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# RISK FACTORS FOR THE SUCCESSFUL IMPLEMENTATION OF THE NEW EUROPEAN INTEROPERABILITY FRAMEWORK FROM THE EU EXPERT'S PERSPECTIVE AT THE LEVEL OF PUBLIC ADMINISTRATION

Master Thesis

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# EUROOPA ÜHENDUSE KOOSTALITLUSE RAAMISTIKU RIIGI TÄITMISE RAKENDAMINE ELI EKSPERTI PERSPEKTIIVIS AVALIKU HALDUSE TASANDIL

Magistritöö

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## Author's declaration of originality

I hereby certify that I am the sole author of this thesis and this thesis has not been presented for examination or submitted for defense anywhere else. All used materials, references to the literature and work of others have been cited.

Author: Timur B.

May 9, 2019

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This thesis is the brief start of the new initiatives in the related field. I had a great time and learned a lot at Tallinn University of Technology especially e-Governance Technologies and Services program. I want to thank all people who shared their knowledge with me and supported during the entire educational process.

Sincerely,
Timur B.

**Abstract**

Digital government with its online services is not a myth anymore. People become addicted to receiving online services being in café, home and abroad. European Union is the one on the largest market economies which would like to offer their citizens to move freely in all aspects through EU countries. It would create an independent cross-border, seamless and unified digital single market, where people, goods, capital, and services can move easily. It would like to keep old partnerships and strength new one between citizen, business and public administration. The European services would follow the principles of transparency, cost-efficiency, innovation and easy to access.

This research paper is about one of the core initiatives of the digital single market that would create a successful electronic government based on common principles and standards, which were developed by European Commission Directorate-General for Informatics, unit interoperability. The initiative named the *"European Interoperability Framework"*. [1] It is set of the guidelines and principles to create a successful electronic government with online services in.

Sometimes to implement some new initiatives take time and understanding, additional cost and funding.

Through this research, the author would like to define some possible risk factors of successful EIF implementation through conducting an interview with EU experts by examining 4 main levels of interoperability which are, technical, organizational, legal and semantic interoperability layers.

Consequently, to reach and implement such a huge amount of project would not be easy, even 28 EU Members States are eager to implement and reach independent EU digital single market initiative only with a successful outcome.

Keywords: interoperability, European Interoperability Framework, e-governance, e-services, European Union, public awareness, digital single market, digital strategy.

The research paper is in English and contains 61 pages, includes 6 chapters, 4 graphs.

## Abbreviations list

| | |
|---|---|
| **EIF** | European interoperability framework |
| **EIS** | European interoperability strategy |
| **EU** | European Union |
| **ICT** | Information and communication technology |
| **IT** | Information technology |
| **NIFO** | National interoperability framework observatory |
| **UN** | United Nations |
| **e-GOVERNANCE** | Electronic governance |
| **e-GOVERNMENT** | Electronic government |
| **NIF** | National interoperability framework |
| **ISA** | Interoperability solutions for European public administration |
| **EC** | European Commission |
| **PA** | Public administration |
| **IAP** | Interoperability action plan |
| **EFTA** | European free trade area |
| **DSMS** | Digital single market strategy |
| **DSM** | Digital single market |
| **GG** | Good governance |
| **MFA** | Ministry of Foreign Affairs |
| **RQ** | Research question |
| **A2A** | Administration to administration |
| **A2B** | Administration to business |
| **A2C** | Administration to citizen |
| **EIRA** | European interoperability |
| **MS** | Member state |
| **PSI** | Public sector information |
| **SOA** | Service-oriented architecture |
| **SLA** | Service level agreement |
| **GDPR** | General data protection regulation |
| **CAIF** | Central Asian Interoperability Framework |
| **CAII** | Central Asian Interoperability Institute |
| **OOP** | Once Only Principle |

| | |
|---|---|
| **EID** | Electronic ID |
| **eIDAS** | Electronic Identification, Authentication, and Trust Services |

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# 1 Introduction

Usage of the Internet and digital technologies showing rapid growth[1] and it took an important place among people in daily routines. It helped to promote digital services to become more integrated and involved by people, business, public administrations are both locally and cross-border. Those two aspects changing the way we are living today. Digital services become more integrated with society and economy with their potential user needs. [1].

The European market is big where the digital economy is stepping to substitute traditional, it is using many digital services, so Europe is following basic principles to make its market more competitive and attractive, its follow to provide transparency, efficiency, and accountability in the public administration to avoid any failures. Awareness of digital tools and cross border public services usage should be increased, and all 28 EU countries should benefit from it. It would increase the digital potential for the member states. [2]

Therefore, to achieve and increase digital potential EU countries designed Digital Single Market Strategy convenient initiative to create freedoms for people, to move around EU, make a business that would allow ease goods, capital and services move. Digital Single Market strategy would allow these 4 freedoms to interoperate and receive digital public and business service among 28 EU Member States. [2]

All four freedoms would have common supported policies that are interoperable and interconnected between each other within decentralized access to networks and systems. [2] There would not be any obstacles to work freely, relocate the business and make free trade and operate them in any EU country. Moreover, trustful and secure data exchange would be needed to interact and exchange data electronically between all Member States public administrations, to get specific public service. [1] Digital Single Market initiative would bring huge economic benefits and it is the step forward for vast opportunities for technical change, innovation and economic growth and job provision. It rises enough policy issues change for the public authorities and state institutions for better innovation change and economic stability in the EU region.

Accepting innovations and change create additional difficulties among states based on the national level which are limited to seize these opportunities and find a proper solution in this transformational change challenge.[2] As mentioned above Digital Single Market provides

[1] *"https://www.statista.com/topics/1145/internet-usage-worldwide/"*

an opportunity to move people, goods, capital and services freely all these aspects would provide equal rights to get public services, where personal data would be protected. [2]

Definity by the creation of Digital Single Market and achieving its initiatives will help Europe become the leader in the transition from the traditional economy to digital, it would help European companies to grow globally. [3] Consequently, public authorities has to consider this initiative an try to avoid any limitations towards interoperability. Interoperable communication is an important tool to achieve settled targets.

Using the *"European Interoperability Framework (EIF) to steer European interoperability initiatives contributes to a coherent European interoperable environment, and facilitates the delivery of services that work together, within and across organizations or domains"*. [1]

Always to implement something and to achieve some goals specific guidelines are required. EIF provides *"guidance to public administrations and state members of EU"* [4] how to improve governance in terms of its interoperable activities by providing sets of recommendations, helping to creates an interoperable cross-organizational relationship which supporting streamline end-to-end digital services processes. "*It states for improvement of existing and new legislation frameworks do not compromise interoperability efforts*." [4]

In this regards this research would raise possible risks evaluations and problems of successful implementation EIF with direct relation to National Interoperability Frameworks among European countries public administrations. Importance of the research is to contribute avoidance of possible mistakes and risks related to national interoperability frameworks and interoperable solutions, raise awareness of usage, trust, and transparency. It would deliver information to national public authorities, business analysts, IT communities and independent ICT experts.

### 1.1 Problem Statement

Interoperability is the key factor for developing effective and useful electronic services for the end users in the community. [4]

There are several European Commission *"directives that indicate the crucial impact of interoperability on information society*" [2], while it is presented main principles in digital Market Strategy, in the European Union e-government action plan for 4 years starting 2016 until 2020 with possible prolongation. [3]

European public service is a cross-border sector where public administrations[2] supplied by, and European citizen and business are interoperable between each other. [4] The EIF delivering interoperability outcomes with the specific context in *"providing European public services"* [2].

Interoperability itself in the *"context of European public service delivery is creating a possibility to communicate towards mutual benefits"* [1] and reach common goals by involving information share and related knowledge between State Members and organizations, provide support to the business sector for the data exchange between their ICT systems and networks. Multilateralism of the interoperability is set by nature to understand and describe community values in a reliable and good way. [4] Interoperability actions set frameworks that crates partnership and cooperation for the organizations to deliver joint public services. To reach mutual goals interoperability framework specifies common elements, the set concepts, principles, policies, guidelines, vocabularies, recommendations, standards, practices, and specifications. [4]

Relatively the EIF is a guideline, set of underlying principles and recommendations, this thesis is about to investigate of possible risk factors and problems of the EIF successful implementation among 28 European countries with a core base of the interviews with EU experts.

### 1.2 The Motivation for the Research

Research motivation and the idea for the research paper emerged during the EGA conference[3] in Tallinn where relevance and importance of it were found. The author of the thesis is originally from the Kyrgyz Republic, the country which has to continue interoperability framework implementation with EGA foundation, on that reason the author found interoperability becoming mutual part of the digital government and digital economy consolidation consequently a consideration of the main European Union initiative later on EIF guideline was taken into consideration. By the result of the research author would like to find possible risks factors and problems during EIF implementation among EU states, relatively would like to consider them for future initiatives. Additionally this thesis follow the initiative where EIF will help to lead and create future Central Asian Interoperability Framework, including the possibility for all central Asian countries to become interoperable

[2] *"Refers to either national public administrations (at any level) or bodies acting on their behalf, and/or EU public administrations."*

[3] https://2018.egovconference.ee/

among each other, where the society would get benefits as same possibilities that EU counties are leading towards today. Additionally, the outcome of this research will help to create an organization named Central Asian Interoperability Institute as a supervisory board to follow, promote and raise awareness about interoperability frameworks and solutions among interested Central Asian and world member states.

### 1.3 Research Question

The research question is: What are the possible risk factors for the successful implementation of the new EIF from the EU expert's perspective at the level of national public administration?

Thesis work contains one research question which examines the main 4 levels of the interoperability, those are legal interoperability, organizational interoperability, technical and semantic interoperability.

By conducting face-to-face interviews with EU experts' author found and evaluated possible risks and problems emerging during EIF implementation on national levels based on those 4 levels of interoperability.

Additionally, the author compared e-government national interoperability frameworks success and failure of some countries, Estonia and Germany based on reports from ISA2.

The qualitative methodology performed in order to produce collected data, SonixAi[4] as a software tool used to organize and analyze interview outcomes.

### 1.4 Thesis outlines

The first chapter contains and describes the topic introduction, problem statement, the motivation of study, research objectives and outline of the thesis.

The second chapter describes more about the methodology that the author conducted the research, detail explanation of research questions.

The third chapter reviews as-is situation about EIF, literature review regarding a topic and theoretical reviews from the independent experts. It also contains countries comparative analysis mentioned in 1.3 research objectives.

The fourth chapter provides domain analysis of the topic, importance of the EIF, conducted interview results and interview outcomes.

[4] https://my.sonix.ai

The fifth chapter summarizes the findings, answering research questions, recommendation and implication, limitations, and listed any possibility of further research direction.

## 2 Research Methodology

In January 2004 the initial draft of the EIF was published it contained information that EIF focused on supplementing information instead of replacing. It was developed to change communication exchange between state administrations. All publications draft release was controlled under Enterprise DG of the European Commission. [5] EIF would help to achieve cross-border interexchange of data between states participants.

The EIF is not a legally enforced document but agreed and signed to follow by 28 EU representatives in Tallinn Declaration on eGovernment in 2017 as a strategic document to follow for the successful national interoperability frameworks development and increase e-government implementation in the countries. Each country must follow own national interoperability framework implementations according to EIF develop and implement related recommendations and solutions offered by and each must choose own path, the path which leads to success.

Regularly the problems related to eGovernment and public service delivery could be the same in all countries, but the solutions are completely different and each country deciding which path they should choose. EIF only provides the possibility to create interoperable governance with integrated public services by recommending it states to follow up with the main requirements or not. EIF stands to create new ways of intergovernmental cooperation through solving and challenging the traditional ways of governance. [4]

Answering to research question author used qualitative research methodology to gather the available data and providing result. The importance of the topic to research using qualitative research methodology would provide author possible results of the research question. In the previous chapter, the author mentioned the importance of the thesis and problem statement. Before collecting the data and conduct interviews, the author has presented a hypothesis of the possible outcomes to meet the result based to literature review and other possible works related author would validate the literature review through in-depth interviews and analysis.

