- Openness
- Transparency
- Reusability
- Technological neutrality and data portability
- User-centricity
- Inclusion and accessibility
- Security and privacy
- Multilingualism
- Administrative simplification
- Preservation of information
- Assessment of effectiveness and efficiency (European Commission 2017a).

Also, the conceptual model for public service provision has been updated from the previous version (Fig. 4):
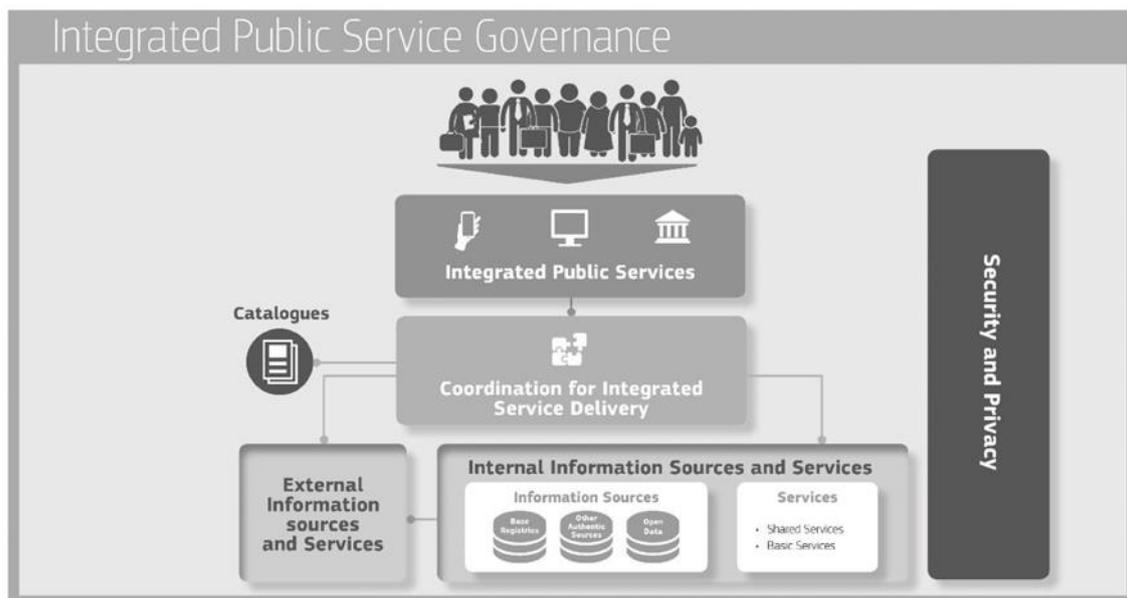
Fig. 4   Conceptual model for integrated public services

In order to measure whether it achieved the objectives set, an initiative was created to gather the feedback and evaluate the results and the impact. According to a joint CEPS and EC study on the evaluation of the implementation of EIF conducted between 2020 and 2021 (European Commission 2021b) some conclusions have been made. The assessment was based on three main criteria: effectiveness, efficiency, and coherence. The following table presents the main findings of the study with regard to the governance aspect.

Effectiveness	Positive	Layered view of interoperability and conceptual model are useful
	Room for improvement	Lack of awareness (mostly local level)
		Need for more action
Efficiency	Positive	Streamlining of procedures and facilitating data exchange are seen as bringing benefits to a wider range of stakeholders
	Room for improvement	Non-binding nature has brought its benefit but more could be done to build a cohesive approach
Coherence	Positive	Consistent with existing initiatives
	Room for improvement	Should be fully taken on board in implementing new policies

Tab. 1   EIF major findings from final evaluation study

As can be observed from the Tab. 1 although EIF has definitely brough benefits there are areas where improvement is needed. This has been acknowledged by the European

Commission as in 2020 it was announced that a new updated version will be presented (European Commission 2020b).

2.8 Key EU level programmes related to interoperability governance

ISA²

Following the realized need to facilitate interoperability governance in the European Union there have been multiple programs across several years each with its own focus. ISA2 is the fifth such initiative that has been running for 5 years, from 2016 to 2020 with a budget of 130,9 million. The following core objectives were laid down:

-       develop, maintain and promote a holistic EU approach to interoperability;

-       facilitate efficient and effective electronic cross-border or cross-sector interaction to contribute to the development of a more effective, simplified, and user-friendly e-administration at national, regional and local levels of public administration;

-       identify, create and operate interoperability solutions supporting the implementation of EU policies and activities.

-       facilitate the re-use of interoperability solutions by European public administrations (COM(2019) 615 final).

In order to achieve abovementioned core objectives, multiple initiative have been introduced such as EIF 2017 on which one will elaborate later in the thesis.

As of now, the program has reached its end, however, some parts of it are still running. In order to identify whether it was successful in attaining its goals, an interim evaluation has been performed during the period of activity of the program (European Commission 2019). The final evaluation is scheduled for 2023. The table (Tab. 2) below presents a view of major findings related to interoperability governance from that covered the following criteria: relevance, effectiveness, efficiency, coherence, EU added value, utility, and sustainability.

Relevance	Positive	Objectives in ISA2 are relevant for the stakeholders and have been mostly addressed
	Room for improvement	New needs and problems experienced can only be partially addressed

		A more binding legal framework for interoperability is need for better results
Effectiveness	Positive	Results achieved by ISA2 are aligned with the objectives of the programme
	Room for improvement	Time frame of the programme doesn't allow to achieve objectives to the fullest degree
Efficiency	Positive	Process to select actions funded by ISA2 is considered relatively efficient and fit for purpose
	Room for improvement	Monitoring and evaluation reports could converge towards common metrics
Coherence	Positive	Actions are characterised by substantial synergies among each other and limited overlaps
	Room for improvement	Coherence between intellectual property rights for ISA2 solutions and CEN/CENELEC standards need to be clarified
EU added value	Positive	The level of coordination ensured by the programme plays an important role in enhancing the overall interoperability among European public administrations
		Enhanced cross-border interoperability in the EU
		Advancement of common EU policies
	Room for improvement	None or minor reported
Utility	Positive	Some of the new needs and problems experienced by consulted stakeholders are addressed
	Room for improvement	The way solutions meet user needs may improve

Sustainability	Positive	Plays a central role in enhancing the interoperability landscape in the Union
	Room for improvement	Lack of coordination between national administrations.

Source: European Commission 2019

Tab. 2   ISA^2 major findings from interim evaluation study

An overview of the results clearly identifies the need to increase collaboration and communication between public administrations with a more binding tool.

Solutions under ISA^2

A variety of instruments have been maintained to advance governance of interoperability under the ISA^2 program. Each one is trying to address a specific area related to interoperability and its governance connected to specific actions. For example

● Joinup platform – sharing IT interoperability solutions for public sector administrations

● NIFO – National Interoperability Framework observatory

● European Interoperability Reference Architecture (EIRA) – common architecture for the design of the solutions and specifications

● Cartography Tool (CarTool) – an open-source plug-in that allows to model solutions based on the EIRA

● Common Assessment Method for Standards and Specifications (CAMSS)

● Core Vocabularies – re-usable data models

● EUSurvey – tool for public consultations

Instruments mentioned are just a limited number of all of the solutions that are offered for free and used by public administrations across Europe. In total there are 24 such solutions (European Commission n.d.)

Connected Europe Facility

An important program that has supported the trans-European network and infrastructure to create the links was the Connected Europe facility. It did not only focus on the provision of public services as it dealt with the energy, transport, and communication sectors. For the purpose of this thesis, one will describe the communications sector only.

This branch of CEF aimed to support and facilitate cross-border service provision and help public administrations, businesses, and citizens. The digital services infrastructures have been developed and deployed. The backbone of the Connected Europe facility was the Digital Single market program. The main goal was to provide solutions that allow public administrations to become interoperable across Europe. On the contrary of ISA2, it dealt not with governance but with actual IT solutions that can be reused by public administrations across Europe. The budget of the Digital Service Infrastructures was estimated to be over 700 million euros over the course of six years, from 2014 to 2020. The main areas that have been addressed are artificial intelligence, cybersecurity, computing, data in cloud infrastructure, and their deployment.

Another important role of the Digital Service Infrastructure is supporting public administration in adjusting the back-office processes to be compliant with the regulations and directives. This was done with the help of the concept of the building block. As a part of the CEF program, multiple building blocks have been developed for a variety of projects. Building blocks can be defined in this case as digital solutions that "can be re-used in different policy areas by a range of different actors" (European Commission n.d.).

The recognized benefit of the building block is its ability to be reused. Keeping the same structure makes them interoperable by default and allows administrations to cut the cost of the development of the project. Many projects and building blocks have been developed as part of DSI. Among the prominent ones are e-invoicing (receiving and processing electronic invoices, according to the EU standards), e-delivery (supporting public administrations and private companies in a secure exchange of data and documents), and e-signature (promoting electronic signature) building blocks (European Commission n.d.). The concept of building blocks is also an integral part of the EIF (European Commission 2017a).

Considering the success of the program the CEF has been prolonged to run from 2021 to 2027. Telecom branch or DSI, together with projects under ISA^2, partially have been joined under Digital Europe Programme. Mostly however it transformed into CEF Digital, the second generation of CEF with the goal contribute to IT infrastructure in a number of ways:

● develop safe, secure, and sustainable high-performance infrastructure such as Gigabit and 5G networks;

● increase capacity and resilience of digital backbone infrastructure;

● digitalization transport and energy networks (European Commission, Regulation 2021/1153).

Digital Europe Programme

Both ISA[2] and CEF Telecom programs have ended in 2020. In order to maintain the work on the matters covered by those, along with CEF Digital (European Commission, Regulation 2021/1153), by the Regulation (EU) 2021/694 of 29 April 2021 Digital Europe funding program has been established. It is a new program, but some of its activities have been carried out under CEF Telecom and ISA². The program also builds on the results of the Horizon 2020 program, enabling technologies such as HPC and artificial intelligence to scale to a large scale. The regulation defined five interrelated specific objectives for the period from 2021 to 2027:

● High Performance Computing

● Artificial Intelligence

● Cybersecurity and Trust

● Advanced Digital Skills

● Deployment and Best Use of Digital Capacity and Interoperability Regulation (EU) 2021/694)

For the purpose of this thesis, the last objective is the most interesting to look at. Ten main operational objectives for this specific objective have been defined:

● support the public sector and areas of public interest, such as health and care, education, judiciary, customs, transport, mobility, energy, environment, cultural and creative sectors, including relevant businesses established within the Union, to effectively deploy and access state-of-the-art digital technologies, such as HPC, AI and cybersecurity;

- deploy, operate and maintain trans-European interoperable state-of-the-art digital service infrastructures across the Union, including related services, in complementarity with national and regional actions;

- support the integration and use of trans-European digital service infrastructures and of agreed European digital standards in the public sector and in areas of public interest to facilitate cost-efficient implementation and interoperability;

- facilitate the development, update and use of solutions and frameworks by public administrations, businesses and citizens, including of open-source solutions and the re-use of interoperability solutions and frameworks;

- offer the public sector and the Union industry, in particular SMEs, easy access to testing and piloting of digital technologies and increase the use thereof, including their cross-border use;

- support the uptake by the public sector and the Union industry, in particular SMEs and start-ups, of advanced digital and related technologies, including in particular HPC, AI, cybersecurity, other leading edge and future technologies, such as distributed ledger technologies (e.g. blockchain);

- support the design, testing, implementation, and deployment and maintenance of interoperable digital solutions, including digital government solutions, for public services at Union level which are delivered through a data-driven reusable solutions platform aiming to foster innovation and establish common frameworks in order to unleash the full potential of the public administrations' services for citizens and businesses;

- ensure the continuous capacity at Union level to lead digital development, in addition to observing, analysing and adapting to fast-evolving digital trends, and share and mainstream best practices;

- support cooperation towards achieving a European ecosystem for trusted data sharing and digital infrastructures;

- build up and strengthen the European Digital Innovation Hubs and their network (Regulation (EU) 2021/694).

