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Improving Knowledge Transfer Processes of e-Governance Competence

Example of Estonia

Master's Thesis

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Author’s declaration of originality

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

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Abstract and Foreword

This thesis examines how the processes of e-Governance competence knowledge transfer could be achieved based on the example of Estonia. In the introduction part of the thesis a research methodology is being explained as well as theoretical background given and research questions discussed. The main research question of the thesis will look at how can the knowledge transfer process of e-Governance competence be improved based on Estonian example. It is supported by having a deeper look into knowledge transfer in e-governance perspective in general.

Following the introduction, the thesis is divided into four main chapters, which are followed by the summary and conclusions. The scope of the thesis covers an overview about knowledge transfer as an organizational theory. In addition, I examine export of e-governance know-how. Furthermore, I will give an overview about e-readiness evaluation and e-government development and challenges in these areas. Then I will look into European Interoperability Framework and other developments on European Union level.

Lastly, I will conclude my thesis with the best practices in knowledge transfer in Estonia, illustrated by the examples of transferring knowledge concerning Estonian e-governance infrastructure components X-Road, RIHA, PKI and Eesti.ee that are well-known all over the world. The outcome of this thesis is a recommendation for improving the methodology of Estonian e-governance-related knowledge transfer.

This thesis is written in English and is 65 pages long, including 7 chapters, 13 figures and 4 tables.

Keywords: e-governance, framework, e-government, e-participation, knowledge transfer, know-how, Estonia, X-Road, RIHA, CatIS, PKI, e-Estonia, Eesti.ee, e-Governance Academy, interoperability

Annotatsioon

E-valitsemise oskuste teadmussiirde parandamine Eesti näitel

Käesolevas magistritöös uurin, kuidas parandada e-valitsemisega seotud teadmussiirde protsessi Eesti näitel. Töö sissejuhatavas osas annan ma ülevaate uurimismeetodikast ja teoreetilisest taustast ning uurimisküsimustest. Peamine uurimisküsimus keskendub sellele kuidas e-riigi pädevuste osas parandada teadmiste edasiandmist Eesti näitel. Seda toetab teadmussiirde mõiste sügavam käsitlus e-valitsemise seisukohast üldiselt.

Pärast sissejuhatust on lõputöö jagatud neljaks peatükiks, millele järgnevad kokkuvõte ja järeldused. Töö annab ülevaate teadmussiirdest kui organisatsiooniteooriast, seejärel käsitlen teadmiste edasiandmist selle eksportimise vaatenurgast. Samuti annan ülevaate e-valmisoleku hindamise ja e-valitsuse arendamise osas kui ka nimetatud valdkondade väljakutsetest. Vaatan ka Euroopa Koostalitusvõime Raamistiku arenguid Euroopa Liidu tasemel.

Viimaseks, lõpetan oma lõputöö Eesti parimate praktikate näidetega teadmiste edasiandmises, mida illusteerivad Eesti e-valitsemise infrastruktuuri põhikomponentide näited X-tee, RIHA, PKI ja Eesti.ee, mis on tuntud üle kogu maailma. Magistritöö väljundiks on soovitused Eesti e-valitsemisega seotud metoodika täiendamiseks, et parandada e-valitsemise oskusteabe edasiandmist.

Lõputöö on kirjutatud inglise keeles ning sisaldab teksti 65 leheküljel, 7 peatükki, 13 joonist, 4 tabelit.

Võtmesõnad: e-valitsemine, raamistik, e-riik, e-osalus, teadmussiire, oskusteave, Eesti, X-tee, RIHA, CatIS, PKI, e-Estonia, Eesti.ee, e-Riigi Akadeemia, koostalitusvõime

List of abbreviations and terms

BSC	*Balanced Scorecard*
*Cat*IS	*The catalogue of interoperability solutions*
CIO	*Chief Information Officer*
DSM	*Digital Single Market*
EC	*European Commission*
EGA	*e-Governance Academy*
EGDI	*E-Government Development Index*
EIF	*European Interoperability Framework*
EIS	*European Interoperability Strategy*
EIU	*Economist Intelligence Unit*
EPI	*E-Participation Index*
HCI	*Human Capital Index*
ICT	*Information and Communications Technology*
ICT-OI	*ICT Opportunity Index*
ID	*A form of identification, especially an ID card.*
IDI	*ICT Development Index*
*Info*Dev	*The Information for Development Program*
ISA	*Interoperability solutions for European Public Administrations (public administrations, businesses and citizens)*
ISO	*International Organization for Standardization*
ITA	*Information Technology Agreement*
ITGI	*IT Governance Institute*