## 3 Qualitative Analysis

The author chooses qualitative research through literature review to find and analyze the outcomes of the research question, by defining the method itself is helping to use practical materials and set them in an interpretive situated activity that locates the observer in the world of knowledge. [6] These practices transform the world into learning outcomes and knowledge understandings delivering information to the end users.

This knowledge assumes to contain several series of interpretations, conducted interviews, including field notes, conversations and recordings. The level of interpretation would increase the value of the qualitative research by representing the field of study, interpret the phenomena by their natural settings and attempting to make a sense of meanings would deliver to people. The world would receive the naturalistic approach to the research. [6]

The label *"qualitative research"* [7] is used as an umbrella term for a series of approaches to research in the social sciences. This area also known as hermeneutic, reconstructive or interpretive approaches. [8] In this regards it is better to use this method to evaluate learning outcomes.

Qualitative research contains general aspects of the topic which involves the discovery of the detailed model developed from high involvement in the actual experiences. [9]

It is more subjective and not so exact as a quantitative research approach where initially there is no hypothesis but after employing certain qualitative research methods e.g. surveys, interviews, case studies, generalizing facts and results a hypothesis arises. [7]

## 4 Overview

In the following chapter is discussed firstly some related works in the field of interoperability, public service implementation, e-government and their relation to this paper with a view to be aware of EIF risks and problems findings, why specially EIF is so important and could have obstacle outcomes during the implementation for the European public service design and e-government implementation at the end. Secondly, theoretical framework regarding the topic.

As an example, a country comparison was considered to show and illustrate the situation with EIF implementation.

### 4.1 Existing Body of Knowledge

Governments around the world strive for sustainable development of their economy, societies, and welfare, and of their environments. The contributions of e-government to

support governments in transforming towards better public service delivery, greater interaction between their citizens and government, and improving the efficiency of public organizations [10].

The new e-government Action Plan 2016-2020 of the EU commits the Member States to continue investments in e-government to modernize state administrations by promoting open data and to enhance cross-border and cross-sector interoperability. [1] With this Action Plan, EU countries are continuing to deploy innovative measures to reduce administrative burdens among public services receivers, constantly defined as citizens and business. [4]

Since 19th-century technological progress has increased citizens involvement and has accelerated at an unprecedented rate delivering newer opportunities for them and provide interaction with their governments.

The new phenomenon emerged as a key factor to provide better interaction for the citizens with their government, the phenomenon of using electronic services through internet by using ICT tools. "*Interoperability phenomenon is now a reality, usage of electronic services including social media networks and mobile phone applications has become an integral part of daily responsibilities and duties."* [11] Although it contains the possibility for faster exchange of accumulated knowledge and data between interested parties. [10] The expectations of the interoperable systems would create meaning of interoperability in organizations, state institutions, and business companies. Interoperability is concerned to provide systematic data exchange with two or more system components with ease availability and access through involved systems. Interoperable public service would deliver and at the same time receive accepted service from other units which sharing the information through. It would create effective operation and communication between units and related participants. [12]

To provide interoperable services the term electronic government was settled to define it. "*This common word has many definitions interpretation and there is no commonly agreed and accepted for this terminology"*. [11]

According to IGI Global e-government from electronic government, also known as e-gov, digital government, online government or from different outlooks transformational government, which is using internet technology for the exchanging information, to provide services and interacting with people and business and relatively with government institutions. [10]

For the successful e-Government remains to contain an important aspect of the public administration management such ruling administration, legislature, and judiciary to make

improvements toward internal efficiency and to deliver user-friendly public services and promote available access process in a democratic regime.

According to Gottschalk and Solli-Sather "*the level of e-government interoperability has the following four stages: aligning work processes, knowledge sharing, joining value creation and strategic alignment". "Collaborating and communicating agencies are assumed to be more cost-effective when work processes are aligned, knowledge is shared, value creation is joined, and strategies are aligned*." [12]

So, basically, e-government describes strategy with settled steps and values. It contains projects and programs that help to reach the government strategies approach.

Relatively e-government defines an e-government strategy set values and steps which are carried out in projects and programs in order to realize the government vision set.

Sometimes the realization of these strategies leads to success sometimes not. E-government strategy development involves processes through which decision makers derive strategic actions. [13]

For effective development of an e-government strategy, decision-makers need to have a good Overview of the related topic and understanding the context about their countries aspects such as politics and democracy, economy, culture, people, infrastructure, etc. [6] For instance, the decision makers need to consider the political sphere and existing democratic processes when developing an e-government strategy and its objectives. In analyzing the context of their countries, the decision makers need to particularly identify and analyze e-government challenges that exist in their countries hence, it is possible to develop a strategy that is robust and achievable and to invest in e-government solutions that are sustainable.

Back to e-government, the European Commission defines *as "the use of information and communication technologies in public administrations - combined with organizational change and new skills - to improve public services and democratic processes and to strengthen support to public policies".* [14]

According to Commission documents, by e-government public administrations will become 1) transparent and open and active to promote democratic participation 2) would provide inclusive public services and become more service-oriented, interact with citizens 3) become productive in delivering maximum values for the economy, taxes, and related aspects. To do so a set of recommendation always required, to follow the path that leads to successes but sometimes not.

Therefore, the guideline European Interoperability Framework is the right tool that provides a roadmap to follow and consider some recommendations for public administrations to create worth e-government where public services are cross-border integrated.

EIF establishes the relationship of all participants it would become cross-organizational, to follow with the data semantics and support end-to-end digital services, and also do not allow legislation to compromise interoperability efforts. [1]

The EIF policy creating consensus and helping to identify needs about interoperability and to promote the delivery of cross-border developments and solutions. [15] "*The EIF has been agreed by most European countries to help develop cross-border eGovernment services in Europe and is based on the experience of many European countries in developing their own national interoperability frameworks.*" [16]

It contains four phases: *"raise awareness related to the European Interoperability Strategy and European Interoperability Framework"*. [1] Both providing guidance for the establishing European Interoperability Reference Architecture (EIRA) in phase two. To create an operations phase to use EIRA and promote possibilities on different domains. On the last stage *"is to improve the public service values"* [15] through established domain architectures.

Both the EIF and compliant national frameworks in Europe are naturally also interoperable with each other. National and regional interoperability frameworks are needed as they can help make huge savings because different ministries or countries do not waste money duplicating the work of others. [17]

By promoting EIF recommendations member states would unsure purposes and need of European public administrations for receiving and delivering seamless public services at many public administrations level and become digital by default from citizens and business perspectives. [1]

*"The main challenge now is to guarantee the secure and free flow of data, develop standards and ensure interoperability".* [5] [4]

Interoperability *"delivers valuable importance in digital transformation period which contributes establishment of the Digital Single Market initiative"* [2] in European countries to follow this initiative. [1] Interoperability allows interacting towards mutually beneficial goals by sharing of knowledge and information between state participants. It allows a business to work closely with state institutions to reach a common goal and provide digital public services by data exchange between state ICT systems. [2] Successful implementation

[5] *"Andrus Ansip, VICE-PRESIDENT of the European Commission for the Digital Single Market"* [1]

of "*interoperability processes take a long time many important decisions"* [18] are considering accordingly.

Based on EIF which provides set of recommendations as the main guideline for the Digital Single Market Initiative decision makers creates possible risk factor of lack of awareness of its implementation, however, it could generate more time consumptions to overcome unclear actions through. EIF covers main 3 interoperability areas: 1) A2A (administration to administration) where EU Institutions or the Member States interacts between each other; 2) A2B (administration to business) where EU Institutions or the Member States public administration interacts between businesses; 3) A2C (administration to citizen) where EU Institutions or the Member States public administration interacts between citizens. [4]

There are four underlying contents of the EIF, it contains one conceptual model, four levels of interoperability, twelve underlying principles and forty-seven recommendation on each underlying content. It would be examined detailly in the next chapters. [1]

However, an important part of EIF contains underlying principles that create a conceptual model of integrated public service governance. [1]

Public administrations always need some defined guidelines to follow, set of instruments for the ease initiatives implementations EIF help to design and update National Interoperability Frameworks it could be also national policies, strategies to promote them through interoperability. It would contribute establishment for the cross-sectoral and cross-border interoperability to deliver European public services. [1] Integrated public services would be a beneficial outcome for the end user and always should consider public authorities would have enough understanding of the front-office and back-office of public service. These services delivered by government agencies to the public, in a broad sense including sectors such as public education, healthcare, transportation, broadcasting, waste management, social welfare, public safety among others [14].

According to [14] *"The relevance of interoperability would be greatly underestimated if it is only considered in terms of progress in public services directly delivered to citizens or business"*.

Lack of interoperability would stake ICT systems of different agencies to deliver public services. [19] The possible risk factors could be emerging, and the public won't receive good in quality service. It is always attempting government to avoid them because it can be both expensive and risky. It could be risky because "*government agencies do not want to change the way they are working"* [19] it refuses any changes the way they are operating. The failures of this kind of change would directly affect the existing government operations

and services. From the expensive point of view, the government won't be able to overcome additional financial terms and in term of opportunity cost. [19]
The government should create accessible public services that people would be able to get them and feel societal and organizational feel that they belong to, it should raise awareness of the public service provision and deliver to citizens, try to connect society and organizations. Governments should have a technological dimension through socialization, must concentrate on online public services and information provision. As mentioned above this often called *"accessibility"*. [20]

However, technological transformation to provide ease and quick public services is important and EIF through ICT solutions is an available, narrow and convenient guideline to follow up through. In recent years society already using and receiving some of the public services online and every year, it would only increase, and e-Government phenomenon would only consolidate its meaning and would innovate the ways of information and service delivery. [20] So, basically author would outline two policy perspective in this regard: 1) policies and regulations should be helping people to use ICT and digital services the second one is when the use of ICTs is helping people. It would help to raise awareness between each other, and the transformation period won't take a long time. [20] "*The main objectives should be the efficiency and effectiveness of public management practices that would increase quality and deliver public services conveniently"*. [20] So, interoperability would be considered as a strategic role to increase both factors of the ICT systems. [1]

Changing the way government organizations operate and interoperate between each other some new policies should be developed to improve existing processes where mutual negotiation and cross-sectoral and cross-border cooperation is highly required. Consequently, it would create additional obstacles on how to be interoperable where complex decisions from public authorities are would consider. [14]

Sometimes governments making mistakes to provide solutions on service that won't be used by citizens, it brings additional financial costs, or sometimes solutions were created but lack of understanding how to work with is an insufficient and created solution is just not delivering forward. It measured that governments supply insufficient digital service nor provide the ability to use them by people. Transformation service delivery to digitalize existing process was neither particularly helpful not compelling. [21] although legal

provisions for information sharing exist and should be taken into consideration, technical and organizational barriers prevent the adequate exchange of information. [14]

One important part of the interoperable e-government contains maturity level of its public e-services. The e-government concept refers to the relationships established between public organizations and their stakeholders through ICT. It helps to identify the public service existence, evaluate possible risks and obstacles, would introduce a relationship between interoperability frameworks and it influences public service design and implementation phases. Therefore, maturity models were anticipated to introduce various categories to follow and set up a public governance structure to implement interoperability on states level. [13]

### 3.1.1 European Interoperability Framework overview

#### 3.1.1.1 EIF contents

*"The European commission priorities outlined in the digital single market strategy relation to e-Government and interoperability"*. [2]. ISA2[6] program is leading the initiative regarding the European Interoperability Framework "*where common approaches are agreed to deliver European public services in an interoperable, cross-border manner"* [1]. *"It proposes basic interoperability strategies which contain common principles, recommendations, and models to follow through."* [4]

It gives the opportunity to and proposes European public administrations to create seamlessly, crosses border European public services to different public administrations, citizens and business which tend possible to be open-by-default, cross-border-by default and digital-by-default. [1]

Therefore figure-1 is providing us a structural overview of EIF which contains simple content of conceptual model, set of twelve main principles, four levels of interoperability, which the author will take into consideration and the main research is focusing on these four levels and last but not least is forty-seven recommendations to follow through. Each of the main contents has sub-content that provides additional explanation and more detailed aspect of EIF guideline. [1]