What can be highlighted is a European Digital Innovation Hubs initiative that interestingly has the private sector as its primary user but does not exclude the public sector.

2.9   Multi-level and multi-phase governance

EIF recognizes the fact that "European public services operate in a complex and changing environment" (European Commission 2017). The landscape is constantly changing hence the governance of interoperability of it has to be adapted as well. This is supported by one of the findings from the research by Kubiczeck et al (2011) that governance structure is prone to change and adapt during its lifecycle. The elements of it could be replaced or adapted depending on the inside and outside factors. When one is discussing transition multi-level governance and multi-phase governance are considered (Loorbach 2004).

Loorbach (2007) presents a view that allows to analyze the actor`s functions and activities by placing them on a certain level. Differentiation is performed using their intrinsic differences. Activities are divided into three types and hence are placed on the following levels: strategic, tactical, and operational.

At the strategic level reframing of a problem is performed. It is recognized that a new perspective is required as the old structure is not able to address the complexity of the issue. The direction of the solutions is identified, stating the focus and determining the constraints.

On the tactical level vision is translated into specific goals and concrete actions and strategic sector-specific agendas. The network of actors is created, and shared-belief communities are formed.

The operational level is where the experimenting of solutions takes place followed by the implementation.

Each level is divided into three phases providing a multi-phase approach: predevelopment, take-off, and acceleration. The approach is illustrated in the table (Tab. 3) below became a basis for the model template developed by Wimmer et al.(2018). It was adapted to the public sector to include the political level, that is inherent to the public sector (Wimmer et al. 2018).

	Predevelopment	Take-off	Acceleration
Strategic	Problem structuring, Envisioning, facilitation	Direction, leadership, facilitation	Legislation, regulation, institutionalization
Tactical	Agenda and strategy development	Coalition-building, networking	Integration and alignment

Operational	Knowledge production, experiments, innovations	Participating in debate, knowledge diffusion	Practice

Source: Loorbach 2007

Tab. 3 Transition management

3   Methodology

Literature review has outlined the existing knowledge and perspectives on interoperability, the governance of it as well as described the context in particular the cross-border service provision in European Union. The next step of this thesis is to present the methodology that was used to address the research questions set in the introduction.

Methodology in detail covers a step-by-step process of a theoretical framework, the method used to collect and analyze the data. Respectively, tools are described that, with the input of collected data, allowed to address questions set in the introduction of this thesis.

The research methodology in this thesis could be divided into two main parts. The first part addresses sub-questions 1 *"What elements of interoperability governance could be identified on the EU level?"* and *2 "What are the most recent developments impacting interoperability governance on the EU level?"* is addressed using the interoperability governance model template (Wimmer et al. 2018).

The main question *"What bottlenecks could be identified when it comes EU interoperability governance model?"* is addressed using Governance Assessment Tool (Bressers et al. 2013).

This thesis uses a qualitative method, a case study as a research strategy, and interviews as a data collection method (Saunders, 2012).

3.1   Interoperability governance model template

To study interoperability governance a template has been developed in 2016 by the researchers and members of the project team under SC 288 EIS Action Review follow-up under D04.02 Interoperability collaboration governance models, and consequentially used in the report (Wimmer et al. 2018b) and paper (Wimmer et al. 2018a). The template is presented below:

It is necessary to state that as this is just a template, some elements might be missing and some that would have to be added due to the quantity and the structure. The main focus of this are the defined layers that allow placing the artifacts in a hierarchical manner defining the roles they are playing in the whole governance model.

The authors present the description of each level:

-       Political layer: high-level governance that primarily includes decisions made by political actors. Authors specifically point out, that unlike in the private sector, strategic decisions are highly influenced by the political power that actors possess. The layer was not present in the framework from where it was adopted, however, was added due to this reason.

-       Strategic layer: heavily relies on the previous layer developing a coherent strategy that should be constructed with consideration of reached political decisions.

-       Tactical level: deals with the development of more specific standards and artifacts that could be used in different areas and disseminated further down.

-       Operational level: provision of the actual public services using the developed solution and its maintenance.
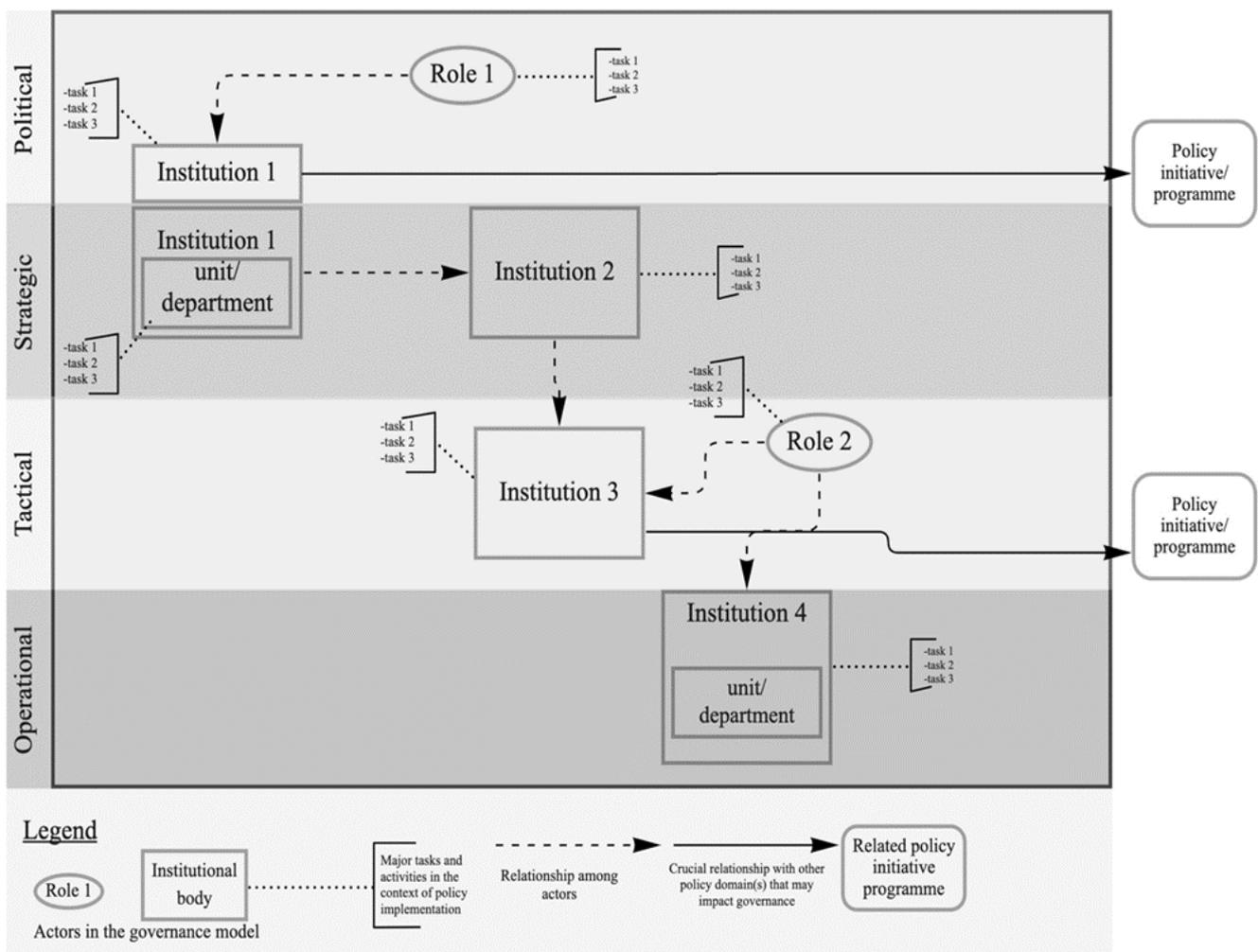
Source : Wimmer et al. (2018a)

Fig. 5   Interoperability governance model template

To further aid the model authors provide the list of artefacts that are scoping the model. The list includes:

● Policy frameworks/initiatives (Agenda, Strategy, Vision, Action Plan)

● Legal framework

● Interoperability framework

● Funding programs/Financial instruments

● Governance model

● Guideline (supporting e.g. the implementation of the underlying policy, the framework of the governance model) (Wimmer et al. 2018b)

The presented artifacts together with roles and institutions as an essential part that of the model and are also assigned to a layer they are operating on. The model, through the use of arrows, explores the connections between institutions.

It is essential to recognize that the aim of this research is not to test the template or its approach. In this thesis, it is rather used as a tool to illustrate and visualize the existing structure. Otherwise, the purpose of the paper would be shifted from depicting the governance structure to the evaluation of the template and the approach of the researchers that have developed it.

3.2 Governance Assessment Tool and Contextual Interaction Theory

Governance assessment tools are a useful tool for identifying bottlenecks and their possible solutions (Casiano Flores et al. 2021). It is acknowledged that Governance Assessment tool has not been developed to study interoperability governance. However, the author does not limit the usage of the tool to one policy domain. The tool itself is rooted in the Contextual Interactio,ns Theory. The main assumptions of the theory are:

1. Policy processes are not mechanisms, but human social interaction processes between a set of actors (people, parts of organizations). This includes policy implementation management and project realization.

2. Many factors can have an influence on the activities and interactions of these actors but only because and in as far as they change relevant characteristics of the involved actors.

3.   These characteristics are: their motives (which drive their actions), their cognitions (information held to be true, with which the situation is interpreted) and their resources (providing capacity and power).

4.   These three characteristics are influencing each other, but cannot be restricted to two or one without losing much insight.

5.   The characteristics of the actors shape the process, but are in turn also influenced by the course of and experiences in the process and can therefore gradually change during the process.

Governance Assessment Tool presents itself as a matrix of governance dimensions and four criteria: extent (elements taken into account), coherence (coherence between elements), flexibility (different roads leading to the goals) and intensity (how elements urge changes) (Tab. 4).