ITIL	*Information Technology Infrastructure Library*
ITL	*Estonian Association of Information Technology and Telecommunications*
ITSM	*IT Service Management*
ITU	*International Telecommunication Union*
MS	*Member State*
NGO	*Non-governmental organization*
NIF	*National Interoperability Framework*
NIFO	*National Interoperability Framework Observatory*
NIS	*The Directive on security of network and information systems*
OSI	*Online Service Index*
PKI	*Public Key Infrastructure*
RIHA	*Estonian catalogue of public sector information systems*
SDG	*Sustainable Development Goal*
TI	*Transparency International*
TII	*Telecommunication Infrastructure Index*
UN	*United Nations*
UNDP	*United Nations Development Programme*
UNECA	*United Nations Economic Commission for Africa*
WEF	*World Economic Forum*
WGI	*World Governance Indicators*

Glossary

Interoperability	"*Interoperability, within the context of European public service delivery, is the ability of disparate and diverse organisations to interact towards mutually beneficial and agreed common goals, involving the sharing of information and knowledge between the organisations, through the business processes they support, by means of the exchange of data between their respective ICT systems."* (European Commission, 2010a)
Interoperability Framework	*"An interoperability framework is an agreed approach to interoperability for organisations that wish to work together towards the joint delivery of public services. Within its scope of applicability, it specifies a set of common elements such as vocabulary, concepts, principles, policies, guidelines, recommendations, standards, specifications and practices."* (European Commission, 2010a)
e-Governance	*"Combination of electronic services and participatory services",* which is a combination of e-government and e-democracy defined as *"e- Government is a transaction of user-oriented services offered by government that are based on information and communication technologies*", and *"e-Democracy means digitally conveyed information (transparency) and the political influence (participation) exerted by citizens and business on the opinion-forming processes of public – state and non-state –institutions"* (Ott, 2016b)

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1 Introduction

In my research, I will analyse how to assess the readiness of a country for technology implementation in regards of e-government looking at European Union Interoperability Framework and other related sources. In Estonia, there is an organization named e-Governance Academy (EGA) that offers professional consultancy to the countries all over the world and also provides training by experts from IT staff to high level government officials. ("e-Governance Academy," 2016) The thesis also brings out EGA's experience and evaluation of their work models. The main research question is about how to improve the knowledge transfer process of e-governance competence based on the example of Estonia. The outcome of the thesis would be to provide a recommendation for methodology improvement of e-governance knowledge transfer process.

The thesis will also have a look at EGA-s questionnaire and methodology as a tool to understand the as-is situation of the country in means of e-readiness. Now the questionnaire that e-Governance Academy is using to evaluate the e-government readiness of the countries in their everyday work consists of two parts. The first part is about evaluating the country's current situation, to have an overview about which kind of e-services, databases the country already has, does any legal framework for e-governance services exist and which institutions are responsible for e-government solutions' implementation and maintenance. The second part of the questionnaire is about digital identity management, digital signatures and trust services in the country. ("e-Governance Academy," 2016) The usage of the questionnaire is the first step on the way of knowledge transfer as it provides knowledge about the country's current situation to EGA, based on what EGA again can plan the future steps for successful e-governance knowledge transfer.

In my research, I will concentrate on how to improve the process of sharing knowledge in e-Governance field between countries on the example of the work done by EGA. Also, I will have a look at interoperability frameworks and tools available. Finally, I will have look at e-governance implementation methodology in the context of European Interoperability Framework elements.

In the last part of the thesis will also have a look at Estonian examples of knowledge transfer agents in the field of e-governance, among others, at a system, which is meant for semantic asset management, that could help countries and organisations to put a framework in place and to have a broader overview about what parts are already there and what else is needed to develop. According to EGA's international experience (Ott, 2016a) it is suggested, that such systems, services, reusable components, legal acts and overview about organisations' contacts usually does not exist.

Nonetheless, it is considered to be one of the prerequisites of developing Interoperable e-Governance Architecture. Internationally, this kind of expertise is hard to find, „register of registers“ is a new topic, which is for example further developed by several countries like Georgia and Armenia. (Ott, 2016a) In this regard, I will bring Estonian semantic asset management system RIHA as an example, as well as EGA's own system, which is called CatIS.