Consequently, European public services have fundamental behavioral aspects to promote and aware of interoperability. Underlying principles contain four categories. The first principle is about the context of setting EU actions on interoperability where subsidiarity and proportionality are the key aspects. *"EU decisions must be taken as closely as possible*

[6] https://ec.europa.eu/isa2/isa2_en

*towards citizens – is the subsidiarity aspect recommend following"*. [1] So, the *"proportionality principle limits EU actions"* [1] towards the necessary *"objectives of the Treaties to achieve"*. [1] EIF providing *"recommendations to overcome possible differences in EU states policies lack of interoperability that won't affect the digital single market initiative"*. [1]

The second principle describes openness which directly related to data, software and exact specifications. The important part is also transparency where the data should be published without or a few restrictions. The clear data statement would provide a transparent decision-making process clear and realize transparency in practice. Transparency mostly concentrated on interfaces availability and visibility and personal data protection rather than reusability mostly focusing on existing IT solutions, sharing and reuse them. [1] Technological neutrality and data portability decisions makers from states should focus on functionality and offer results on technology to avoid technological dependencies and specific technical solutions and products implementations. Data portability would help to avoid lock-in in data transfer between different systems.
All related initiatives related to public services should be focused on the user and be user-centric as much as possible. Nevertheless, public service design should offer multi-channel service delivery to end user where a single point of contact would be applicable and once-the only principle would be followed, and the user would receive feedback any time. [1]

The third principle defines user needs and expectations through availability and accessibility to have the same right to use public services to get access and make EU public services social and economically attractive. *"Accessibility derives possibility to use and access public service by everyone without any limitations to people with disabilities and other disadvantaged groups"*. [1] The life cycle development of the EU public services must contain these important aspects.
It should contain multi-channel delivery both papers based and electronically. Security and privacy – public service interactions should be secure and trustworthy. Public administrations should guarantee the citizens privacy, following with GDPR. Multilingualism – it is an important aspect of providing European public service, all public services should be available in the end-user language both front and back-end functionals. [1]

The fourth principle stands for cooperation between public administrations. There should be simplified administrative cooperation without any administrative burdens in both business and public services get by a citizen. [1]

All digital process should consider important aspects as digital-by-default and digital-first. First component digital-by-default should contain at least one digital channel to access and use public service whether digital-first would give a priority to use the first digital channel instead of the traditional way to get public service and avoid the no-wrong-door policy. [7]

While receiving the information it should be kept somewhere so preservation of the information and records should be available and access should be provided for a specific time. Preservation policy should be set to avoid any contradictions in long-term preservation. Technological solutions should evaluate the *"effectiveness and efficiency of provided European public service"*. [1]

#### 4.1.1.2 Interoperability Governance

Interoperability governance is the background layer of the interoperability by-design paradigm which explains the main interoperability model of the European public services, [1] could be also defined as an integral element which refers directly to four layer of interoperability and decision frameworks, organisational structure, roles and direct responsibilities, institutional provisions, agreements and policies those factors would help to increase complex monitoring of the EIF and NIF on EU level. Figure-2 providing visual overview. [4]

An important part of the EIF is four layers of interoperability, therefore it's classified as *"legal interoperability, organizational interoperability, semantic interoperability, and technical interoperability"* [1]. Each has uniqueness and responsibilities that must be followed through. For instance, legal interoperability is the contributed provision of the following European public services conducted by national legal frameworks. It provides vision and ensures the policies differences between member states and providing biding and a common vision to work together. It provides monitoring of the national legislation of the EU states and comes to a common approach to overcome barriers. It is trying to avoid any obstacles and barriers that would affect the path to digital single market strategy.

Therefore, legal interoperability defines two main important steps to perform are interoperability checks by checking current legislation and then to provide evaluation

[7] https://ec.europa.eu/docsroom/documents/4327/attachments/1/translations/en/

through interoperability barriers of data usage cross border. All related data exchanges between member states must follow with the accordance of data protection regulation. During the law-making process, digital check is important to avoid any misconduct because it would directly affecting the relationship between public services, semantic and technical interoperability too. Commonly agreed approach is important here. The law-making process would also increase the potential for creating a base for reusing existing IT solutions, consequently, it would reduce time and cost consumption during the implementation phase. [4]

Additionally, organizational interoperability as legal interoperability has its own defined prerequisites to follow through. The most important is to create cooperation and organize management functionality to ease the process. Each public administration should clearly understand their responsibilities, the path of expectations and mutual goals and benefits for the valuable assistance and service provision. Public administration should be service providers and service consumers centric oriented. [1]

Hence organizational interoperability defined semantic would provide the logic of the data that would be interchanged between participants and public administrations. It contains two key aspects to follow and understand, first is the meaning of semantic which refers to data elements and their mutual relationship, it contains special vocabulary and schemata to describe the way how data is used and through data elements increase meaning and check the behavior of communicating parties. [1] Another meaning is syntactic which helps to identify the data change the incorrect way, including grammar, specific terms and the format. To achieve semantic interoperability key prerequisites[8] and approaches[9] should be taken into consideration and followed.

While all 3 levels of interoperability defined the last technical interoperability covers back end and front end of related applications and infrastructures. [22] The special technical specification format used should be followed, mostly defined by the state actors while defining technical interoperability. [1] Interconnections services, service data integration, data exchange, and secure communication protocols should be included in the technical interoperability layer.

Consequently, four interoperability layers defined, and it should work somehow, so basically layers with cross-cutting component would create integrated public service governance, which provides public service provision where all members states must work together and

[8] Agreements on reference data, form of taxonomies-controlled vocabularies, thesauri, code lists, reusable data structures/ modes
[9] Data-driven-design coupled with linked data technologies

meet users' expectations. This approach is defined as interoperability by design paradigm. [1] It provides *"possibility and clear understanding of the organizational structure, defines roles and responsibilities, involving stakeholders into the decision-making process. Some important aspects must be considered such, "scalability and availability of interoperable and replaceable unit encapsulating an internal structure, external information and services"* [1] it explains the meaning of some service agreements, management structure, business activities. It helps to achieve any actions related to "*European public services provision"* [2] through mutual interoperability agreements.

#### 4.1.1.3 "*Conceptual model for integrated public services"* **[1]**

Model of integrated public services explaining in the figure-3 it is "*showing the provision of the integrated European public services"*. [1] It contains 7 levels which are importantly related to each other. Those are: "*conceptual model; base registries; internal information sources and services; open data; catalogs; external information sources and services; security and privacy."* [1] The main principle of the concept model is to show the direction how to plan, develop and operate in orders to European member states. the model itself is interconnected through shared infrastructure by unifying service component, such as service-oriented architecture. The model providing the possibility to recognize data reusability through interoperability where European public services. Data reusability should be *"available without any organizational boundaries from various sources inside or beyond of public administrations. Retrieved data, information, and services should be available in an interoperable way or format"*. [1]

Consequently, this model also contains additional components of integrated service delivery where coordination functions stand for removal any complexity to end user and provide available European public service. The process could be regulated manually or automatically and should contain key aspects of "*identification, planning execution and evaluation"*. [1]

Public administrations owning dozens of information sources where many services are available, these amount of information sources sometimes comes from outside boundaries of an administration, it could lead duplication of effort if re-usage through available resources and solutions.

As already mentioned above a no-wrong-door service delivery policy which helps to find and provide additional channels to deliver service. Through data and services reuse it would decrease operational costs and would increase the interoperability and quality of the received

service. Reusability of the services and other assets are combined in catalogs which would increase their usability and findability. It would contain privacy and security are the primary concerns of the European public services provision.

#### 4.1.1.4 EIF Conceptual model

As all factors mentioned above figure-4 contains the logical structure of EIF. The model itself contains the structure starting from *"design, planning, development, operation and maintenance of integrated public services"* [1]. It would give an overview of public services to all governmental levels starting from local to national EU level which would follow the path by contributing and make the digital market a reality.

## 4.2 Theoretical Framework

This chapter contains a brief explanation based on an overview of interoperability implementation from different perspectives. It fulfills a previous chapter regarding EIF as a core direction.

### 4.2.1 Risks and problems overview from different perspectives

The chapter above described briefly about public service design, the importance of e-government and why interoperability is so important. Defining interoperability "*as a mix of policy, management and technology capabilities"* [2] would bring effective, qualitative public services where trusted organizations and state members would stable network with effective data exchange. [19] In order to be an effective partner with other participants such private corporations and companies, non-governmental organizations, academic institutions, etc. governments must take responsibilities to improve their capabilities and create trusted cooperation and partnership. Sometimes it causes problems to do so. To create interoperable e-government with interoperable public services "*take a lot of time and money consumption".* [1] Based on the main research question we took into consideration 4 layers of the interoperability that plays an important part in creating any public, business, citizen service interaction. Therefore, each participant should take into consideration of reshaping their existing strategies, business models, structures to create collaborative work across institutional boundaries. [23] Many scholars have discussed "*European investments in IT for digital services"* [2], about the improvement of public service delivery involving many approaches which would avoid any complex issues regarding *"administrative procedures*

*and create a high degree of interaction*" [1] "*between national, regional and local administrations.*" [21] Comprehensive cooperation would help to achieve it Any changes in "*service delivery strategies as many occurring in government"* should able to face main "*three distinct but related problems:* "*Creating interoperability requires potential network members to invest in changes to internal organizational arrangements, practices, and technical resources in response to an externally agreed upon set of priorities".* [19]

*"It would require potential network members to create new, and in some cases renew cross-boundary relationships; recognize and manage the challenges to network formation including the creation or modification of an enough legal framework to enable new ways of sharing resources including money and data, as well as barriers to communication, collaboration, and issues such as divergent policies and practices."* [19]

*"Participants seeking to improve interoperability for coordination across government agencies do not know in advance all the tools or resources needed or how to acquire them, or precisely what configuration of old and new capabilities will be needed to achieve initiative goals"* [9].

Consequently, all related problems as mentioned above could cause additional risk and expensive cost. Any changes would be evaluated as an expensive not only from financial terms perspective but more relatively in terms of opportunity cost. The risk could emerge at any stage, so deep analysis should be done before losing a huge amount of money. Also, government agencies and representatives' tent to resist change efforts, the new way to operate and act. [19]

Additionally, maturity interoperability would also have possible risks and problems that would affect public service delivery and business interaction. Interest of improvement and providing good services sometimes create personal outlook in small companies that not aware of process, so how is it is important, instead of cooperation with government to follow the guidelines they acting on their own, if the company closely working with government on providing public service it must take into consideration government requirements as a base principles. Basically, isolation and low awareness of the interoperability maturity model would affect the collaboration across organizations and government projects rather than a high level of interoperability awareness where the benefits maximize would be in advance. [19]

So, basically the "*high level of interoperability"* [24] interactions is important, a "*low level of interoperability"* [24] could affect the process.

Additionally, interoperability can also misuse user data in a wrong way, and it would cause unauthorized manner of securing and providing data to end- user. [24] Data exchange should be followed by standardization and definitional tasks it would help to avoid possible technical and semantical risks during implementation. Each country must choose the way to be secured but they should follow main principles that EIF is offering, main conceptual solutions already provided.

Neither technical nor semantic interoperability implementation are not the same in European countries, to compare date data and exchange it is too difficult now, and it is a big challenge for them. This is because ministries who responsible for implementation interoperability frameworks have or using different definitions of basic categories, for instance could be stated base registries or tax authorities. [24] Lack of common definitions of basic categories could be count as a possible risk factor for the successful implementation of EIF from technical and semantic interoperability. It would only slow down the processes related to data exchange and the result could be drowned in the bureaucratic routine.

Additionally, organizational barriers are also important. The coordination and process management between ministries and agencies has always an insufficient organizational motivation, raise awareness among staff resistance and explain the importance.