Governance dimensions	Extent	Coherence	Flexibility	Intensity
Levels and scales	How many levels are involved and dealing with an issue? Are there any important gaps or missing levels?	Do these levels work together and do they trust each other between levels? To what degree is a mutual dependence among levels recognized?	Is it possible to move up and down levels? (upscaling and downscaling) given the issue at stake?	Is there a strong impact from a certain level towards behavioural changes or management reform?
Actors and networks	Are all the relevant still coders involved? Are there any stakeholders not involved or even excluded?	What is the strength of interactions between stakeholders? In what ways are these interactions to institutionalized in stable structures? Do the stakeholders have experience in working	Is it possible that new actors are included, or even that lead shifts from one actor to another when there are pragmatic reasons for this? Do the actors share in social capital, allowing them to support each other tasks?	Is there a strong pressure from an actor or actor coalition towards behavioural change for management reform?

		together? Do they trust and respect each other?		
Problem perspectives and goal ambitions	To what extent are the various problem perspectives taken into account?	To what extent? Do the various perspectives and goals support each other or are they in competition or conflict?	Are there opportunities to reassess goals? Can multiple goals be optimized in package deals?	How different the goals ambitions from the status quo or business as usual?
Strategies and instruments	What types of instruments are included in the policy strategy? Are there any excluded types? Are monitoring and enforcement instruments included?	To what extent is the incentive system based on synergy? Are trade-offs in cost benefits and distributional effects considered?	Are there opportunities to combine or make use of different types of instruments? Is there a choice?	What is the implied behavioral deviation from current practice and how strongly do the instruments require and enforce this?
Responsibilities and resources	Are all the responsibilities clearly assigned and facilitated with resources?	To what extent do the assigned. Responsibilities create competence struggle or cooperation within or across institutions?	To what extent is it possible to pool the assigned responsibilities and resources as long as accountability and transparency are not compromised?	Is the amount of allocated resources sufficient to implement the measures needed for the intended change?

Source: Bressers et al 2013

Tab. 4   The Governance assesment tool matrix with its main evaluative questions

The matrix allows to assess extent, coherence, flexibility and intensity of governance dimensions such as levels and scales, actor and networks, problem perspectives and goal ambitions, strategies and instruments, responsibilities and resources.

Each square is assessed using a set of questions to identify how dimensions respond to criteria. Using these questions and the data gathered from documentation the bottlenecks have been identified.

This tool is deemed appropriate for the purpose of bottleneck identification in cooperation with interoperability governance model template as the governance dimensions could be located on the model template developed by Wimmer et al. (2018a).

3.3   Case study justification

The research of this study and the methods used to collect the data are following the approach of a single descriptive case study (Yin, 2003). There are several reasons to justify such a choice. Firstly, this approach allows to explore in-depth the subject of a study which in this case is EU interoperability governance model (Yin, 2009). Focus on a single case allows to explore not only object itself but the surrounding factors that influence it. The object is the interoperability governance model on EU level.

Secondly, when it comes to governance models, there is no one size fit all as its structure and content are highly contextually dependent (Kubiczek et al, 2011). Hence, exploring this model of governance will bring insights specific to case. As the changes to the governance structures are inevitable, one aims to look at a current state of art, complementing by most likely anticipated changes.

Thirdly, case study allows for an opportunity to combine sources of information to provide a coherent view supporting one source with another. This research has combined document analysis as well as interviews.

Furthermore, the study could be classified as illustrative. As defined by Gao (1990, taken from Baškarada 2014) it refers to "descriptive in character and intended to add realism and in-depth examples to other information about a program or policy". This deems fit to the thesis as the goal is to depict and provide structured view.

3.4   Data collection

There are few data collection sources that are recommended to use for the purpose of case study. Documents, archival records, interviews, direct observations, participant

observations and physical artifacts are identified as key (Yin, 2014). Current thesis has combined documents and interviews as sources for the data collection.

- **Document analysis**

Document analysis has been reported to be useful in the majority of case studies. Its strengths include but are not limited to stability (allowing to review documents multiple times), exact (contains exact data that can be crosschecked) and broad coverage (allows to analyze multiple events, time frames and settings) (Yin 2009). One of the main weaknesses however includes selection bias as consciously or unconsciously author may select an incomplete set of data.

To address this point and make the best out of benefits the following steps have been taken:

- Firstly, initial set of documents has been identified that address directly the subject of the research. Among such were the EIF 3.0, ISA^2 documentation as well as CEF documentation. From there one identified document that have been built up on the content of the following. Evaluation studies are an example of such. One has researched the documents that have been mentioned or described in the documents already analysed.

- While conducting the interviews, many interviews have also mentioned a set of documents that they deemed relevant to the topic. If the document has not been previously included, one has also added it to the list of the documents.

- **Interviews**

In order to add validity to the research and gather additional information not covered in the documentation, a round of interviews has been performed.

Interviewees have been selected to include various backgrounds yet still having an extensive knowledge in the field of interoperability mostly on European Commission level but also on the national level allowing for different perspectives on the matter of interoperability governance. The potential interviews have been contacted by the means of email or on LinkedIn if the email was not available. If they agreed for the interview, it was arranged to the most recent availability of the interviewee.

After the interview, they were asked to recommend a candidate to interview. Hence, using a snowball method 7 people have been interviewed. Interviews have been conducted in a span of a month. All of the interviews have been conducted via Zoom application. This allowed, with the permission of the interviewee, to record the meeting allowing for a later

transcription of the text. Such an approach gave a possibility for a later content analysis. All of the interviews were from about 45 minutes to 1 hour in their duration. Table (Tab. 5) shows in detail general information about each interview and interviewee. Interviews were semi-structured in their nature in order to uncover the perspective of each interviewees yet still providing possibility to draw some comparison between each interview (Wilson 2014).

A set of questions has been prepared based on the topics of interest. Interviewees have been asked the same questions, sometimes, however formulated differently to address or to connect to the point the interviewee has made earlier, or if he or she has already covered fully or partially one of the questions not yet put.

Interviewee	Interviewee description and justification for Interview	Format	Date	Duration
1	Officer of the European Commission. Responsible for a portfolio of programs including the European Interoperability Reference Architecture, EC Project Officer for the EIRA.	Online via Zoom, video and audio recorded	17.06.2022	1 hour
2	IT senior official of the European Commission as well as of the the Spanish government. Programme Manager at Interoperability Unit of the Director of Informatics of the European Commission dealing with all the four levels of interoperability (legal, organizational, semantic, technical).	Online via Zoom, video and audio recorded	23.06.2022	45 minutes
3	Former project officer in DIGIT.D3, the unit responsible for Trans-European Services. Former head of Connecting Europe Facility (CEF) Stakeholder Management Office.	Online via Zoom, video and audio recorded	28.06.2022	45 minutes

4	Programme manager in European Commission in charge among other things of Innovative Public Services and Interoperability Academy	Online via Zoom, video and audio recorded	30.06.2022	45 minutes
5	Partner at Wavestone's European Services Practice leading the European Commission and Agencies account. Main areas are digital government, emerging technologies, interoperability, among others.	Online via Zoom, video and audio recorded	07.07.2022	1 hour
6	Programme Manager for EU policies and a Seconded National Expert at the European Commission's Directorate-General for Informatics (Interoperability Unit – D2)	Online via Zoom, video and audio recorded	08.07.2022	45 minutes
7	Former consultant for the Wavestone working on the stakeholder management for European Commisio	Online via Zoom, video and audio recorded	19.07.2022	45 minutes

Tab. 5   Brief description of interviews and interviewees

The questions were formulated in a following manner:

- Background of the interviewee

- Interoperability governance from their perspective

- Is it necessary to have interoperability governance on EU level, and if yes why?

- What are the key elements and what is missing, if anything?

- What are the enablers of interoperability governance on EU level?

- How the interoperability governance on EU level will develop in the future their opinion?

- Additional comments, if any

All recordings have been transcribed using online tool Trint AI to allow for context analysis later.

3.5   Data analysis

The following steps for the were identified for the document analysis:

- Documents have to be thoroughly read multiple times identifying the roles, institutions and artifacts.

- The following have to be placed on the appropriate level in the template consequentially identifying the tasks and connections.

- The first step needs to be repeated to reconfirm the initial judgement.

- After the conducted interviews would be performed documents are revisited in case of doubts to make the necessary corrections.

The following steps for the were identified for the interview analysis:

- Interviews have been transcribed using specialized software, followed by correction of errors in order to achieve the highest precision in the text.

- Multiple rounds of coding have been performed on the final presided version of transcription.

- Identified codes have been grouped to form categories of existing bottlenecks for interoperability governance at the EU level.

Codes for both data analysis as well interview transcript analysis (Bryman 2012) using the following elements from interoperability governance template and Governance Assessment Tool and put in the following groups:

- Levels of governance;

- Actors and institutions;

- Roles;

- Artefacts shaping governance (legislation, agendas, models);

- Governance bottlenecks.

4 Results

Following the literature review and methodology this part of the thesis presents the results obtained from the data collection process. Data is used to visualize the as-is model, as well as the possible to-be model, allowing to highlight current missing elements and bottlenecks but also those that could occur only during the transition from one state to another. Descriptive analysis has been performed to produce the models followed by the interoperability policy governance assessment at the EU level using GAT.

This section has utilized the data from both documents as well as interviews, presenting them rather alongside each other than separating them. Documents used have been taken from official sources available online. All of the interviewees are or have been directly involved in the interoperability governance policy development process in the past 5 years or have been working closely with institutions and actors involved in the decision-making process. Whenever possible, the statements were backed up with direct quotes from the interviewees.

4.1 Current state of interoperability governance
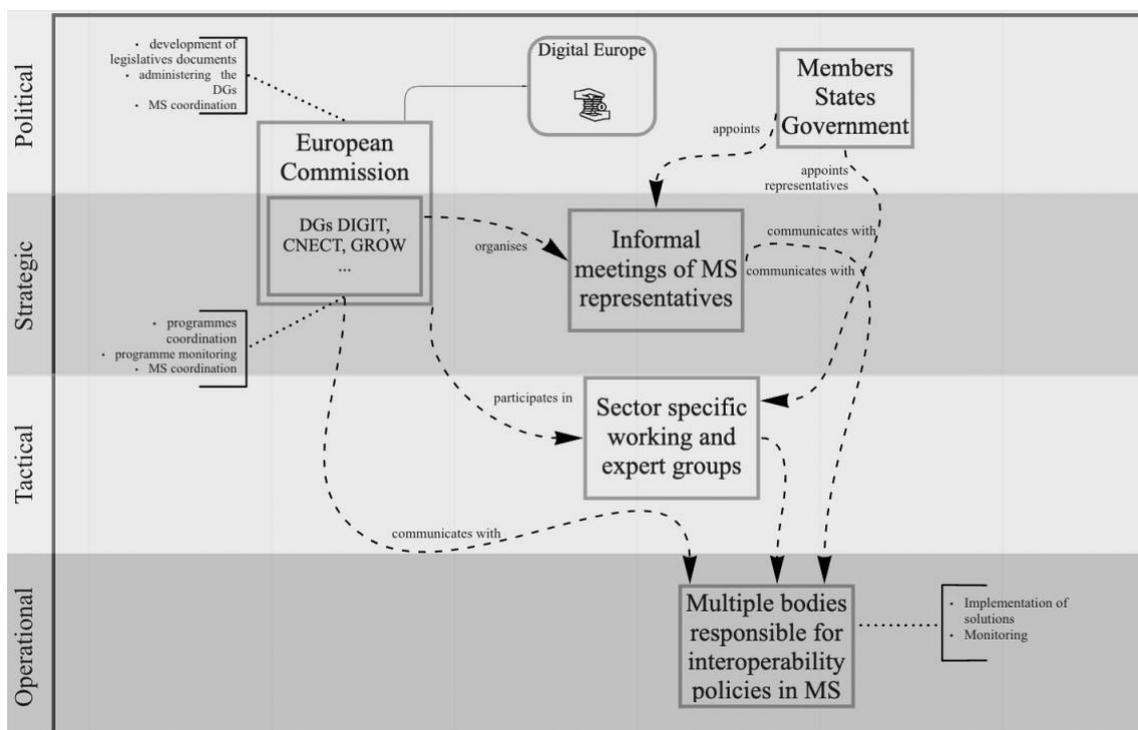
Fig. 6   Current state of EU interoperability governance

4.1.1 Political level

European commission

The role of the European Commission is clearly defined with regards to interoperability governance at the EU level. One could generally divide it into two main parts: internal and external. Internally it is managing various DGs and teams within the EC that are involved in various activities whether it is the development of legislation, implementation, or governance of certain programs. The external role includes:

- proposing and developing the policies, initiatives, and relevant legislation in the domain of interoperability

- governance of the initiatives, strategy design and roadmaps for governance and funding programs

- enablement of cooperation between member states on various levels.