Overall, legal barriers seem less challenging, but there are still legacies that take time to address, as well as some uncertainty about compliance with EU regulation, and rapid technological change which often makes it very difficult for both legal and organizational changes to keep up. [24]

EIF itself could cause some risks on the reason of lack enough and a brief explanation. [14] Within comparison of EIF 1.0 and EIF 2.0 there was not changed too much, and not too much progress has been made through how to guide interoperability projects with state actors and create mutual cross border cooperation. There is a big gap on how to use EIF, how could it be implemented successfully, the main barrier could be a lack of experts in this field, lack of knowledge and awareness of the EIF initiative. Interaction with EIF should totally change the way the government is using ICT, reorganize the internal process between institution data exchange, create awareness among the population to use new modernized digital services. By achieving interoperability in government would interact with *"culture and traditions, political power relations, and other possible factors"*. [25] The framework includes important context-related aspects but there is a gap with recommendations are given

which are not adequately drawn on the knowledge availability nor providing additional outlooks. [14]

#### 4.2.1.1 Interoperability in digital health

According to Angelina Kouroubali, Dimitrios G. Katehakis: *"interoperability implementation in e-health falls within the boundaries of a complex problem as it requires an understanding of unique local conditions and their historical pathways. It involves various actors, dissimilar perspectives, norms, and values"*. [26]

The big gap to use interoperability and interoperability solutions in digital health care diminish the possibilities and opportunities for data reuse. The data repositories and ICT systems in digital health care are using different information models to keep data, this data is provided in different syntaxes, formats, and outstanding semantics. The unified common and core format is missing. Captured data often inconsistent and used with incompatible formats. [26] Supplementary data usage for specific purposes are not formalized or readily available. Mostly these data contain variable quality and its unstructured, contains free text it would definitely great change for the implement in automation and digitalization processes.

Common terminology is important in enabling interoperability also there is a big issue with related to split, unreliable and complex terminologies, often interpreting the use of terminologies difficult to use and implement. Existing eHealth systems are collecting and using only limited information without providing their real potential where potential companies which providing software solutions are eager to solve short term problems, while for the better interoperable communication and service delivery should be taken long term strategic investment and cooperation. It would help to avoid several initiatives and keep personal data secure. [26] Specific unified terminology and defining keywords are important for the interoperability process.

High heterogeneity of ICT solutions from different vendors could be the technological challenge in a concern of the incompatibility of the system also would affect the existing legacy system and several data formats.

Incorrect data exchange based on the different interpretations of the same concepts and database schema integration with naming problems and structural logical contradictions would emerge.

#### 4.2.1.2 Interoperability from the scratch

Many factors would affect the development of the interoperable state, based on Estonia real-life study cases many we can find that strong political will should be presented to create an interoperable state. [25] In the core of the Estonian success story to digital transformation was taken roots in the early 1990s when two key political issues played an unbelievable role. We can see today Estonia presenting many features and digital services those are available around the world. Consequently, it has launched new and new projects every day.

Therefore, political will in the past stating today's situation. The year 1992 started with the first Laar government who had a passion to spread ICT development of the country and provide competitive advantage received widespread political support in Estonia. [25] From those days Tiger Leap[10] program was established, and we can consider that Estonia started to become digital by default giving IT skills form the scratch, schools and wider among the population. Another important aspect is to have well-educated experts in the related field, those days those people were in Estonia, the passion to create digital country was the passion of those people. Sooner or later Estonia started to recruit talented IT people to work for the government to provide available public service and solutions.

In sum up for this part, we can assume as a risk factor for being interoperable strong political will, passion to become digital and IT experts are needed, those aspects would raise awareness of using both digital public and business services.

The political landscape and large-scale support of digital transformation also resulted in "*low legal and policy barriers"* [25] that attracted talent "*from the private sector"* to push their initiatives forward. Public-private partnership is an important tool for the interoperability process too, but monopoly would raise a huge problem for success. [25]

*"The huge thing with, for example, Cybernetica. The government cannot support [only] one company. You have Estonian government that supported Cybernetica with lobbying, promoting, everything. And they still complain. I hate it. I think it's one of the biggest frauds in Estonia. [It's] like a scientist taking money from [a] university and at the same time from social funds from the government, and still they can't sell it."* [25]

Based on the phrase above it can consider that monopoly in public-private partnership will affect the process. It would be counted as a risk factor that would influence to follow EIF and NIF guidelines.

[10] https://www.hitsa.ee/about-us/historical-overview

Another additional aspect government should not invent “bicycle” from the scratch but use existing ICT tools and solutions which would have help to avoid of time lose, because time is important.

By improving the interoperability process in the government and try to understand this meaning public authorities’ decision-makers should not assume that additional investment should be required there is no need to change all ICT tool under institutions and discard existing ones. Strong investment and update can be done further to reach technical and organizational capabilities. [19]

The government interoperability is mostly the set of multidimensional, dynamic and complementary capabilities within defined networks and tools which gives the opportunity to keep what you have and take advantage to update them in the future without big losses. It could be that sometimes they have to focus on existing strengths and consider valuable limited resources that are missing and improve them. [19] *“Consequently, deciding how to become more interoperable is among the tough decisions where the governments should make the right decisions.”* [19] These important decisions would be direct impact consequences on the public.

The risk and high-cost combination would create fear among governments it could find difficult for them to launch sustainable and ultimately success to overcome any efforts for creating an interoperable government. Sometimes they are ignoring and avoiding those right things to do.

#### 4.2.1.3 The once only principle

The administrative burden is the key obstacles to create an interoperable European digital single market which forced the companies to use and conduct business activities across the country. To avoid the administrative burden and reach interoperability in business activities through would be an important initiative. Digital integration and interoperability process would be under the blow of breakdown. [22]

Good and reasonable contributions to the European economy would bring digital single market initiative but there are some barriers that still need to be overcome, and then European companies would get access and make business across and exchange data directly with partners and citizens. It would create effectiveness to operate remotely and do business and provide services across. [22] There are many questions would emerge regarding avoidance of administrative burden and allow companies, organizations and state institutions to conduct an exchange date across borders. How to create the possibility of data movement

between European information systems freely and allow public administrations to save a business from the need to afford data several times in different institutions repeatedly.

There are several principles to avoid bureaucratic burden on of the most important actual and relevant to use is the once-only principle. It is a core approach to avoid data duplication in each institution. Government collecting data once and other actors can easily access it. [27] It contributes that any information that public administration has already collected should provide the possibility to share it with other public administrations within the country or outside. Public administrations need to avoid any multiple requests to provide data again and again. [22]

There are several possible biggest barriers could emerge during once-only principle implementation that would directly affect the interoperability framework. As we already mentioned above EIF stands for 4 main interoperability levels, and OOP could conduct them to reach a successful outcome. Therefore, the biggest associated barriers could emerge from the legislation with legal interoperability exactly with compliance with the legal requirement of each member state. Additionally, technical interoperability obstacles would also present. The awareness itself about OPP would create an understanding of lacking empirical evidence and low responsiveness of the benefits. Consequently, business correspondence with member state would also face unclear demand with limited resources. [22]

As well as the political will and interest would also contribute to and create one of the major pushes towards, if not than difficulties of changing existing organizational processes would be difficult. Availability, accessibility, and accountability of the information systems and commercial policies would be taken into consideration as a risk that would create the fail possibility.

As mentioned above legal issues are clearly defined as a key implementation barrier of the OOP so we can assume that all related risks could be applicable through interoperability framework at the European level. In this regard, legal data transfer would have important concerns that would ensure the legal value and validity information exchanged through taking into consideration secure personal data protection and communications.

One of the important initiatives that would also affect is a single digital gateway regulation[11]. It has a big impact to create difficulties for the ease and free data exchange, under legislative norms and principles, so basically legal bureaucratic routine would influence the cross-border communication with lack of access to data. [22]

[11] *"The single digital gateway will facilitate online access to the information, administrative procedures and assistance services that citizens and businesses need to get active in another EU country"* https://ec.europa.eu/growth/single-market/single-digital-gateway_en

According to technical interoperability barriers, the author would undertake that heterogeneity of existing ICT systems, data quality difference, data models, data elements and data handling systems. These important aspects would be potential technological interoperability obstacles for cross-border data sharing and reuse. In some other cases, the domains where data is not stored digitally would create an accessibility barrier to data exchange.

Therefore, the author outlined and identified related obstacles into four areas are technical and interoperability issues, administrative, political and organizational context and finally is legal aspects as the key obstacle followed by resources restrictions, organizational and technical interoperability issues.

Subsequently, "*once only principle is important"* [28] while creating interoperable European public services and e-government state.

#### 4.2.1.4 EID and eIDAS regulation

While the once only principle is a mutual and important key for the successful interoperability framework implementation electronic identification can be also taken as a complex part of this process. Electronic identification provides the possibility to use identification card in the electronic area and represent naturally legitimacy of person. It is unique in its nature. [29] Projects regarding electronic ID cards began in the late 1990s with a few countries involved where electronic functions would combine with identity document. Electronic ID provides secure digital service to citizens. As mentioned above digital single market would need strong electric ID where all member states would have the same right and accessibility and availability of the service. Therefore, electronic ID can provide access to several e-Government and e-Business services. It substitutes and creates a high level of secure authentication while using various login credentials. [30] Why electronic ID is so important for the digital single market initiative, why do institution should have common principles to be interoperable between each other? Sometimes to get electronic service can cause many inconvenient situations. Cross border cooperation and using electronic services from any country of the EU facing multiple problems regarding nonexistent interpretation of the electronic ID. Simply the unexpected common regulation was not provided until eIDAS regulation has emerged. [30] There are still EU countries that are using multiple credentials to get into the electronic environment and each environment has it is own unique identifier, mostly they are using for authorization username and password, while in Estonia,

all electronic services are provided by authorization electronic ID. There are big advantages of using such eID because it can help save time and cost consumptions of creating and providing public services. Obviously, there are still many misunderstandings regarding it. For instance, an Italian, Greek or Belgian eID card would not accept identification in Estonian online service and could be vice versa. [16] Not all EU countries have legal status as mandatory eID cards for all citizens, it could be possible obstacles to follow with EIF implementation and reach targets in digital market strategy.

Where there is an eID there is a trust, but not all citizens agree with it, a narrow awareness raise among the population is still present. People do not trust e-government; some paranoia obstacles still must overcome. Consequently, trust is an important key factor for successful e-government. Creating online trust would beneficial from economic and social development perspectives. Also, it would create a particularly broaden experience to use electronic services and to avoid placement perceived lack of legal certainty. [29] To create competitive internal and external markets all administrations must accelerate to take up with electronic identification and create trust services for broadening electronic public and business services.

Additionally, governments must take into consideration and accelerate next online identification methods, such as mobile ID, smart id, face recognition id, and ensure trust services among consumers. [27] It would increase retail financial services, business capabilities exchange, and people would have the possibility to move and do business across EU countries.

If these factors won't be considered, it would lead fail. According to Taavi Kotka "*capabilities as a strategic priority in the state's development because it would facilitate access to e-services among the citizenry"*. [25] Not all 28 EU countries has obligatory electronic ID as Estonia has, so for cross-border cooperation it could be count as a possible risk factor that would influence on the implementation of legal and semantic interoperability. [31]

#### 4.2.1.5 Organizational interoperability

The term "organizational" "*means organize something"*. [14] Simply it is the process of keeping everything in order, delegate the responsibilities, where each member is responsible for exact task or action. [32] Organizational process or organizational change management always needs to be renewed in terms of organization, its internal structures, and capabilities that would affect the internal and external users. [14] Organizational life process is a change, which includes both strategic and operational levels. [32] Consequently, the organizational

process is important it helps to elaborate future needs of the organization and would help to keep path through organizational strategies that were set.

Therefore, as we mentioned above EIF 4 layers of the interoperability where the organizational interoperability is responsible for the organization mechanism to follow by public administrations, business, and citizens. It helps to create a bound interconnection between participants. [19]

Organizational interoperability helps to overcome organizational issues during implementation, it helps to align main objectives and business processes. It provides a clear understanding of responsibilities and expectations. [12] "*It should have a clear understanding of the usage techniques and accepted modelling by conducting all related aspects in a clear document."* [1] This document must be followed by other internal participants, it should raise awareness of the related initiatives and currents works. The relationship between participants should be clear. Additionally, each member state participant must adopt organizational interoperability to avoid additional factors directly related to cost efficiency. [1] Each data exchange process should be transparent and do not contradict the whole vision of the public institution.