Member states

Members States appoint representatives to cooperate with other MS when participating in the meetings at the invitation of EC. The appointed delegates are chosen at the discretion of the MS.

4.1.2 Strategic level

European commission

As illustrated in the Figure 6, European commission role spreads across political and strategic levels. Such roles could be highlighted on the strategic level:

- organizing the meeting with MS representatives

- administering the work of the working groups

- funding of programme elements

- providing support in the implementation of existing programmes

- monitoring the implementation of existing programmes and the execution of its elements

- monitoring EIF implementation

Currently, there is no other governing body on the strategic level. As put down by one of the interviewees: R2: "So *the let's say the decision-making process until now [referring to Interoperable Europe Act] has not really existed in a coordinated way*." Another interviewee addressed that EIF, despite outlining the governance of interoperability does not constitute a framework:

R4 *"We don't have really a framework because it's [EIF] a commission communication. It's just a guidance document."*

However, there have been efforts made to address governance of interoperability at this level:

R2**:** "*We called the CIOs, chief information officers, of every member state to come, is true. It was, it's been just the embryo, the origin of the governance. But this group was kind of it's an informal group with CIO and representatives. And in this group, we started to sketch ideas for this new legal act [referring to Interoperable Europe Act], and we came up with a conclusion of 20 to 24 action points."*

The goal was to gather the perspectives of Member States and facillitate the collaboration in the matters of interoperability.

It is important to mention that ISA^2 Committee and CEF Coordination Committee have been performing a similar role. Coordination was organized with relation to programme specific goals.

4.1.3   Tactical level

Tactical level, due to its nature of developing standards and specifications for different sectors inevitably requires a number of working groups and expert groups present:

R3: "*Even if we would be fully harmonized across the member states on how we do things, each domain have specificities that we just don't know about necessarily. Unless we are experts in every domain, and we are not*".

A number of such groups have been created to work on specific solutions under ISA^2 and CEF Telecom. For ISA^2, it was Trans-European Services for Telematics between Administrations (identifying areas of policy that require an integration), European Legislation Identifier (supplement on policy and ISA^2 promotion), and Geospatial Solutions (identification of requirements and prioritization of actions related to geospatial solutions). With regards to CEF, specifically for DSI, such working groups have been

established, as eIDAS Expert Group, e-procurement specific expert groups, and European Multi-Stakeholder Forum on Electronic Invoicing. In addition, four operational management boards have been created (eInvocing, eDelivery, eID, and eSignature) that are responsible for project management-related tasks for their respective solutions.

One cannot omit standardization bodies that asses and develop standards and specifications in the ICT sector at the EU level such as ETSI, CEN, and CELENEC. The funding is provided partially from public funding following the requests from EC to work on certain standards. Only standards developed by these bodies is recognized at the European level.

4.1.4   Operational level

The operational level depicts institutions whose role is a provision and maintenance of public services, as noted by one interviewee R2: *"The Member States, regions and the local governments ... at the end of the day, they are delivering the public services."* Therefore, on this operational level, it's the MS, specifically bodies responsible for interoperability policies. Each Member State defines a body with such role. In addition, each Member State also has a body responsible for digital public administration policies. In some MS, these two roles are covered by the same body; in others, those are different bodies.

The roles of these bodies in relation to interoperability governance include:

- developing National Interoperability frameworks, agendas, and execution plans, developing national policies

- collecting the relevant data on the execution and the implementation of interoperability programs

- governing the implementation of interoperability programs on the national level

- working with the EC and providing input on relevant programs.

4.1.5   Artefacts

The table (Tab. 6) below presents a set of artifacts that shape the governance of interoperability at the EU level, followed by a brief description of each.

Type	Level	Artefact	A short description in relation to interoperability

Vision	Political	Tallinn declaration 2017	Declaration of MS commitment to eGovernment and laid down underlying principles including digital-by-default, once only, and interoperability by default.
Vision	Political	Berlin declaration 2020	Re-affirming commitment from Tallin declaration and principles on value-based digital government, including digital sovereignty, interoperability and human-centered systems
Policy frameworks/ initiatives	Political, Strategic	Digital Agenda for Europe: 2020-2030: Shaping Europe's Digital Future and Europe's Digital Decade	Long-term strategy supporting the Digital Single Market
Policy frameworks/ initiatives	Political, Strategic	The Digital Single Market Strategy for Europe (DSM) (2015)	Breaking down the barriers to cross-border online activity
Legal framework	Political	Regulation (EU) 2022/868 Of The European Parliament And Of The Council Of 30 May 2022 On European Data Governance	Cross-border and cross-sectoral data governance

Legal framework	Political, strategic	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	Enabling interoperability by providing clear shared definitions and frameworks
Policy frameworks/ initiatives	Strategic, tactical	The Digital Europe Programme 2021-2027	An approximate 7.5 billion funding program is shaping the digital transformation of Europe.
Policy frameworks/ initiatives	Political, strategic	Horizon 2020	Research and Innovation funding program
Financial instruments	Strategic, tactical	Connecting European Facility (CEF) 2021-2027: Digital Service Infrastructures	Funding and research program for DSI
Interoperability framework	Strategic, tactical, operational	European Interoperability Framework 2017	Interoperability framework that includes a set of principles and recommendations for interoperability governance

Tab. 6   Artefacts scoping current EU interoperability governance

Each artefact plays a certain role in interoperability governance in the EU, usually on multiple levels. Even if not directly, some documents outline and set the context for the interoperability in European Union.

Tallinn declaration 2017 and Berlin Declaration 2020, signed by representatives of all MS, both confirm the political will to develop user-centric interoperable public services for citizens, clearly placing them on the political level of the governance framework.

Digital Agenda for Europe 2020-2030 is based on two main communications Shaping Europe's Digital Future and Europe's Digital Decade, which outline long-term actions to support the creation of safe and secure digital markets in order to address the rapidly changing environment influenced by digital technologies. Digital Single Market strategy has added on, defining three pillars such as providing better access for consumers and businesses to digital goods and services across Europe, creating the right conditions for digital networks and services to flourish as well as maximizing the growth potential of the digital economy.

Other regulations have also added to the promotion of interoperability at the EU level. Although not directly contributing to interoperability governance, they are an important part of the governance framework. For example, Data Governance Act, that entered into force in June 2022 and will become applicable from September 2023 that aims to facilitate cross-border and cross-sectoral data sharing, which is vital for legal and semantic interoperability. Similarly, eIDAS (Regulation on electronic identification and trust services for electronic transactions) ensures mutual recognition of electronic identification schemes and creates a shared internal EU market for trust service providers.

Digital Europe program (2021-2027) is an active funding program that adds to interoperability via funding related projects in line with the principles defined in respective regulation. It also incorporates some parts of past ISA[2] and CEF Telecom programs. An addition for interoperability governance steaming from the DIGITAL program (specifically, objective operational number ten of a strategic objective number five) is Digital Transformation Accelerator (DTA) and European Digital Innovation Hubs. Although the regulation is already in force, the currently selected process for EDIH is not finished as they are scheduled to begin their operation around autumn 2022. Key roles of such, according to EDIH Work program 2021-2023, are:

- providing services based on a specific/focus expertise, supporting the public and private sector in the digital transformation process

- acting as an access point to the network of EDIH to access the necessary competency

- share best practices via the network of EDIH

- provide testing facilities for solutions

- have an obligation to provide interoperability with DTA tools

Digital Transformation Accelerator (DTA) will, in its turn, have the role to:

- provide guidance for EDIH

- building up the community around EDIHs specialties

- ensure the connection with existing relevant initiatives, including Joinup Interoperability Hub

- conducting impact assessment and roadmap development

- Ensuring online presence, external communication, tools, and support

Finally, the European Interoperability Framework (2017) directly adds to interoperability governance by providing guidance for public administrations in the form of general principles and recommendations.

4.2   Current development in the realm of EU-level interoperability governance

In order not to repeat the data, current developments part will describe solely the upcoming changes. The objective of this part is to illustrate the transition of interoperability governance.

4.2.1   Political level and strategic level
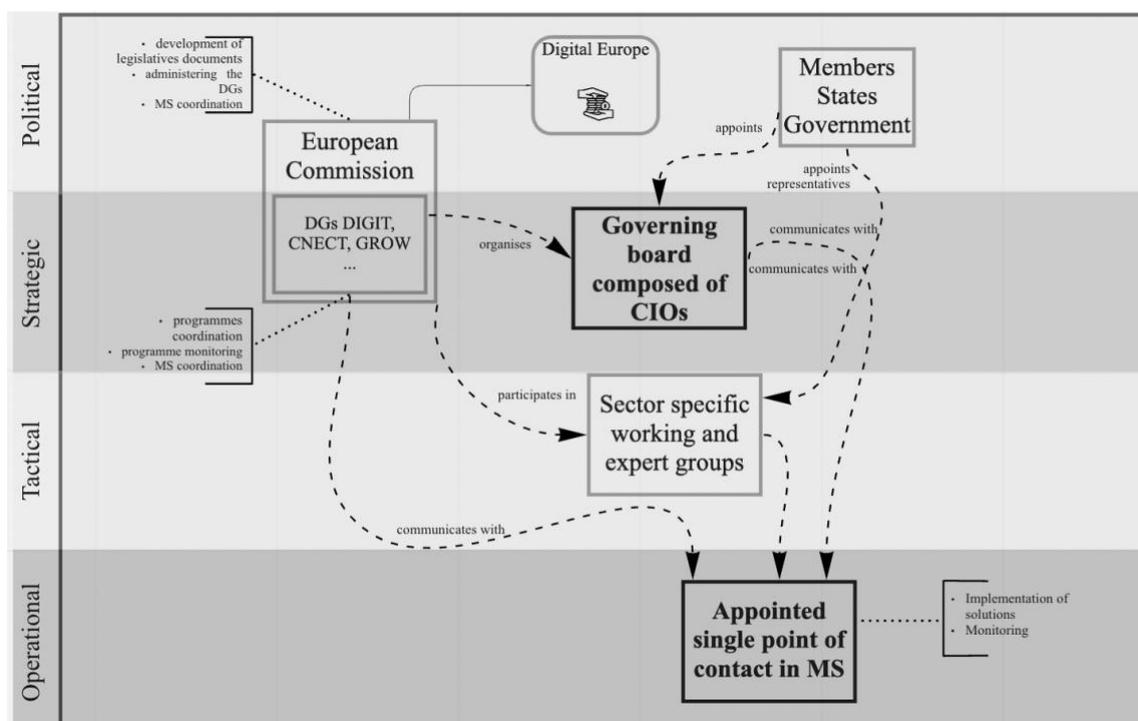
Fig. 7   Current developments in EU interoperability governance

On the political level, the role of the EC or Member states does not appear to go through change. However, the perspective on it seems to be shifting. As put down by interviewees from EC, the goal is to organize the governance in a way so that European Commission would be R1:" …*simply supporting the member states*." and "R4: "…*monitoring and giving the money*…".

With regards to role of MS former EC commissioner points out that R3 "…*things have changed a lot in Member States since I have started working here [European Commission] because digital transformation is something that, I mean it's inevitable*".

Strategic level, in turn, faces substantial change. As stated by multiple interviewees, the Interoperable Europe Act is currently under development. One of its major points is the creation of the body, Interoperable Europe Board, that would consist of a CIO from each MS (R1: "*CIO of each member state will be a member of this governing board*"). The board will have the following roles:

- acting as an executive body (*R2: "Interoperable Europe Board is more like the executive of the organization, indeed, it is the top of the top. It's like a, you know, in any political decision-making process"*);

- providing the final view on policies regarding interoperability (*R1: "one group making the final decision, given also the strategic input, the strategic guidance on what needs to be done"*);

- ensure Member States` collaboration regarding interoperability on a high level by holding regular meetings (*R1: "putting in place a governance level which is sharable between the member states"*);

- promote MS-to-MS collaboration on a high level;

- ensuring policies are communicated to relevant bodies in MS (*R4: "also to have the CIO to alert the country this is coming, and this is what we need to agree and to be prepared and to ensure that we are we have interoperability"*).

4.2.2   Tactical level

Interoperable Europe Board as governing body, would not be dealing with design and specification development:

R2: "*But these people don't have the time to then, do the nitty gritty work and know the little details of designing or identifying solutions or specifications for whatever is the purpose of the business. That will be delegated to another group.*"

The role briefly discussed above by the interviewee would be designated to expert and working groups. The key meaning here is necessity of having a certain number of groups with different field of expertise as pointed out in previous sub-part by one of the interviewees. However, the following suggestion exists regarding the structure of governance on tactical level:

R2: "*So there could be a group of experts coming from the network, they would have the expertise on interoperability, and they can support the creation of a database in one specific domain. This approach will facilitate that at least minimum cross-cutting elements and interoperability that will be introduced in this, in this kind of domain are specific groups coming from the generic or cross-cutting expert groups*".

4.2.3   Operational level

Interviewees point out that draft of Interoperability Europe Act suggests an establishment of a single point of contact in Member States, in contrast with multiple bodies that currently exist. The body would act as a link in the interoperability governance chain, coordinating the with levels above it as well as coordinating interoperability efforts on a national level of each MS:

R2"*Ideally, it would be good to have like a streamline approach, like one institution, so that we don't need to contact many... Because for us, it's very difficult to sometimes get the information from Member States because we don't have access to all the contacts in the national government.*"

However, contrasting with a high possibility of creating an Interoperable Europe Board, single point of contact seems to face a stronger opposition as per an assumption of an interviewee: R2"*But I have to be honest with you. It's just a first proposal. I don't think it will remain as it is now*".

It is unclear however what alternatives could be suggested or whether an alternative would be suggested at all.

4.2.4   Artefacts

The table below (

Type	Level	Artefact	Short Description
Legal framework	Political, strategic, tactical, operational	Interoperable Europe Act	Addressing Interoperability governance on the EU level
Legal framework	Political, strategic	Data Act	Harmonizing rules on fair access to and use of data
Legal framework	Political, strategic	eIDAS 2.0	Update of the current Regulation (EU) No 910/2014,
Interoperability framework	Political, strategic, tactical, operational	EIF 4.0	The updated version of the current EIF
Catalog, instrument	Tactical, operational	Catalog of solutions	Ready solutions for the states possibly open for public procurement)

Tab. 7) presents the artefacts that have the potential to directly impact the governance of interoperability at the EU level.

Type	Level	Artefact	Short Description
Legal framework	Political, strategic, tactical, operational	Interoperable Europe Act	Addressing Interoperability governance on the EU level
Legal framework	Political, strategic	Data Act	Harmonizing rules on fair access to and use of data
Legal framework	Political, strategic	eIDAS 2.0	Update of the current Regulation (EU) No 910/2014,
Interoperability framework	Political, strategic, tactical, operational	EIF 4.0	The updated version of the current EIF
Catalog, instrument	Tactical, operational	Catalog of solutions	Ready solutions for the states possibly open for public procurement)

Tab. 7   Upcoming artefacts with relation to interoperability governance

Already mentioned Interoperable Europe Act, if adopted, is aimed to institutionalise governance model at EU level:

R2: *"The new policy that we are going to launch in my unit in DIGIT is the so-called Interoperable Europe Act and what we want to do is to have our governance in the European Union, at least for European systems. The spirit of the new act is to have a proper governance where we can bring together different policy areas and to decide together along with Member States on what needs to be done to foster interoperability"*

The goal of it is *R2:"to make the European interoperability framework more fit for purpose"* as well as to *R1"create a push for some countries that are not ready yet, digitally ready, but they need to."*

The act aims to establish Interoperable Europe Board, possible similar body on tactical level and a catalogue of developed solutions, already compliant with regulations, that potentially will be available for MS to acquire through public procurement. The draft has already been negotiated with representatives from the Member States, but only the first draft. It still has to be adopted by the European Parliament and European Council; therefore, changes will be introduced.

Other known updates will be made to the current eIDAS regulation, which, among many, will include the legal framework for European Digital Identity Wallets. Its architecture is currently being negotiated. One of the main points of discussion is whether EDIW will act simply as a container for National Identity Wallet or will require architectural changes in existing eID national schemes. The current draft offer significant changes to the eIDAS regulation adopted in 2014.

Data Act that aims to harmonize rules on fair access to and use of data. Both impact interoperability in their respective ways, providing common legislation for MS (legal interoperability) as well as common definitions (semantic interoperability) for MS.

Currently, there is no definite information on what EIF 4.0 would look like. However one could expect that it will be reconsidered in the light of the following research, as well as EIF evaluation, ISA[2] interim and final evaluation, and input from the academic research. The updated version of EIF will require alignment with legislation as well as the inclusion of the needs of the actors involved.

4.3 Interoperability governance bottlenecks identification using Governance Assessment Tool

Having presented the current model as well as upcoming developments, one will move on to the assessment using the data from the interviews and documents. The original governance assessment tool is presented as a table with questions that could be used to assess the cells in the matrix (Table 4), with governance dimensions on one side and the criteria on the other side. Therefore, this part of the results will be structured in a similar way, covering all defined criteria for a dimension and then proceeding to the next dimension. Hence following the matrix horizontally first, focusing on the dimension first

Although through discussion will be presented in the following, six section, some parts would include analysis as it is necessary to do in order to identify the bottlenecks.

4.3.1 Levels and scales

Extent: How many levels are involved and dealing with an issue? Are there any important gaps or missing levels?

Four-level model has been used to illustrate interoperability governance regime on EU level including political, strategic, operational, and tactical. The arrows illustrated interactions between bodies between different levels.

European Commission, for example, as can be observed from the models, is connected to the entities on all levels below, therefore illustrating the said connection. It is active on both political and strategic level itself. Futherdown, is administers the work of some working groups and expert groups, in addition to communication with standardization bodies such as CEN.

Finally, strategic and political level is connected with operational level by EC, among other things, monitoring the EIF implementation:

R2: "I can tell you that in default, we are collecting data for the monitoring of the EIF and we need to do this, otherwise it wouldn't work. We need one contact. And these people sometimes they have difficulties reaching out to other colleagues in the regions. So, in a way, this has to be addressed in the legal act to have something like a counter partner, because otherwise it's not practical"

It addition to illustration of the connecting lines between levels, interviewees points out the inherent complexity on operational level. It maybe does not constitute a direct part of interoperability governance, however, influence it.

Coherence: Do these levels work together and do they trust each other between levels? To what degree is a mutual dependence among levels recognized?

Levels are connected and interact with each other. There is a clear hierarchy that can be derived from the model (political, followed by strategic, followed by tactical, followed by operational).

Matter of trust here could be argued to not being relevant between all levels. However, trust between not all level is relevant, mostly trust is inherently needed between Strategic an operational level. MS

It could be seen that levels are mutually dependent. Without input from one, the development of interoperability is not possible as each level. For example, the Digital Europe program that provides guidance and funding for interoperability projects is a crucial tool that allows the development of specific areas via EDIH that aim to provide services based on their expertise.

This, however, is the vertical perspective on the levels. When it comes to interoperability governance horizontal perspective, connection between entities withing level, has to be addressed as well.

Flexibility: Is it possible to move up and down levels? (upscaling and downscaling) given the issue at stake?

Interoperability governance has matured from being a concern on a National level to a European level. The development of the Interoperable Europe Act is a sign of such a transition. States no longer can work in isolation when it comes to interoperability. Once-only principle implementation requirement, for example, allows illustrates the necessity of EU-level governance to enable cross-border collaboration. Agreements with neighboring states sometimes are already in place:

R4 "*There's something that happening, especially in neighboring countries, because we know that people are moving and they need to ensure that the administration talks to each other.*

However, collaboration is required between all MS. This has not yet been achieved.

Intensity: Is there a strong impact from a certain level towards behavioural changes or management reform?

The political and strategic levels tend to have the strongest impact when it comes to interoperability governance at the EU level. Adopting legally binding policies, such as

Interoperable Europe Act, will inevitably change the way interoperability is managed on other levels. A clear example of such would be the CIO network. Right now, the informal network exists, but the powers and roles of each representative vary significantly. Countries that do have a CIO role tend to be more active in communication with regard to interoperability governance. Representatives that do not hold the respective role cannot always provide necessary feedback or communicate on the matters related due to the lack of the mandates that CIOs have.

What is necessary to address here is that decisions such as Act are a product of negotiations between EC and MS. EC cannot enforce what states have and how to do it. Commission can propose a solution and framework to be guided by, but in the end, it is MS that has the final decision.

4.3.2 Actors and network

Extent: Are all the relevant still coders involved? Are there any stakeholders not involved or even excluded?

When *a*ssessing whether all the relevant stakeholders are involved, it should be first defined what those stakeholders are. Deriving from the data collected, the following list could be suggested: EC, MS representatives, experts participating in expert and working groups, institutions on the MS level dealing with public service provision, and citizens as users of the public sector. Here can be pointed out that citizens are currently not directly involved as interoperability, being a back-office matter, doesn't fall in the scope of their attention. In fact, it is brought up in the interview that they should not be a part of relevant stakeholders R3 "*as a user, as a citizen, it should be preferably transparent, you shouldn't need to care about any complexity behind the scenes*."

Two additional groups of stakeholders highlighted by interviewees are private sector R3 "*and the private sector of course needs to be involved otherwise again. If it is only public sector, it will not necessarily work out. Private sector needs to be a world*" and non-EU stakeholders R6 "*it is not enough to look at European or national level. we need to think globally. So globally it's a very important aspect*". When it comes to private sector involvement, European Digital Innovation Hubs could take this role. It could impact interoperability through sharing best practices and supporting both private and public sectors. Non-EU involvement could be observed as well. For example, NIFO Monitoring of the implementation of the EIF collects data from non-EU member states as well, such as Ukraine.