#### 3.2.1.6 Legal interoperability

*"A Legal Interoperability Specification defines a necessary attribute that shall be fully met to support legal interoperability in the Public Policy Cycle."*[12]

*"All public administrations in the EU have dozens of legal documents. For the creation of the digital single market, state participants should have the ability to avoid legal contradictions in a common approach."* [4] It would be difficult to exchange data between countries that contradicts countries legislation, where each could contain basic laws hierarchy, public law includes treaties, legislation, regulations and government policies and private law.

Legal interoperability of EIF stands to avoid legal barriers by creating a common approach to follow. It allows to keep existing national legislation but admire to contribute to European public services provision. It helps to ensure the awareness and ability to work together by conducting additional agreements between each other. [4]

[12] *"https://joinup.ec.europa.eu/site/eia/EIRA/EIRA_beta_dev/HTML/elements/e3332dd3.html"*

According to [33]: *"Legal interoperability covers the broader environment of laws, policies, procedures and cooperation agreements needed to allow the seamless exchange of information between different organizations, regions, and countries."*

As mentioned above in 3.1.1 in EIF overview current national legislation to perform towards European public services need to make interoperability checks to avoid possible barriers and contradictory requirements. [1]

By drafting legislation to reach European public services it should consider the relevance of the legislation, to keep data digital check and take into consideration data protection regulation requirements.

#### 4.2.1.7 Technical interoperability

Technical interoperability is the link between legislative and semantic interoperability. Technical interoperability is the performance of technical specification such back and front end of the service provision. So, according to [33] *"it is the ability of two or more information and communication technology applications, to accept data from each other and perform a given task in an appropriate and satisfactory manner without the need for extra operator intervention"*. [33]

It is the core of the service delivery process and imports part of data exchange and it should keep mutual interests towards legal interoperability contradictions. It interconnects closely with semantic interoperability to deliver good service, data evaluation, available access to services, convenient user-friendly interface and secure communication protocols. While implementing strong consideration should be appointed to legal systems because it causes many barriers during the implementation of the technical layer. [33]

#### 4.2.1.8 Semantic interoperability

*"Semantic interoperability refers to the ability to ensure that the precise meaning of exchanged information is unambiguously interpretable by any other system, service or user."*

## 4.3 Comparisons of National Interoperability Frameworks

This chapter is describing the comparison of two European countries of national interoperability frameworks of Estonia and Germany. Under comparison, the author would find possible risks and EIF implementation, awareness level, political will, etc.

### 4.3.1 Estonia

#### 4.3.1.1 Main interoperability highlights

Estonian National Interoperability framework already has the third version of it. According to the last third version and NIFO Factsheet Estonia for the 2016 year [34] did good evaluation progress towards European Interoperability Framework. It contains two levels, first descriptions of the framework and the second describes the sub-frameworks and activities on interoperability. [35] All National frameworks are enforced under the "*Minister of Economic Affairs and Communication directive*." [35]

*"According to the European Union e-government report 2016",*[13] [35] Estonia has shown good results in being e-government, provide digital services and initiatives regarding interoperability.

According to one of the *interviewee-2: "Because I mean the country overall or maybe it doesn't have a high ranking but in one thing it could be very strong. So, it's always I mean Denmark, Estonia Netherlands, they're sort of overall high, who providing good e-government solutions."*

Subsequently, Estonia is following the recommendations that EIF is offering to and showing good result among 28 EU countries.

#### 4.3.1.2 Alignment NIF/EIF

Mostly NIF is the similar interpretation of the EIF and Estonia "*fully aligned with all principles and recommendations of the EIF*." [35]

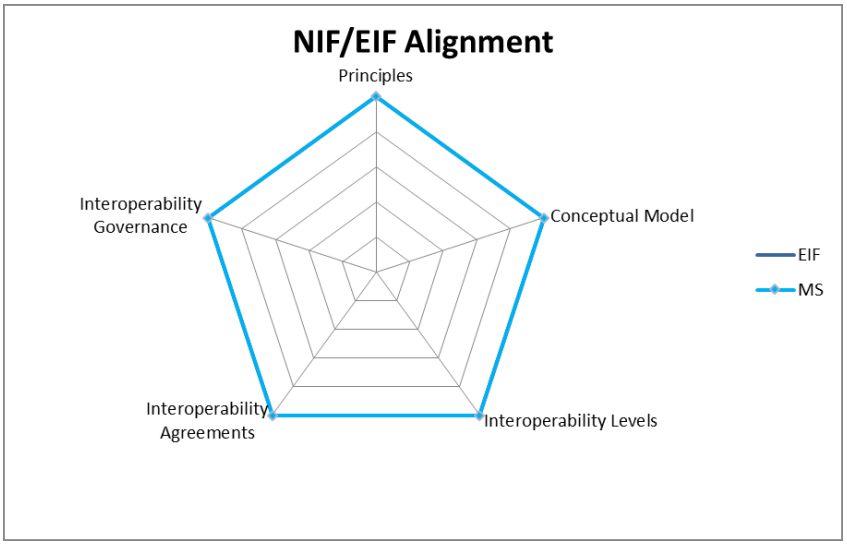



*Figure 1 Evaluation graph. Source: JoinUp*[14]

[13] https://ec.europa.eu/digital-single-market/en/news/eu-egovernment-report-2016-shows-online-public-services-improved-unevenly
[14] https://joinup.ec.europa.eu/sites/default/files/inline-files/NIFO%20-%20Factsheet%20Estonia_2016_v1_0.pdf

This is the EIF alignment that helps to evaluate, measure and monitor the basic 5 criteria which contain twelve EIF principles through the NIF implementation. As author mentioned in 3.1.1 EIF implementation is measured on those criteria. In total Estonian NIF follow up with all *"12 these underlying principles of European public services."* [34] The conceptual model is the same as EIF is offered. [34] Regarding the state interoperability architecture Estonia is following the service-oriented architecture approach [35] that would the good to get and receive digital services. *"All the digital services are delivering through decentralized interoperable layer X-Road[15] where authentication and authorization for data exchange are provided and delivered by X-Road data security layer[16]."* [35] So, Estonia did quite well, regarding authentication and authorization, not many countries have mandatory eID that operating the key factors mentioned above. The semantic and technical level contains authentic sources interfaces. [34]

Estonian NIFO factsheets contain the same follow up the structure of the interoperability layers. Author mentioned in the 3.1.1 about relevant legislation Estonia following it regards and respect to data exchange. The organizational layer of interoperability is classified as all levels of the administrations are aware and business processes are commonly documented. Change management and continuous service delivery and improvements encourage NIF. The semantic layer of interoperability is on the good rank, the framework puts these assets forward to continue work through collaboration with private companies and organizations. [34] Technical interoperability *"is ensured through formal specifications including the open standards framework, interoperability architecture framework"*. [34]

All related interoperability agreements are followed with accordance to EIF. The Estonian NIF is always improving the feedback and suggestions regarding required specifications with the private sector, public administrations, and individuals.

Estonian NIF strictly following data protection related regulations and guidelines through available technical measures. [34] *"Ministry of Economic Affairs and Communications of Estonia is coordinating different activities regarding governance with compliance to the interoperability framework.*" [34] The Information System Authority managers are coordinating the activities related to interoperability as a whole and sub-comities are following the other related activities. Those sub-comities are eID, X-Road and basic infrastructure and digital services. From general perspective Estonia has the leading

[15] https://e-estonia.com/solutions/interoperability-services/x-road/
[16] https://www.ria.ee/et/riigi-infosusteem/x-tee.html

positions of the electronic services providing, public service design and its implementation, personal data protection, service-oriented infrastructures feature like eID, mobile ID, smart ID, and secure data exchange layer X-Road.

#### 4.3.1.3 NIF Implementation

This figure-2[17] showing the level of NIF implementation towards EIF recommendations. It shows us that Estonia did very good in 3 direction, it followed both practically and conceptually at the principle level, conceptual model and interoperability governance. The conceptual and practical level at the interoperability agreement and interoperability levels are not improved.

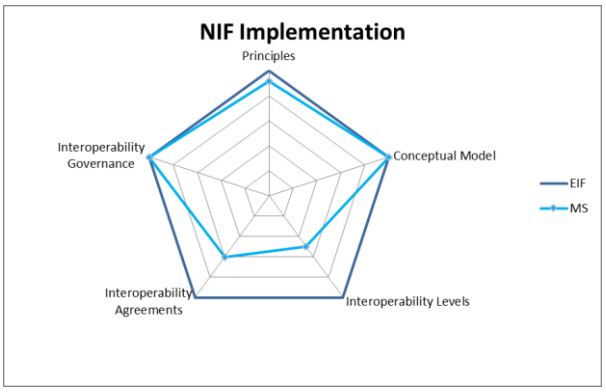



*Figure 2: NIF implementation Estonia. Source: JoinUp*

#### 4.3.1.4 NIF monitoring

Figure-3[18] provides monitoring of the underlying principles, (see 3.1.1 of the research), of the European public services according to Estonian NIF [34]. As we can assume that principles have a huge gap, and the conceptual model with interoperability levels need to be improved. More detailed related to underlying principles see chapter 3.1.1

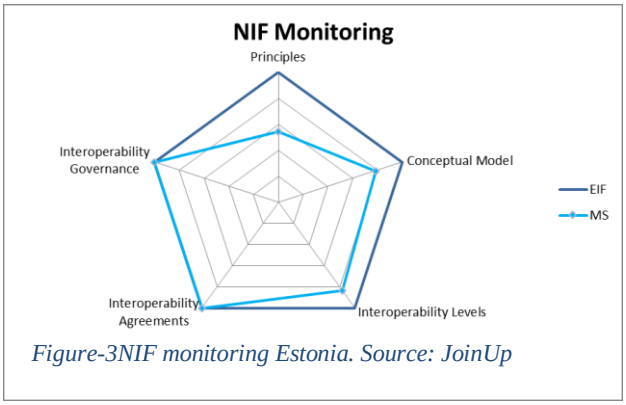



*Figure-3NIF monitoring Estonia. Source: JoinUp*

The monitoring was done through Estonian State Information Systems Authority where IT architecture framework, management process and interoperability related processes between public administration were indicated. Indicators were monitored through the X-Road website.

RIA is also responsible to monitor interoperability agreements, where secure data exchange is applicable.

[17] https://joinup.ec.europa.eu/sites/default/files/inline-files/NIFO%20-%20Factsheet%20Estonia_2016_v1_0.pdf
[18] https://joinup.ec.europa.eu/sites/default/files/inline-files/NIFO%20-%20Factsheet%20Estonia_2016_v1_0.pdf

RIHA is responsible for registries of all "*changes in public sector information systems and its services"*. [34]

### 4.3.2 Germany

#### 4.3.2.1 Main interoperability highlights

If we compare with Estonia where it has a 3rd version of the interoperability framework, Germany in this regard does not have formal defined one. Interoperability related issues and the governance of the IT sectors is established on the levels of governments. [36]
Germany in 1990 become a federal republic with 16 independent states in with their own executive and legislative bodies. [33]
On the reason that Germany is a federal state and it is quite difficult to come to with common agreement. All related IT projects are coordinated under the *"Federal IT Framework,"* [36] under "*Federal IT Council through Federal IT Steering Committee."* [36]
*"Federal Government Commissioner for Information Technology is responsible for the IT strategies, standards, service-oriented architectures, and its portfolios."* [36]
The "*IT Planning Council*[19] *(consisting of the Federal Government Commissioner for Information Technology and contains one IT representatives from all 16 federal states) is providing support with IT-related initiatives, responsible to cooperate all 16 IT representatives and discuss all related to IT topics such e-government, European public services, IT regulations and operations, budgeting, efficiency and public service availability*."
*"As it seems that there is a big difference between the two countries implementation process of the basic requirement of the EIF would be totally different."* [36]
Consequently, Germany has 16 federal states and population is 83 times higher so the implementation and public service usage would be totally different.