Finally, it could be argued that all the required stakeholders are involved. The question, however, is to what extent and whether the degree of involvement of some stakeholders is a bottleneck for interoperability and its governance on the EU level.

Coherence: What is the strength of interactions between stakeholders? In what ways are these interactions to institutionalized in stable structures? Do the stakeholders have experience in working together? Do they trust and respect each other?

Interoperability governance on the EU level requires the involvement of a lot of people on all levels of the governance structure. As a result, many officials and experts get involved in representing the Member States. The bottleneck on the strategic level mostly, however, not excluding the political level, lies in the fact that as a variety of representatives exist, the information gets disseminated and does not reach a level further down. Knowledge is not shared between various groups of people who represent a state. This is supported by the statement from the interviewee directly working with representatives from MS:

R4: "*And that's sometimes we noticed as well that the people who are talking to they are not the same that will be after representing the country in the council. So this is also sometimes the complexity and they don't know. And so here, here it's I mean, we are making the links, so we're trying to say, please contact this these people too, to be sure and convey the message. They are coming either from Minister of Interior or sometimes there is the minister of Public Administration, if it exists, and sometimes this ministry of the Minister of Economy, I mean, to simplify it. So and after when we go to the Council for a negotiation, we tell something that the public administration but if it's as if we may not have the same ministry we talk to and the one that is in the council and. There is also divergence.*"

Representatives, considering this divergence, do not have the full knowledge of the matter. Adding to that, the idea that they, coming from different institutions, have different views on interoperability creates an additional level of complexity. Hence, the governance of issues related to it is hindered.

Related to the lack of mandate, the role of the MS representative back at home influences the input on the decisions regarding interoperability. During one of the interviews, it was pointed out that for the countries that do not have a Digital Ministry or a similar entity, Representatives are appointed from institutions that are dealing with the provision of digital public services. This responsibility could is assigned to different entities. This background influences their input at the meeting on the EU level:

R4: *"I mean, when it's Ministry of Economy, there are more usually more liberals than the Ministry of Interior because, of course, they're not dealing with the same files. But depending on who is responsible for this, these aspects we see we see also the tendency that some of them, they are more restrictive and the others are more a more liberal opening to have this [referring to interoperability governance] centralized."*

Flexibility: Is it possible that new actors are included, or even that lead shifts from one actor to another when there are pragmatic reasons for this? Do the actors share in social capital, allowing them to support each other tasks?

From the previous part, it could be considered that all the relevant stakeholders for effective interoperability governance are involved in one way or another. It is unclear what additional actors can influence the governance of interoperability and whether they can bring a drastic change. However, that governance is in constant transition. Therefore, if there is any new body or institution that appears, it may transform the governance regime of interoperability at the EU level. This actually can be seen from the Interpretable Europe act that, if adopted, will transform the governance regime of interoperability drastically.

Intensity: Is there strong pressure from an actor or actor coalition towards behavioral change for management reform?

Interoperability is considered a back-office matter. Citizen as a user is not concerned with how certain service is provided but rather is concerned with the fact that it is provided and the benefit of public service for them.

R7: *"The informed citizen might call it out e-government or digital government or digital government services. They don't worry about interoperability. That's for the nerds like you and me, you know. You know, this is something that's not going to scream at you in the same way that the cost of living is going to or, you know, the price of energy bills or whatever"*.

As a result, its governance is not addressed on a political and strategic level in the MS and is followed by decreased involvement in matters on the EU level. Having no priority back at home, representatives do not actively participate in decision-making and don't provide feedback on interoperability. This is different, however, for representatives from MS, where digital agencies do exist, as they have an overview and vision of what they would need to be achieved on the EU level and how it would influence the interoperability and its governance on a national level. This bottleneck to interoperability governance is also related to the mandate bottleneck.

4.3.3 Problem perspectives and goal ambitions

Extent: To what extent are the various problem perspectives taken into account?

When it comes to the interoperability governance model included in the EIF 2017, four components have to be considered: legal interoperability, organizational interoperability, semantic interoperability, and technical interoperability.

For legal interoperability, one of the interviews brought up the point that there should be peer-to-peer legal agreements between countries. To enable legal interoperability, MS needs to have common parts in its legislation. Organizational interoperability, dealing with compatibility of processes and roles, is currently not addressed. For example, not all MS have a clearly defined CIO role. Similarly, some countries have different bodies responsible for digital public service provision, whereas interoperability governance lies in the hand of other bodies. The draft of the Interoperable Europe Act suggests appointing a single point of contact in each MS. However, one of the interviewees expressed his concern that it may not be a part of the voted-upon act as it may suggest too much pressure on the institution. The tactical level in the Act is addressed by a catalog of solutions that the Member States would be able to use.

Coherence: To what extent do the various perspectives and goals support each other or are they in competition or conflict?

Again, EIF provided a clear governance model for interoperability governance. It contains guidelines for interoperability governance for public service provision. National context shaped the developed National Interoperability frameworks. To what extent they support each other depends on a country's case.

The EIF perspective on interoperability at the EU level appears to be shared. All the interviews pointed out that sharing this view is key to enabling interoperability.

It can be seen the synergy is not existent when it comes to organizational and legal governance. What is observed that semantic and technical interoperability are present in some sectors that allow exchange of data. But legal interoperability as well organizational require much more cooperation and incentive to be achieved.

Flexibility: Are there opportunities to reassess goals? Can multiple goals be optimized in package deals?

There are such opportunities to reassess goals or rather general and strategic objectives. A clear example of this is the assessment studies of EIF and ISA[2]. Reevaluation and

assessment are laid down in the legislation that establishes the program or a framework. This allows adjusting the goals initially set based on the results produced, observing what produced results necessary.

Reevaluation is enabled by monitoring activities, mostly organized by European Commission. Goals are optimized via funding programs, such as Digital Europe that contains strategic and specific objectives.

Intensity: How different the goals ambitions from the status quo or business as usual?

When it comes to assessing how ambitious the goal of enabling interoperability governance is, two things have been pointed out by the interviewees. Firstly, it is argued that current interactions between actors at the EU level could not be considered interoperability governance framework. Therefore, Interoperable Europe Act will be a drastic step. However, it still may not be ambitious enough. However, considering the democratic principle and the fact that EC cannot simply impose legislation on states, it had to be a middle ground decision. Secondly, the concern raised is that the act may be too high level:

R5: "So my fear is that the legislation. We will not get a good balance between being precise enough and being at a high level. In a way that does not impact the sectors that are already working and to the level that actually doesn't impact anything. So, it's very difficult because interoperability is cross-cutting, but it's also vertical interoperability."

The interviewee points out here a challenge of enabling interoperability governance is such a way that makes an impact where development is required while not ruining already existing structures.

4.3.4   Strategies and instruments

Extent: What types of instruments are included in the policy strategy? Are there any excluded types? Are monitoring and enforcement instruments included?

Interviewees recognized that in order to enable interoperability governance on the EU level, there is a need for a solid legal structure. Interoperable Europe Act is definitely a start of this; however, an array of legal agreements has to be made as one act would not fulfill the array of needs. Specifically, was mentioned the need for agreement between the Member States and agents responsible:

R1*: "So you need to have those legal interoperability agreements, peer to peer, okay. And then sync happens with governance. So what the governance agreements that you*

have between the agents. What legal in terms of data exchange in a Belgium is also legal in Poland because if not, then you will not be able to exchange information between the components servicing Ukrainian and then service in Poland"

Interoperable Europe Act, in combination with peer-to-peer agreements between member states, is necessary for a complete structure of interoperability at the EU level. Countries should consider having common parts in their legislation. Otherwise, inequalities and lack of organizational interoperability hinder interoperability governance at EU level.

Coherence: To what extent is the incentive system based on synergy? Are trade-offs in cost benefits and distributional effects considered?

Inoperability governance requires clearly defined action points that have to be addressed. ISA₂ and CEF Telecom had strategic and specific actions that have been addressed by certain programs. The same is true for the Digital Europe funding program. What is noted by the interviewee directly involved in the governance of eDelivery under the CEF is that some actions tend to be addressed by multiple programs:

R3: "*I mean, I saw there is also sometimes you have several functions that work on the same thing*"

Similarly, this tends to be true for the working groups:

R3: "*The problem is that there are so many groups, the commission has so much collaboration with the member states in so many fields, and sometimes it's a little bit overlapping in scope*"

Therefore, on strategic and tactical levels, some issues tend to be addressed in multiple ways creating overlaps. These overlaps create redundancies complicating the process of decision-making and therefore affecting the streamlining process. If this is true for CEF Telecom, it can be expected that similar issues might be similar in other programs.

Flexibility: Are there opportunities to combine or make use of different types of instruments? Is there a choice?

The question in the GAT to identify flexibility in the dimension of strategies and instruments aims to identify whether there is a possibility to make use of different types of instruments and whether there is a choice presented. However, when it comes to interoperability, the aim is to have a unified perspective on the matter following similar principles. The challenge lies in the fact that each MS has the power to choose the models of governance. This is, however, justified by differences between MS:

R2: "*It [governance] depends on the political context, on the organization of the country, on the size of the country.*"

The context plays a role in how interoperability governance is realized:

R2*: "Let's take the case of Estonia. The central government is relatively small and the population is highly skilled on new technologies. So in a setting like this, it's much easier to have to set up a whole process. But in the case, for instance, of a country like Germany is much more complex because they have 16 landers. Even also they there's the federal. State is quite the big. So, the context is different and it is difficult*".

It is evident that there is no silver bullet and no single model for interoperability governance due to inherent differences between Member States.

Intensity: What is the implied behavioural deviation from current practice, and how strongly do the instruments require and enforce this?

A set goal such as the once-only principle illustrates that current practices have to be transformed to allow cross-border services. There is already a legislation that puts certain obligations. However, due to inherent complexity the process is rapid as many thing have to be agreed upon between level and institutions on these levels.

4.3.5   Responsibilities and resources

Extent: Are all the responsibilities clearly assigned and facilitated with resources?

Bottleneck that exists on the political and strategic level is the lack of mandate. Firstly, lack of mandate of Member States` representatives that participate in the meetings:

R2*:"It's just somebody who's there appointed to participate to a meeting with the Commission and they don't have any decision-power and/or mandate from the country to really post an opinion. And we see also in the feedback we're receiving. We see that the person, usually, from the country that have a digital agency, they are the more powerful in the sense that they give comments, they say this is what we do, because we understand that they have the possibility to steer the interpretability in the country, others they don't intervene. So, they say we have to consult first, we cannot say anything. And so they are the quiet ones. And here we hope to change that*".

Hence, lacking negotiation power and not providing input or feedback to the discussion on interoperability, some member states end up at the risk of stalling the decisions. When the decision is made, the risk lies in the non-acceptance of the decision back on the national level.

Secondly, most interviewees have recognized that the lack of mandate of the bodies at the Member States level has hindered the interoperability of governance at the EU level. Having no decision-making power at the national level results in a lack of political power to promote and enable interoperability. Simply put *R3"If you don't have the mandate, then you don't have to do it"*. As a result, there is a lack of incentive to cooperate. This seems to be true for cooperation between member states as well as for cooperation in Member states between national organizations. In essence, there is a lack of institutes that allow doing that.

Resources, therefore, here include financial resources, organizational resources and knowledge resources.

Coherence: To what extent do the assigned. Responsibilities create competence struggle or cooperation within or across institutions?

European Commission has a significant role at both operational and strategic levels when it comes to interpretability governance. One of such roles, as had been defined in the previous section of the results, is administering the work in the of the DGs. Within each DG, there are many teams that are involved in the governance processes such as development, implementation, monitoring, and so on. Hence, many meetings are organized with the representative Member States that overlap and collude, discussing the same things at once. The European Commission being aboard responsible for many parts of the governance of interoperability at the EU level presents itself as a complex entity.

R3: *"Member States have to participate in ten different groups who don't talk to each other, which is annoying for the MS. We hear that often. They come to our meeting and they're like, Yeah, but the commission last week said this and that. Why don't you talk to your colleagues? It's not great"*

Therefore, this becomes a bottleneck when it comes to the communication between EC and MS. Such an overlap for Member States representatives means that those have then combined all the information coming from different channels from the Commission. This bottleneck mostly represents itself on the political and strategic levels. According to one of the interviews, it is necessary to hide the complexity of the Commission's works from the Member States and organize the process in a way that includes fewer channels of communication but makes the flow of information more direct. The need is to make the communication between Commission and the Member States last convoluted as for representatives of Member States, it becomes more complex to understand the processes and the developments that are happening, therefore making them less eager to participate:

R3: *"It would make it more difficult on the commission side because it is different DGS, different teams involved in the implementation. So all of these now would have to work together on the resistant block and it's much more difficult. So instead of hiding the complexity from the member states, sometimes we end up exposing the complexity and making it the Member States or our stakeholders task to understand how to one to navigate this complexity."*

The interviewee suggested that although the coordination should be organized, of course, between the representatives of Member States, but also a significant part should be on the coordination of decisions made regarding the interoperability issues on the Commission side as well.

R3: *"I think that we shouldn't be we shouldn't be exposing the complexities of the member states. We should make it easier for them and they don't care which gig is doing what and they shouldn't need to care. Sometimes even the same. DG And the collaboration is not good and that it's just not the problem with the member state. So if this can lead to more collaboration in the member states, but also with the Commission itself to sort of act as the umbrella initiative of all the different digitalization work happening, then that would be a big, big step forward."*

Another complexity that comes that is related to the European Commission when it comes to interoperability governance is the complex bureaucracy that the Member States are facing when they ask for assistance on interoperability matters. This is supported by the statement from the interview that even if representatives of Member States from the national level would want to get support from the Commission, whether in regards to funding or other assistance, they end up not getting the help; they require just because they don't know how to or whom to talk to. It is argued that the process should not be that difficult:

R4: *"I think a lot of times people don't get the help that they could get and maybe need because they are not aware or because it's very complex to ask for it. They need to fill in too many thing. For someone sitting in a member state it shouldn't be it should not be difficult, it should be easy. They should just be able to go and to a place and they find the information and ask for the things they need. How can you help me? And it doesn't necessarily need to be grant funding, but it could also be different services that is available."*

Funding, however, is a great example of assistance that requires a lot of effort. As discussed before Digital Europe program provides funding for interoperability enabling

programs as well as CEF Telecom did prior to that. However, getting funding under those programs can be rather complicated:

R3: *"Because I would be asked like how can I receive grant funds for doing this? And it would take me a lot of effort to investigate actually which kind of grant funding can they receive for that particular thing. Is it structural funds, and they get or program grant funding? That kind of is very difficult for me, and I can imagine if it's difficult for me, it would be even more difficult for them."*

Flexibility: To what extent is it possible to pool the assigned responsibilities and resources as long as accountability and transparency are not compromised?

Roles, of EC and MS as pointed out before is not prone to change intensely. The roles are split according to their position in the schema of European Union, hence not tied to interoperability.

Intensity: Is the amount of allocated resources sufficient to implement the measures needed for the intended change?

Interoperability governance heavily relies on the cooperation between actors as well as their willingness to do so. However, such cooperation is heavily dependent on whether the actors are aware that the issue exists and has to be addressed in the first place. Actors dealing with governance on all levels in order to enable interoperability and set in motion the streamlined governance processes and decision-making need to understand the value that interoperability could bring: R2 *"But then also I think there is a lot of work to be done in the awareness that it is cost-efficient, that generates value to the society. This was also a very important aspect"*.

Awareness is also required in the realm of understanding the necessity of interoperability itself. Considering the nature of interoperability and therefore need for communication and cooperation in a complex EU environment, governance has to exist to bring actors together, providing guidance based on joint decisions.

Awareness here also refers to actors dealing with interoperability having knowledge of already existing solutions and instruments that will allow for the development of interoperability capabilities. It has been identified that currently, many resources have been developed by the EC-related projects. However, to make use of those, one has to be aware that they exist in the first place.

Therefore, awareness has to be recognized as a bottleneck from three angles: awareness of the relevance of interoperability, awareness of the need for interoperability

governance, and, finally, awareness of existing instruments related to interoperability governance. All three have to be addressed on all levels of governance, some to a bigger extent on certain levels.

Connected to the awareness bottleneck, there is one with regards to the knowledge of the decision makers on the political and strategic level. When discussing interoperability, a certain set of skills and knowledge must be attained; this does not mean that representatives have to be IT or IT architecture specialists. But in order to know how to develop the capability of interoperability and therefore govern it, representatives need to understand the underlying principles and the context of interoperability:

R6*"It doesn't mean that they need to have a technical background, but rather need to understand that, need to understand something, need to understand what is around what the other Member States are doing."*

On an operational level, this is eliminated as working groups are constituted by experts in the field. The tactical level is also less affected; however, not all MS have the body that is responsible for interoperability governance. Therefore, when the need arises for such an appointed person can be a professional with not enough understanding of what has to be enabled and achieved to successfully promote interoperability on the national level.

# 5	Discussion

The results chapter of this thesis presented findings that were discovered from collected data. In this chapter, key findings are discussed in relation to the case's scope and the existing literature. The aim here is to provide a solid explanation for the findings as well as a hint on how these bottlenecks must be considered when interoperability governance on the EU level is developed.

Research in this thesis has taken a more practical perspective looking at the governance model, actors that are present in the interoperability governance model, how they relate to each other as well as the context they operate in. Firstly, the interoperability governance model in transition will be discussed. Bottlenecks uncovered will precede It will be followed by discussing how theory assumptions could be confirmed using the case discussed.

## 5.1	Interoperability governance model on EU level in transition

Political level

The political level appears to be the most stable out of the levels when it comes to interoperability governance. Changes occur within the layer, such as changing representatives from MS or DG responsible for programs. Intrinsic roles, however, generally stay the same, which is not a surprising discovery. The European Commission is organizing the meetings and fosters MS communication as well as managing the work of the DG and funding for the program.

Complexity in the administering work is not something that can be addressed fully. Bureaucratic principles are there in place for a reason, especially when funding is involved, as transparency and openness have to be insured. What can be addressed, however, is how this complexity is exposed to the user.

Member states appoint representatives to participate. Communication is key to ensuring a joint approach to address legal, organizational, semantic, and technical incompatibilities.

What is important, however, is the changing focus of where those responsibilities should lay. Data has shown there is a shift occurring when it comes to how cooperation with regard to interoperability is enabled. Mostly impacting strategic level, it influences all of them due to their connection. The change is with regards to who should organize the cooperation, in for of meeting and joint projects as well as other forms. It seems necessary for MS to be the ones who want to coordinate their actions. In contrast, EC will take a

role in monitoring and funding. But what to monitor and fund should come from a joint decision of MS. Particularly, it shows the change in motivation. When EC takes the role of organizing, it rather appears as forcing the state. If motivation is different, however, it enables cooperation for interoperability governance.

The motive bottleneck directly flows into the awareness bottleneck. It is unclear to what extent, however, evident that there is a lack of understanding of how much value interoperability could bring to society as well as cost-efficiency. Motivation and awareness are closely connected in this case. The less of such understanding exists, the less thereof motivation to make it happen.

Strategic level

Awareness bottleneck, however, does not only refer to the pollical level. Results have shown that representatives of MS on the strategic level, who do not hold the role of enabling interoperability at the national level of MS, often lack the knowledge to provide informed feedback hindering cooperation. In addition, not having a mandate results in miscommunication between MS on a strategic level. With the CIO role, there is a potential to eliminate this problem. Having a representative who is involved in the topic, has sufficient knowledge of theoretical perspectives of interoperability, and has a mandate to make a decision would be a solution. One can see the possibility of this happening. However, the context of MS could influence what the role of the CIO will imply. Having the same title would not mean having the same role. For MS, which already has such a position is less of a problem. For those who don't, the question arises of the responsibilities possessed by CIO.

Bottlenecks on the strategic level, however, do not stop at the representatives. Even if having the same roles and understanding how processes work to make them interoperable, without the space to cooperate, little progress could be achieved. Informal meetings are not enough as only participants who have enough resources (in this case, mandate) and motivation would strive there, hence the MS they are representing. This is, however, addressed and recognized as the solution it is planned. The platform as such is also important as it not only allows for all MS to present their feedback

Additionally, as EU does not exist in isolation global context has to be taken into account. Backed up by the political level, strategic should at least partially have perspective developments of developments outside the European Union. This would be important to avoid redundancies later. It is important for European Union as a whole due to changes occurring. For example, currently there are seven countries that have candidate status to join EU with Moldova and Ukraine joining the list this year. Of course, it is the joining

sates that have to adapt and make sure that the processes and the legislation is compliant with the existing regulation. However, a support from European Commission and the Member States as well. As for example, in the form of peer-to-peer legal agreement. Therefore, it is important to develop policies and systems that have the capability to interoperate.

There is no way to know beforehand what changes will occur in the future, which technologies and developments will happen in the future, so the best way would be developing the capability.

Operational level

In comparison to the political and strategic level, where vertical cooperation is of most concern operational level seems to place more focus on cross-sectoral interactions. There are many sectors that have to be considered when standards are developed, and solutions are adopted. Numerous working groups have to exist as it is impossible to have experts in all the fields. This overlap in scope can occur when few expert groups are dealing with the same area. In addition, it is complicated to establish which sectors have to interoperate beforehand, making the task of developing a standard that can be used by most even more complex.

Documentation development on operational level requires high consideration of balance between being high level and specific. If not high level enough, it can hinder the interoperability governance, resulting in incompatible standards with the ones already existing in some sectors, leading to the waste of resources and failed projects. Yet it also should be specific enough to achieve the needed results, leading to common specifications.

Tactical level

Tactical level in this case acts as a point where the EU level and national levels connect. It also shares resemblance with strategic level. In this case study in the presented level on the tactical level was placed a body, or bodies that deal with national digital policy development and e-government. The context of tactical level highly influences the actions and the motivation of actors on EU level. The context includes cultural and structural and historical differences.

These are the bottlenecks that cannot be eliminated. What can be done is the effort to take them into consideration when developing a policy.

5.2   Key bottlenecks in the interoperability governance model

Key findings in the form of bottlenecks to current interoperability governance on the EU level present themselves as the following:

- Lack of structured institutionalized decision-making process involving all relevant actors

Currently there is a lack of one governing body on the strategic level, as well as tactical and operational. No clear structure is visible. Decision-making process is under development. Some documents outline the governance of interoperability, but it is classified simply as a guidance document.