Germany set some prior activities to reach and promote interoperability on different levels:

1) *"Technical interoperability is achieved by Germany's standardization initiative SAGA 5.0*[20]*, which is mandatory at Federal level and recommended for other levels of government. In addition, the IT Planning Council coordinates across levels of government and decides on standards for IT interoperability."*

[19] *https://urlzs.com/ZfB5G*
[20] *"SAGA 5.0, http://www.cio.bund.de/DE/Architekturen-und-Standards/SAGA/SAGA%205-aktuelle%20Version/saga_5_aktuelle_version_node.html"*

2) *"Semantic interoperability is supported by the XÖV initiative."*
3) *"Organizational interoperability is supported by the National Process Library initiative."*
4) *"Legal interoperability is partly governed by the IT Planning Council*[21] *and the IT council respectively."* [36]

#### 4.3.2.2 Alignment NIF/EIF

Nevertheless, if Germany does not have specific and defined interoperability frameworks according to NIF alignment they are good. They have strong principles and conceptual model follow evaluation with the EIF principles, partial alignment on the interoperability governance, very strong argument regarding interoperability agreements, and point to be improved is interoperability levels. [36] In the 2016 update of the key aspects regarding EIF, SAGA showed good result it fulfilled 10 EIF principles, principle technological neutrality and adaptivity SAGA aligns partially, the multilingualism principle did not consider at all. [37] Figure-4.[22]

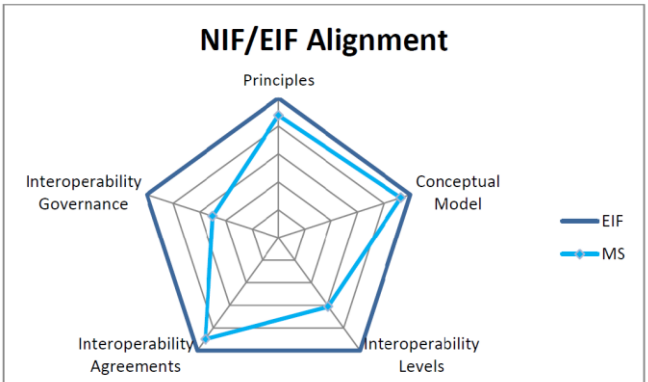



*Figure-4 NIF/EIF alignment Germany. Source:JoinUp*

#### 4.3.2.3 NIF Implementation

So NIF implementations have covered all categories and on some of them reached a positive result. Figure-5.[23] As mentioned above out of 12 principles multilingualism was not examined. With a compare to Estonian NIF, Germany has a weak implementation phase that needs time to develop. All German implementations are based on a large scale, where the systematic implementation approach is

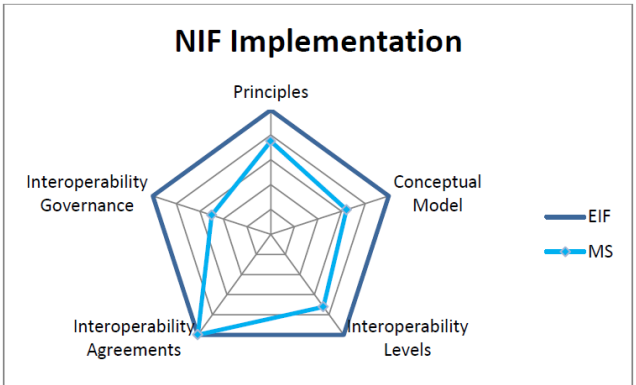



*Figure-5 NIF implementation Germany. Source: JoinUp*

[21] *"IT Council, http://www.it-planungsrat.de/DE/ITPlanungsrat/Organisation/KoSIT/KoSIT_node.html"*
[22] *"https://joinup.ec.europa.eu/sites/default/files/inline-files/NIFO%20-%20Factsheet%20Germany_2016_v1_0.pdf"*
[23] *"https://joinup.ec.europa.eu/sites/default/files/inline-files/NIFO%20-%20Factsheet%20Germany_2016_v1_0.pdf"*

applicable. Each new initiatives and projects deeply determined to follow those principles. [36]

The conceptual model implementation whenever possible mostly is on open based standards which are service and technology oriented. As mentioned in 3.3.2.1 XÖV is open standard through which main base registries are implementing through. It is available for interested. [37]

The interoperability levels were considered that every IT projects should be checked with substitutions of XÖV standards and legislation requirements before making IT solutions and implementations. [38] Consequently, it helps to avoid additional time consumption and potential financial risks

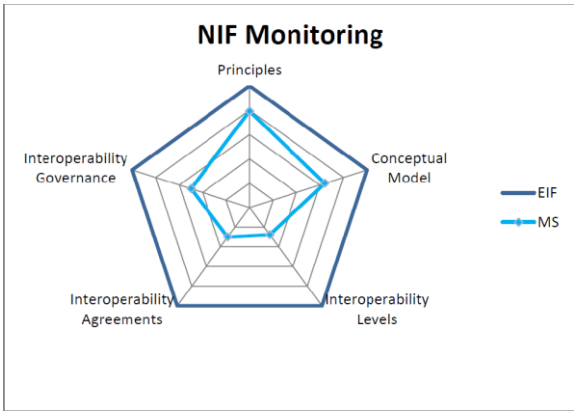
As mentioned above SAGA is helped to reach technical interoperability and interoperability agreements between parties, partners of cooperation were highly reached, it was set right methods, technologies, and standards.

By implementing interoperability governance target, helped to IT planning council to reach and enlarge initiatives towards interoperability implementation across federal states. All related initiatives towards IT consolidation monitored at a high level.

#### 4.3.2.4 NIF monitoring

The monitoring was coordinated through IT planning council in accordance with following strategic principles mentioned above. Each outline in figure 6 shows us that Germany must improve organizational and coordination control over implementation EIF on NIF level. Responsible authorities not following the principles that were offered by EIF.

*Figure-6 Monitoring Germany. Source: JoinUp*[24]




## 5 Recommendation and discussion

[24] "https://joinup.ec.europa.eu/sites/default/files/inline-files/NIFO%20-%20Factsheet%20Germany_2016_v1_0.pdf"

## 5.1 Implementation problems and obstacles

The EU countries covering 4,422,773 km2[25] contains 28 countries and it would take time and cooperation to achieve common digital single market initiatives and goals. The initiative of creating such digital market would help to increase the economies of the member states by offering unified European public services, where the main target is to satisfy people for their daily needs and to create a competitive environment among other countries in the world.

Based on the literature review, countries comparisons and conducted face to face interviews author can define that deep understanding of the EIF itself, the recommendations its offering should be investigated in a more deep and detailed way.

*"To deliver information to members states in the right way would be counted as a challenge."* [15] There is a gap between member states of understanding the concept.
Consequently each member state has to take into account this possible guideline that offers some important solutions , set of recommendations to follow up though, as mentioned in the introduction section, exact country choosing it is own path for the successful development, neither it has the ability to choose what is better for their society, based on the traditions, cultures and the way of life, and territorial values.
During the research, the author defined based on the collected information some key outcomes that would affect any interoperability frameworks implementations among EU states. The author will provide detailed collected information based on interview outcomes in the last chapter.

## 5.2 Conducted Interview Results

According to the research question in total author conducted 7 face to face interviews, each has specific long. In total was recorded for 6 hours and 38 minutes.
Based on the conducted interviews author can conclude that EIF implementation among EU and countries that would be interested in would have possible problems and obstacles. It is important to consider on the base stage of implementation that political regime and political will plays a huge role. As it was mentioned in *4.2.1.2* based on Estonian example strong political will lead to success and it is important.

[25] "*https://ec.europa.eu/eurostat*"

According to *interviewee 2*: *"[00:04:18.99]* ***Lack of political will and coordination*** *of course and relief communication. In my view, the first program of implementing behind implementing the idea sometimes is lack of clear responsibilities or who should be in the organization. Appointed to take the lead. There must be* ***someone taken the leadership*** *otherwise different decisions will be working in silos. And who is going to implement the conceptual model? The concept of whether at the end of the day is about making a joint effort and orchestrating much work through the back office in order to deliver better public services."*

The same aspect from different perspective according to *interviewee – 3:*

"*[00:10:13.99]* ***Political will with delegated responsibilities*** *must present. [00:01:09.87] "Probably many parts of the of like the implementation should contain conceptual model."*

Hence, according to *interviewee-5: [00:08:13.16] "So, this is generally a mostly countries defined and* ***showing lack of interest, and political will or lack of awareness and lack of values simply*** *because of lack of understanding of benefits. A little time ago it was difficult to introduce the EIF now is better."*

Consequently, each country should have a strong political will and political coordination to be part of the success story which leads to success. Generally, political will and support influence not only to follow specific guidelines, but it is also more of creating a competitive country with transparent, independent, innovative digital services in. Entirely all public institutions must be involved in this process and have a political desire to implement something.

Another important aspect that the author found an accepted as a possible risk factor is trust. Trust inside the state institutions both on local, regional and across borders level. In the chapter in sections regarding common eIDAS principles author mentioned that "*trust is an important aspect"* [22] to reach digital single market initiative. Mostly all interviewer mentioned about trust as an important aspect for cross border cooperation among state participants.

Regarding this aspect related to trust *interviewee -1* mentioned*:*

*"[00:14:54.43] So basically* ***trust i****s a big risk factor because a lot of times the different countries don't trust each other because they might have different security standards and I can give an example from what was happening with the EIF."*

*[00:15:12.56] Does regulation before it was adopted. So, one country was saying don't use the exact countries, but I will attribute that.*
*[00:15:22.97] So Germany was saying we don't trust Romania because they* ***have different standards.***
*[00:15:41.3] And then basically with the trust you're on the lowest level with also the weakest link is you know you can if you poke the weakest link it can bring down the entire structure.*
*[00:15:54.32] So that's the problem there. So, a lot of EU countries don't trust other countries.*
*[00:16:58.46] Well I mean it's still a big issue. So, I'd say it has not been solved by one other thing that for example, the EIF does. What they did there and look at the starter project to be forceful they came up with trust levels so that for example if you are trying to access a public service in a different country the country determines sort of the trust that we'll see out. You would have three or four trust levels.*

*[00:17:25.37] For example what for one public service you will need to factor ID and for another country even made a different public service you might just need your passport. Right. So, it's the countries as you have equipment of sort of the D trust level. So basically, you say right, this is for if you want to access my public service and this you need to do this you need to have a two-factor identification rate. So, you have these trust levels basically for the [00:18:01.93] The how you authenticate yourself.*

Consequently, the author outlined two possible important parts in the theoretical part about possible authentication and authorization form during receiving European services, it was mentioned about once-only-principle and eID. These two components have a direct relationship to trust between state participants through their trust services.
Additionally, the author asked questions specified on exact country Belgium in regards that it has similarities with Germany, both states are federal states, where trust inside the country is the big challenge.
*Interviewee-1: "[00:18:17.82] Easiest way to make an exchange. I mean Belgium is the hardest country for this because they have different levels of federalism so basically, they have the national level. Then they have sort of the different states."*

And same aspect about regulation form mentioned *interviewee- 2 "[00:15:26.81] Another risk depending on the member state. There is not one size fits in some countries. They need more a centralized governance structure for these organization because it is a federal state and is clearly a case of Belgium and Germany."*

Important remark by interviewee- 3: *"[00:16:36.84] A sensitivity of a country is not enough to be a federal state. [00:16:44.24] It will never work. The model where there is only one entity coordinating all the other entities acting assembles overseas. It has to be more peer to peer similar group."*

*[00:25:53.13] "The main reason the main risk of cross-border services is also trust. "*

According to *interviewee-2* from vice-versa perspective*: "Definitely the Nordic countries Sweden Norway, Denmark, Sweden, Estonia, Finland they have a really good model for how we meet [00:23:00.0] with standardized protocols just because these countries are smaller and the population is smaller and they are more idea-oriented, it helps."*

Therefore, we can assume the federal states with many populations are not reliable and it is difficult to implement the concepts of EIF. Consequently, in this regards the question regarding data exchange is emerging.

According to *interviewee -6* mentioned that data exchange between countries should be made in a trusted way.

*"[00:10:12.87] So it's a big risk factor there for cross-border exchange of data because if you're exchanging your data that is ok, but you cannot see what is being done with this data. How can you see if you give your data to another country? How can you see what they're doing with the data? Definitely, there are points to work on in this direction".*

### 5.2.1 Organizational interoperability

Roughly we are moving from political will and trust to problems that could emerge on the organizational level during EIF implementation.

According to *interviewee 1: Interviewee- 2: [00:03:03.77] "I would say that the starting point is not only* ***lack of communication of course*** *lack of communication could lead to many issues but sometimes it also lacks coordination. Different organizations may be at the*

*same level are not doing scenes in final with a huge overlapping and because of this lack of coordination and there are many inefficiencies and maybe the result is not very much aligned with [00:03:30.0] the EU. Or there are many silos."*

*[00:05:30.0] "In case there is one appointed organization to take the lead sometimes maybe this organization will not have the real mandate from a political point of view to oversee and to push things forward and then that could lead to lack of coordination. Different entities doing things in parallel with not with any kind of coordination whatsoever."*

Therefor interviewee-2 provided a brief example of a lack of coordination.

*[00:06:00.0] "There are two major very powerful organizations at the state level the Social Security and the tax agency.*

*[00:06:16.08] Sometimes these two organizations they work in silos. There is not any coordination whatsoever and maybe other entities they need to retrieve data from these two organizations because it's needed for a new sort of procedure because these two organizations sometimes they come because they host a personal data about businesses and about citizens about taxation and about Social Security. Since there is no coordination it implies that if I am responsible for a subsidy in one municipality, I may have to check whether this person is entitled to these subsidies. So, I need to check the tax declaration and at the same time may be any only, so I also need to tell whether this person is contributing to the Social Security scheme. Is working for a company. So, there is not coordination some two consultations must be carried out wanted it because there is* ***not any coordination****. There is also about a connecting basis registry through our common infrastructure and this infrastructure. This kind of a ledger well-orchestrated interconnection of different data sources-based registries so the different services can benefit from this data." "This way you can comply with the principle of a usability open is a* ***once only principle*** *is something that is exactly in the spirit of the law. So, this is one* ***decentralization process****".*

Consequently, many important factors can affect the EIF implementation process but as we are humankind that means mostly main building blocks are based on a human factor, not on the technology. Therefore, it would be a big challenge to overcome personal human ambitious to create and implement something that would be successful. According to *interviewee-1* he also outlined that human factor plays an important role in the decision-making process he outlined it an

*[00:00:03.97] "So basically EIF is a sort of tool where there are different risks and most of them rely on human factor that has to do a lot with psychology people sort of* ***not wanting change****." They're used to it. If you've been working* ***in public administration for a long time,*** *you're used to doing things a certain way. So, if you're suddenly asked to change, you're like okay why you know like this is how you been doing" "I don't want to change". So that's one of the things." People do not want to change"*

It quite common because some people sometimes do like their daily routines and it hard to promote new ideas. They do not have a passion to change something. In this regard based on authors experience outlined that in his own country there are people with a traditional mindset, everything new for them is like chaos, they do not want to understand and move forward towards innovation changes. Sometimes public authorities just do not want to lose their power. This human factor is more reliable to make something new and not loose ruling power.

*[00:02:38.07] "Lack of people* ***wanting no to give up this power*** *that they have. Therefore, they are reluctant to change because if you are on top why would you want to sort of change this."*

*"I think that's sort of giving the frame you always must keep in mind that the* ***human factor*** *is always the biggest risk factor and the biggest barrier as well."*

It is important, *"set up committees where you are and able to do so. You must appoint all tasks responsibilities"*

The same interviewee provided an example for better understanding of the concept:

*"[00:03:30.43] "So for example let's say you are trying to set up a base registry and you're trying to make it master data. So basically what is happening you have different registries supporting different services and a lot of times the data is duplicated so everybody wants to keep the data but if you want to make the process more efficient you want them to be able to you have one* ***master registry*** *and you take the data out of that registry. The thing is these* ***human factors come into play right****. So how do you use maybe try to lessen this impact? So* ***instead of having one person deciding*** *you to use and determine which are the services which are the public administration which are the entities which are concerned with this data. And then you set up governance where you sort of you make decisions on the data rights you have to have everybody become involved so you set up stuff cross-institutional governance bodies where you have different people have their say. So, I mean. Have a governance overflow you have better governance you have data management for the*

*management you might have one organization but for the government you should have a* ***more sort of organization be involved in the decision making****."*

*According to Interviewee 7: [00:03:33.03] So you need to have* ***standards simple processes*** *so everything should be* ***simple****.*

In organizational regards each process should be a simple and strong leader should be delegating al this process otherwise it would be a mess of dozen activities and bureaucracy. Consequently, *interviewee-1* outlined that:
*"[00:07:48.71] "And one of the things that you can have is* ***high-level decision maker*** *right. So, if a high level of decision maker can make the decisions that it's much easier, they need, and they can decide as they sort of decision maker the entire project, they push the project along. Hence, they can sort of tell other people what to do. So,* ***if you have a high-level decision maker*** *who is sort of is pushing the projects much easier to get it through."*

*"[00:08:53.9] "Because things like* ***you can always set up standards*** *you know you set up a* ***semantic standard you set up the technologies*** *that you have in the infrastructure but if the people they* ***don't want to do anything*** *then that's the* ***key barrier*** *there."*

*[00:09:10.64] "That's the key risk factor there if people say I don't want to use your common standard because I have my own standard."*

Author of the thesis is also agreed with interviewee-1 because human factor and will is the major obstacle of any process, no will no action, no success. It is always the big challenge to social science why this kind of demotivation's are driving people not do to something new and it is another separate question to investigate and research.

### 5.2.2 Legal interoperability

One of the important criteria of any process is legal aspects. To provide a legal overview, as already mentioned above legal interoperability stands for legal framework bound to work together with other state participants. Problematic aspects "*of the EIF is legal interoperability*" [1] because sometimes is just difficult to understand all those phrases and special terms, the interpretation not always easy and the content difficult to define.

So, based on our interviews we defined several aspects that could affect the EIF implementation. The first aspects that were outlined are the meaning of the interoperability itself, awareness about the topic.

According to *Interviewee-4: [00:01:02.28] "What is really coming back is **awareness** in general term interoperability. Also. Simply the **definition of what does it mean**. A technical term it's not really telling for many for a legal case."*

Hence, the lack of the meaning itself providing obstacles even for the legal people to implement layer related regulation and requirements, conduct and develop new legislation. Consequently, the rise of the topic itself needs to take into mark and aware national states about interoperability, its tools, and key aspects.

*[00:01:31.5] "Lawyers are working with legislation so it's not really kind of headway that they don't want to deal with additional work, but they **don't know about that** they don't **understand it** and then they simply overlook. So, I think the biggest risk is really that **it's easily overlooked simply because of the nonawareness**".*

Another key outlook was mention by the interviewee that "*people just do not communicate with each other"*, it seems strange, but they don't. It is directly related to time consumption, the related cost.

*[00:01:49.19] "The biggest challenge in Europe is to change this and to somehow explain in simple words what can be done. Why is it important? Provide examples. Well, when you take it into account from the start on the new draft legislation it is good."*

*[00:02:09.19] "So I think this is one of the main things and cultural issue between policymakers or people who are dealing with legislation and the IT aspects, so usually these people **they don't talk together**."*

Sometimes people duplicating the initiatives on the lack of communication reason, which creates an additional contradiction between working parties.

*00:02:31.51] "This kind of struggles maybe there is already a kind of initiative in one policy area were taken it could create interrelated legislation so that the legislative level at some point is more like a career in that everyday barriers."* One of the important outcomes were mentioned that the EIF itself it is just guideline form the European Commission that many countries just unwilling to follow, even though the Tallinn declaration was the additional documentation to support this initiative, so accordingly: *[00:03:10.17] "Also the fact that the **EIF is not a legal instrument** as such but this policy recommendations are a good idea."*

Another remark that people from ISA2 unit believe that this EIF initiative is good because it will take time to spread it among states and will take time to raise awareness as already mentioned above.

*[00:03:53.04] "It's sad for us for the ISA2 unit it's really a kind of volunteering basis and the best we can do for the time being just the reasons are there why it can be useful for us to talk it has to deal with that. Intention to improve better regulation. Back to the part of* ***raising awareness*** *through channels is the* ***better regulation guidelines*** *that should be improved".*

Importance of time consumption, awareness raising, and mutual communication should be considered.

Sometimes cultural aspects are influencing the implementation process as already mentioned above: *[00:06:56.67] "So it's true that there are* ***some cultural or mentality*** *protection issues*".

Consequently, *[00:08:13.16] "So, in general, a country defined as a* ***lack of interest*** *or* ***lack of awareness*** *or* ***lack of values*** *simply because of* ***lack of understanding of benefits****. Just once ago there was difficult rather than now."*

If the digital single market initiative is obliged to be achieved there should be a strong political will of all countries to do so, not only on paper but on real actions, there is a strong need in cooperation and close work.

*[00:07:53.1] "But we're being important that we move ahead. Really if leaders or management in public administrations and the policy leaders have to push this message that we* ***need to cooperate*** *we* ***need to share*** *our information we* ***need to be allies****."*

### 5.2.3 Technical interoperability and semantic interoperability

As author mentioned regarding these layers "*it is an important for whole implementation process.*" If we could examine that most problems emerge on organizational and legal layers because technology innovations are beyond these aspects and legislation is always late. Traditionally it was in this path. If we assume that most technical interoperability obstacles are directly related to legislation, because without normative, legal supported document technical implementations not moving forward.

According to *interviewee -1* he provided an example regarding Denmark experience regarding technical interoperability.

*[00:16:03.59] "I mean basically one country that I was to look at is Denmark because basically what they implement that there is they totally* ***restructure the way that they're***

***using data**. And [00:16:30.0] basically they try to get rid of the **different silos** and they came up with the sort of as I said these **governance structures** where the different interested members the entities which are impacted by the data they set out in the governance. They make decisions over the data models have a common data model which is respected. They have an infrastructure which helps exchange the data. They have involved the private sector as well so the private sector can reuse this data. They can create services on top of this data.*

*[00:17:00.0] "Another aspect good case is "Estonia of course and with Estonia cross-border aspect is interesting because about the exchange with Finland. They showed that all related infrastructure for the data exchange they have."*

*"It is better to know good practices form success countries. All countries are different and some of them strong with the economy some of them not, it always good to take best practices and study them."*

In the most aspect of technical interoperability, the financial part is important, because all the time it needs update and it is costly for the national budget.

*[00:01:14.1] "So regarding the **financial cost**, of course, you understand that this is emerging to emerge out of the kind of financial cost how to overcome.*

*[00:01:24.25] any technical initiative consumes and needs money. That's always a problem.*

*[00:05:23.77] It's always a risk. If you can't **find the money** for it. It's always a risk."*

One is the important key aspect is the human, expert that are working on those issues.

According to *interviewee-6: "There is a big gap with experts, not many people understand the topic, both legal and technical"*

As already mentioned above the lack of understanding for this level of interoperability is also applicable.

If we would check in the relation to semantic interoperability, we could find that data exchange needs more detailed clarifications, such as creating common vocabularies, support multilingual provision and understandings. Each country has it is own standards and sometimes it does not want to consider standards of another country.

*[00:08:53.9] "You can always set up standards you know you set up a semantic standard you set up the technologies that you have in the infrastructure but if the people they **don't want to do anything** then that's the key barrier there."*

*[00:09:10.64] "That's the key risk factor there if people say I don't want to use your common standard because I have my own standard."*

So, data flow sharing and exchanging concept between parties is important to understand.

According to *interviewee – 5 [00:28:07.49] "So basically with semantic interoperability you need* ***to have a common understanding*** *of what you're exchanging what the data is so that comes up with the definitions and you see that it impacts. Legally you're required to use all those definitions but then it* ***creates overhead*** *that creates problems. Therefore, it's the semantic and trap will be another an impact on all the different levels. So, if you have common data miles you can either sort of adopting them outright and the different systems or you can map them*."

The mapping could be easily implemented.