Decisions and roles are scattered across levels and sectors creating complexities that complicate the process of governance with regards to interoperability.

The results of the evaluation of both the ISA₂ program as well EIF evaluation as well recognized a need for a more structured approach to interoperability governance in the EU. Similar views are held by the interviewees, who generally have arrived at the conclusion that in order to facilitate interoperability, there is a necessity to have a high level of agreement and centralized decisions, at least in certain aspects. European Commission has started its work on the Interoperable Europe Act, that would address all the levels in some way. It is still in the first stage of its development, and the text has not been made publicly available due to ongoing work. However, some elements of it are already being discussed. Its general aim of it is to enhance the interoperability of governance at the European Union level. It is currently one of the most promising attempts to facilitate governance and cooperation on interoperability matters and approaches. Interoperable Europe act will directly address the governance model of interoperability, bringing elements that have not existed before and introducing the missing governance structure.

What steam from that is the importance of placing more emphasis on the legal and organizational interoperability. Peer-to-peer legal agreements and establishment of coherent bodies that share the same roles on operational level is of utmost importance.

- Lack of communication and coordination

It cannot be denied that cooperation and communication are the key factors for interoperability governance. Without the communication from all relevant actors, including the Commission and Member States representatives, private sector and other relevant stakeholders.

On all levels there is a variety of actors that are not necessary connected with each other. It is impossible for all of them to talk to all of them. Therefore, there should be one entity from which information will be transmitted, where it can be requested and shared, eventually creating the pool of shared cognition.

This is stimulated by Interoperable Europe as well as by Digital Europe program. The goal here, is essentially to underline the importance for MS to collaborate on their own without constant push from the Commission as EC can only do so much. Once the importance would be realized interoperability will develop more rapidly.

- Peer-to-peer MS interoperability agreements

Legal interoperability when it comes to cooperation between Member States is key. It is a basis for coherent approach that is recognized by the governing bodies. Through legislation it is possible to enhance organizational interoperability between governing, but not only bodies.

What is more important is that it gives additional motivation. Legal peer-to-peer interoperability between Member States will provide the context where cooperation is ensured. Lack of mandate of the bodies at the Member States level is recognized as a major bottleneck to the interoperability of governance at the EU level. Having no decision-making power at the national level results in a lack of political power to promote and enable interoperability.

- Awareness of interoperability benefits and the state-of-art (institutions and representatives

It is needed to recognize awareness as a bottleneck from three angles: awareness of the relevance of interoperability, awareness of the need for interoperability governance, and, awareness of existing instruments related to interoperability governance. All three have to be addressed on all levels of governance, some to a bigger extent on certain levels.

Lack of awareness of the relevance of interoperability prevents from a much-needed stronger action with regards to interoperability governance.

Increasing awareness of the need for interoperability governance should be recognized as a priority. Ones it is achieved the motivation to cooperate, communicate to reach a common goal of Digital Single Market will be more profound.

Awareness of existing instruments related to interoperability governance could be achieved through increasing awareness of need for interoperability and for its governance.

-   Duplicated activities for similar functions

Some of the interoperability projects tend to be addressed in multiple ways and functions creating overlaps. These overlaps create redundancies complicating the process of decision-making and therefore affecting the streamlining process.

In addition, it could be argued that because the roles of some entities overlap, creating redundancies and the waste of resources.

-   Bureaucracy as EC level

MS face difficulties in receiving it due to convolutedness in the process in the European Commission. The rules and bureaucracy are rightfully there, however, could be simplified to allow incentive for those who seek aid.

-   Lack of shared pool of cognition

Structurally and culturally MS are different. That inherently influences collaboration possibility. Differences should be properly managed and where possible mitigated guided by the common vision and strategic goal.

5.3   Relation of Contextual Interaction Theory to the case of interoperability governance at EU level

Here is discussed whether theory assumptions could be backed up by the case of interoperability governance at EU level. The statement is mentioned following by the discussion of it.

1.   Policy processes are not mechanisms, but human social interaction processes between a set of actors (people, parts of organizations). This includes policy implementation management and project realization.

From the previous part of discussion, the role of the individual representative can be seen as essential. Individual level is where the negotiation happens. Undoubtedly, individuals represent the perspective of institution. But one shouldn't forget that they also bring their personal perspective to the table.

This could be observed on each level but political and strategic stand out, CIO is an inherently political role. While negotiating they have to make sure that the interest of their country is accounted for.

2. Many factors can have an influence on the activities and interactions of these actors but only because and in as far as they change relevant characteristics of the involved actors.

& 3.These characteristics are: their motives (which drive their actions), their cognitions (information held to be true, with which the situation is interpreted) and their resources (providing capacity and power).

Second and third statements should be addressed together.

Through the discussion and analysis in this thesis many actors have been identified as such that influence motives, cognition, and resources of actor. Here, the perspective of institution is more valuable.

Motivation is influenced by the legislation that requires actions, mandate that gives actors the power to make decisions, awareness that allows for informed decisions,

Cognition is highly dependent on the cultural and organizational context of actors. Shred cognition is not always a possibility but can also be mitigated through the motivation.

Resources are not only the funding that is available. The list of such would also include strategic documents, legislation, interoperability frameworks, guidelines and many more. In addition, technical resources and human resources that are of essence.

4.These three characteristics are influencing each other but cannot be restricted to two or one without losing much insight.

There is definite coordination that can be observed through the analysis of current case. Motivation is influence by resources and shared cognition on the interoperability governance.

Cognition, or rather efforts to create shared cognition, are dependent on the resources available and motivation of actors.

Resources, in their turn, are produced if there is a right motivation and a shared cognition regarding the interoperability governance.

5.The characteristics of the actors shape the process but are in turn also influenced by the course of and experiences in the process and can therefore gradually change during the process.

The discussed above characteristics of motivation, cognition and resources shape the actions of actors in various ways. The structure and the existence of structured decision-making process depend on motivation to establish bodies and institutions that are needed. In the case of this thesis, EU context shapes characteristics.

6   Conclusion

Interoperability governance is a complex multi-level cross-sector matter. This thesis provided answers to what and how the actors are involved in the interoperability governance on the EU level on both micro (individuals) and macro (organizations) levels, illustrates how the model of interoperability governance framework looks like at the EU level, how it transitions, and what are the bottlenecks that could be identified.

Literature review precented necessary theoretical concepts to explore the topic of interoperability governance as well the context of in European Union. Methodology clearly outlined all the steps taken when collecting and analyzing the data. Analysis presented in the detail the results collected, followed by a discussion.

The main question and sub-questions will be stated again in order to evaluate if the questions have been addressed and, if yes, how it was done and what the main results are.

Firstly, sub-questions are evaluated as this follows the course of the research.

What elements of interoperability governance could be identified on the EU level?

To find an answer to this question data has been collected via available document and interviews. The interoperability governance model template has been populated using the data. Such elements have been identified and place on the level they operate at:

- Institutions and their roles

- Actors and their roles

- Relevant legislation

- Strategies

- Funding programs

- Interoperability Framework

The result was a filled in template. In the future it can be expanded to maybe include individuals like CIOs. It might be usefully to assess the failure or the success of the instantiates, going into the details of decisions. Such research, however, has to directly include the larger set of data. However, for such a study with EU level view it can be too convoluted.

What are the most recent developments on interoperability governance on the EU level?

Similar approach has been identified when looking at the current developments in the interoperability governance. Similarly, relevant set of actors has been identified and placed on the interoperability governance model template, such as:

- Institutions

- Relevant upcoming legislation

- Prospect of the update to interoperability framework

The discussion of such has been based on the knowledge of directly involved individuals who have the knowledge on the matter and shared non-restricted information.

What are the bottlenecks could be identified in the interoperability governance model on the EU level?

To analyze this question as stated before documents and interviews have been used both available documents as well as interviews. However, from the thesis content, it can be observed that more attention has been paid to the interviews. The reason for that was to identify the perspective on interoperability governance bottlenecks at EU level of practitioners and present their observation in structured manner with consideration of theoretical framework.

Such bottlenecks have been identified and discussed in previous sections:

- lack of structured decision-making institutionalized process involving all relevant actors

- lack of communication and coordination

- lack of Peer-to-peer MS interoperability agreements

- lack of awareness of interoperability benefits and the state-of-art (institutions and representatives

- clear role definition and mandate of representative

- duplicated program functions

- bureaucracy as EC level to get help

- lack of involvement of all relevant groups.

The research recognizes that the list is not exclusive and it is one of the limitations of this thesis. The bottlenecks presented have the biggest amount of data gathered via the methods used in this research to back them up.

To conclude, the thesis has addressed the main question of this thesis as well as sub-questions in full capacity. The research problem of identifying interoperability governance bottlenecks at the EU level has also been addressed. The thesis offers a fresh view on interoperability governance from both theoretical and practical perspectives.

Limitations and future research possibilities

There are several limitations to this study. Firstly, the tools used in this study. Although proven reliable in their respective studies, they were not developed to study governance at the EU level. The interoperability governance model template by Wimmer et al. (2018) has been used to assess the program at the EU level; however, it has not been tested how reliable the tool is. The governance Assessment Tool has not been developed to study interoperability governance. However, it has been applied to analyze EU-level policy. Similar to the model, the reliability of the tool has not been evaluated. Evaluation of both instruments may become a topic of research in the future.

Another limitation lies in the usage of GAT. The tool is presented in the form of a matrix with questions. To gain more reliability, it could have been possible to use the tool by transforming it into a questionnaire. Additionally, another possibility might be organizing focus groups to gain the perspective of different categories on interoperability governance bottlenecks and compare them.

Future research might be useful to develop a tool that is specific to interoperability at the EU level. It also necessary to look into to what extent these bottleneck affect interoperability governance.

Secondly, a major part of this study refers to the regulation that has not yet gone through the approval of the European Parliament and Council. Therefore, changes in the future final text are inevitable. This limitation was partially mitigated by using only the parts that have been made publicly available and were already put through the process of negotiation with representatives of MS. In addition, it was made sure to confirm with policymakers that the chosen parts are most likely to be a part of future legislation, albeit with minor changes. Future studies could cover the interoperability governance model after the adoption of the act. It would be interesting to compare the results of this study with a similar one later on.

Thirdly, considering the complexity of the interoperability governance, the different views could be taken and present a more detailed picture. As one aimed for a holistic view, some bottlenecks could have been combined for a more coherent view. To understand whether this is true more research is required on the topic. Providing recommendations was not this thesis; therefore, they are not addressed.

To conclude, interoperability in undoubtedly a goal for the European Union. However, achieving it is a complex matter that requires proper structured governance of actors, communication, collaboration and resources.

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Appendix

A: Interview **Guide**

	Interview Guide
1	Introduction: information about the researcher, brief thesis topic introduction
2	Do you agree to be recorded so I could later use the information provided by you for the research purposes?
3	Could you please tell me about your background and your current occupation?
4	Could you please identify what are the essential elements of interoperability governance on EU level?
5	Is it necessary to have interoperability governance on EU level, and if yes why?
6	What is missing, if anything?
7	What are the enablers of interoperability governance on EU level in your opinion?
8	How the interoperability governance on EU level will develop in the future their opinion?
9	Would you like to add anything?