According to *interviewee – 5 [00:28:50.69] "You can create mappings. So basically, there you need to have a common understanding of the data". "It's very important to have if you're exchanging this data to ask. Okay, you know what you're exchanging because otherwise, you will create problems. So there the* ***common data models*** *are very important. So. And I mean you don't have to require everybody to use this data model".*

### 5.2.5 Interview Outcomes

The results of the conducted interviews were valuable and contributed to the research topic. The author outlined the main problems and possible risks in the chapters. So, if we can take into consideration the main obstacle is the awareness of the topic, lack of understanding of it. Form different perspective was conducted that territorial, population-related aspects are very important and possible risk factors. Related to government structure and the governing regime was also taken as an example of a risk factor. One of the important risk factors is the trust between member states they do not believe each other, on the reason of different standards.

Graph 4 visually showing the possible risks according to authors gradations of importance.

| Risk Factors |
|---|
| 1) Lack of political will and coordination |
| 2) Leadership with delegated responsibilities |
| 3) Lack of understanding the framework, non-awareness of the topic |
| 4) Lack of interest |

| |
|---|
| 5) Lack of motivation |
| 6) Lack of expertise, human resources |
| 7) Lack of financial supports |
| 8) Trust |
| 9) Government structure and governing regime |
| 10) Lack of common standards |
| 11) Size of the country and population |
| 12) Lack of internal communication |
| 13) Internal silos |
| 14) Human factor, behavior, culture, traditions |
| 15) Human factor to complicate simple things |
| 16) lack of interests to follow common standards |
| 17) Time consumption |

## 6 Summary

This chapter provides information related to topic actuality, the research purpose, related methodology, research-based evidence, and the result in order to get answers to the research question.

The relevance of the topic today is quite high on the reason that DSM initiative was conducted not long time ago. Consequently, there are some problems to achieve, but on that reason, the initiative itself delivers good and reasonable outcomes to be implemented. EU countries would benefit in implementing this initiative, it would broad the meaning of trust, transparency, competitiveness, and stability for economic growth.

The main research question purpose was to find possible risks of common EIF guideline for all EU countries in the context of successful digital single market initiative implementation where the outcome would help current and future initiatives in this aspect. To achieve a result to the research question and its components possible literature review was done, face to face interview was conducted, a country comparison was investigated.

The research methodology was chosen right and conducted research outcomes were reached. Consequently, the author used qualitative analysis was an important part of conducting face to face interviews with EU experts.

Mentioned above outlooks generally resulted in finding answers to the research question.

## 6.1 Answer to Research Question

The research question: What are the possible risk factors for the successful implementation of the new European Interoperability Framework from the EU expert's perspective at the level of national public administration? According to possible risk factors outcome, there is a need of raising awareness of the EIF topic itself by promoting through additional channels and to delivery it among local, regional and countries.

Additional risk factors also need to take into deep consideration and work commonly to achieve goals. An only a common approach, through discussions, workshops, expertise change would help to overlap the barriers. The strong political support and partnership understanding should create a trusted environment.

Digital single market initiative is a common approach of EU countries so the EIF helps to guide it through to reach any barriers and reach goals.

## 6.2 Future Research Direction

The purpose of this thesis was to find possible risks factor of EIF implementation among EU countries regarding create European public service more interoperable. Consequently, exact public services were not investigated, the general overview was done. According to the theoretical part of the thesis and conducted interviews was concluded that there are dozens of risks in graph 4 that would affect the European digital single market initiative to achieve the goal. It would create additional research questions to investigate next steps in more detailed structure by using quantitative analysis to compare and measure implementation metrics.

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**Appendix 1- Interview Questions**

**1) Opening question:** What are the possible risk *factors for the successful implementation of the EIF* [1] from an EU expert’s perspective on public administrations level?

**2) Organizational Interoperability:**

a) What would be the solution for conflicts of interest?

b) How to overcome the lack of communication between state institutions?

**3) Legal Interoperability:**

a) What are the obstacles to legal documentaries data access and data availability?

b) What could be possible risks/problems at legal interoperability?

**4) Semantic Interoperability:**

a) Why clear and standardized interoperable processes are so important?

b) Can you define the main obstacles of semantic interoperability?

**5) Technical Interoperability:**

a) How insufficient ICT infrastructure would affect the EIF implementation?

b) What could be the possible risk at technical interoperability layer?

## Appendix 2 – The Panel of Experts who participated in the interviews

| Table:1 panel of Experts | | |
|---|---|---|
| **Name** | **Position** | **Time of the interview.** |
| Interviewee 1 | Project/Program Manager Interoperability Solutions for Public Administrations (ISA) Directorate-General for Informatics European Commission | 04.12.2018 |
| Interviewee 2 | Project/Program Manager Interoperability Solutions for Public Administrations (ISA) Directorate-General for Informatics European Commission | 06.12.2018 |
| Interviewee 3 | Project/Program Manager Interoperability Solutions for Public Administrations (ISA) Directorate-General for Informatics European Commission | 07.12.2018 |
| Interviewee 4 | CAMSS Project Manager, Interoperability Unit, DG Informatics, European Commission | 07.12.2018 |
| Interviewee 5 | Programme manager for the ISA² Programme, Interoperability Unit, DG Informatics, European Commission | 11.12.2018 |
| Interviewee 6 | Join Up Project Officers, Interoperability Unit, DG Informatics, European Commission | 13.12.2018 |
| Interviewee 7 | Domain manager and business consultant at Roksnet Solutions OÜ | 01.04.2019 |

Note: Audio recordings and a research diary were produced during the period between December 2018 – May 2019 and are in ownership of the author and can be requested with mutual permission of the interviewees. Interviews were held in English.

## Appendix 3- Graphs

*Graph 1." European Interoperability Framework content and structure"*

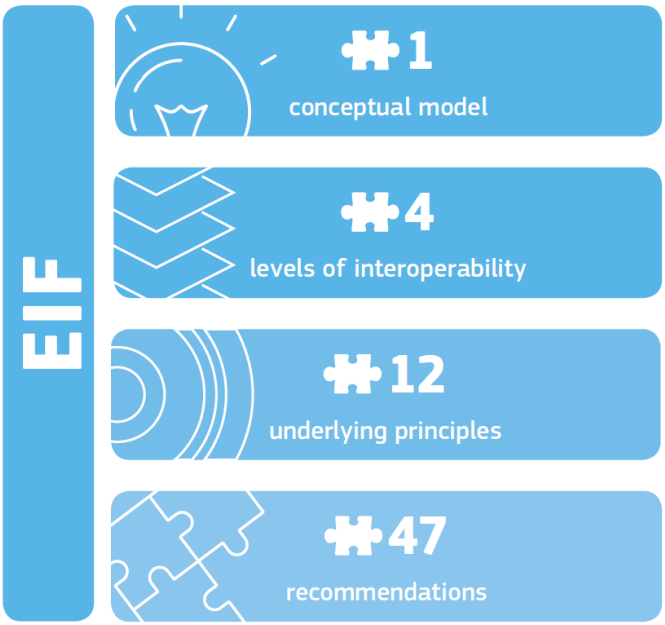


*Figure 7 "European Interoperability Framework content and structure". Source: ISA2*

*Graph 2: "Interoperability Governance"*

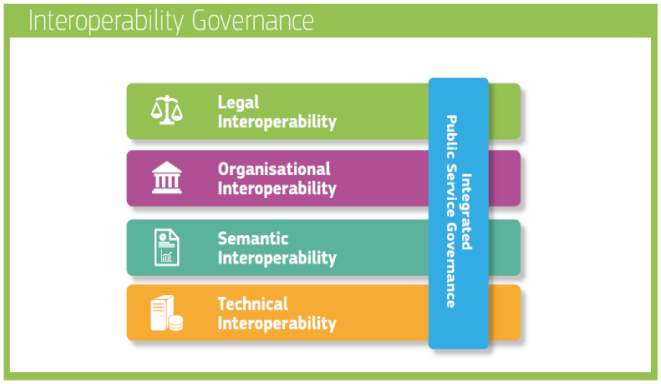


*Figure 8 Interoperability governance*
*Source: ISA2.*

*Graph 3: "Conceptual model for integrated public services"*

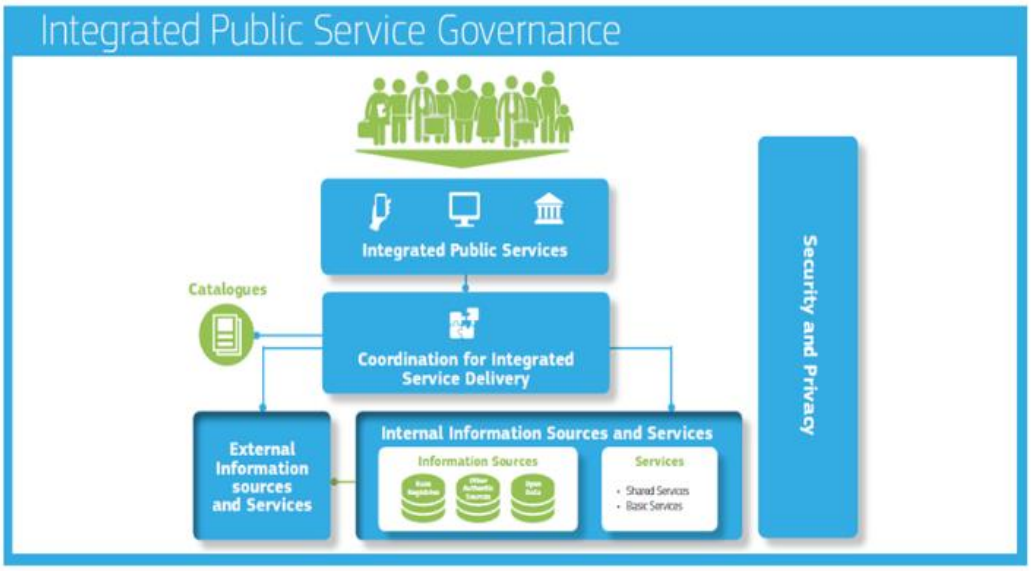


*Figure 9 "Conceptual model for integrated public services." Source: ISA2*

*Graph 4: "EIF conceptual model relations"*

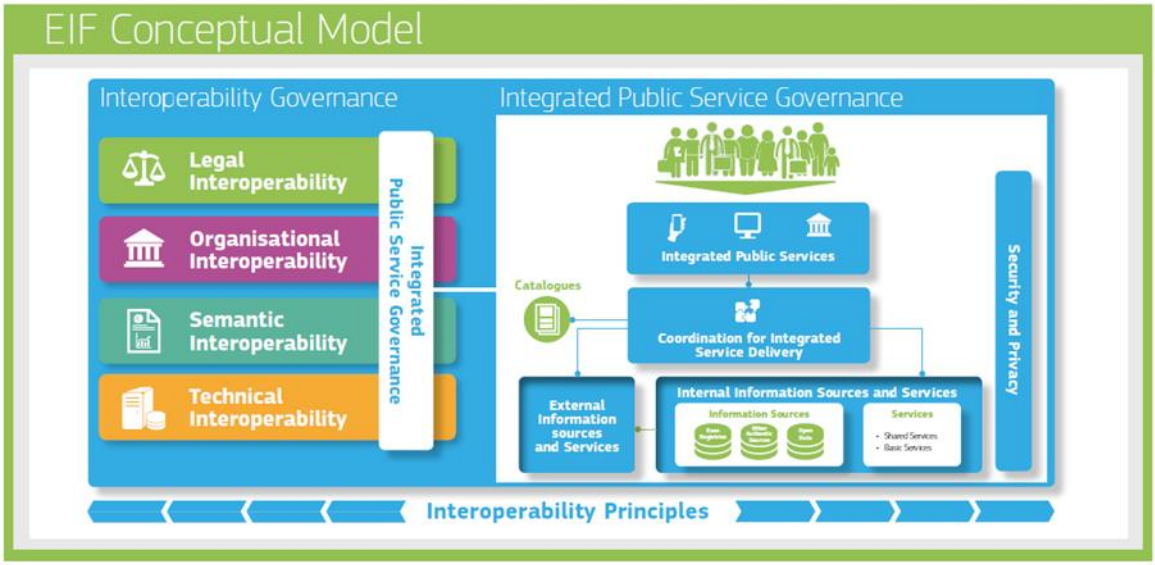


*Figure 10 "Components of the EIF". Source: ISA2*