1.1 The relevance of the topic

In this thesis, I will look into different perspectives of interoperability frameworks and the current methodologies used in the field of e-governance knowledge transfer. *„E-government services suffer from lack of legislations in managing e-government services and overload of information.“* (Yousif and Sulaiman, 2015)

The issue is very relevant on European Union level as EU is working on a general approach in governing e-governments and building a Europe-wide strategy how to do that (ISA). On June 2015, the Council reached a general approach on general data protection regulation that establishes rules adapted to digital era. On EU level, also IDA eLink has been discussed, which means the Interchange of Data between Administrations. IDA eLink Specifications was drafted already in year 2004, but still it is being discussed how the data should be securely changed between Administrations, as there is no one solution agreed upon. (European Commission, 2016a)

Also, the topic is relevant on international level, as the world is being more and more digitized and to follow up, countries need to digitize their governments and services as well, to be better accessible to the citizen and public sector employees. Interaction with the help of Information and Communication Technology (ICT) has broadened growth possibilities for national, local as well as regional development (Misuraca, 2007, p. 11).

Open Government Data has set initiatives for 17 Sustainable Development Goals (SDGs) of which some are also related to Information Technology and e-government development, as *„Goal 9: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation”*, *“Goal 10: Reduce inequality within and among countries”,* but also other goals are still related to IT development and e-services, for example health issues. (United Nations, 2016, chap. 2)

1.2 Theoretical background

Public administration is the one that manages the majority of data and communication. Also, it is important to maintain the control and transparency over data and to speed up decision-making process. The two types of electronic services are firstly the ones that are within the government institutions and secondly, the ones that are put in operation for external interaction outside of the government. To speed up and improve the information exchange between government, citizens and different organizations, e-services are crucial. For that, though, a prerequisite of internet access availability must be fulfilled. Also, it is important to pay attention to the existence of data collections as well as to the available infrastructure and data protection. (Caddy and Jabes, 1999, pp. 110–114)

1.3 Research problem

The main problem is how to improve the knowledge transfer of e-governance competence. For example, when there would be a new e-governance competence centre opening up somewhere in the world, then how could knowledge transfer to that organisation be possible. The thesis is going to analyse interoperability frameworks and other related solutions in the field. It will bring Estonia as an example of a successful country that has implemented e-governance solutions. I will concentrate on transfer needed knowledge and components relying on Estonian best practices.

Another problem is that there is a lack of information about the semantic asset repositories and existing data collections that the 28 EU member states currently have. And which solutions are they using for changing data between different public sector institutions. In European Union, only four countries have a similar data collection system like Estonia has (European Commission, 2016a), in this paper I will only have a look at the Estonia's award winning system RIHA.

The answers to the research problem with the help of research questions should help the organisations overcome problems and obstacles (Hevner et al., 2004, p. 84). As the normal outcome of business processes is to gain revenue (Hevner et al., 2004, p. 85), the same implies to the goals of e-governance. The e-governance process also is a tool to boost the economy, as it improves the citizen participation in democracy as well as well as reduces time between governmental and citizen interaction, also e-governance reduces interaction costs for both the citizens, businesses and governments (Ming et al., 2013, p. 8). "Design is essentially a search process to discover an effective solution to a problem." (Hevner et al., 2004, p. 88)

1.3.1 Research questions

Hereby, I will bring out my main empirical research questions on which the thesis is based on. I have divided the thesis to three stages, which are assessment, design and implementation phase. The main research question would be:

1. ***How can the knowledge transfer process of e-Governance competence be achieved based on Estonian example?***

Answering this question, I will have a look at interoperability frameworks and how the know-how could be transferred from one country to another or from one organisation to the other based on term knowledge transfer. How could similar competence centres like EGA take over the knowledge easily and implement it in their work? While answering to this question, I will also have a look at what e-government knowledge is at all.

Finally, I will have a look at what is happening now in Estonia in regards of knowledge transfer process of e-government knowledge and how to improve this process by providing a recommendation for creation of a new methodology.

There are also three sub-questions, which will help to answer the main question:

1. ***What are the tools of e-Governance knowledge export?***
    a. *What is knowledge transfer?*
    b. *What are the steps necessary for transfer of e-Governance knowledge from country to country?*
2. ***What is knowledge transfer in the context of e-governance?***
    a. *What is done in EU regarding that issue?*
3. ***What is knowledge transfer in the context of e-governance in Estonia?***
    a. *What is happening now in regards of knowledge transfer?*
    b. *How to improve knowledge transfer process?*

These questions are important because the aim of transferring the know-how is to make data exchange between countries internationally possible and also data exchange between countries faster and more effective. But the question is how to do it and this thesis will try to analyse selected IT-frameworks meant for implementation of e-governance solutions as well as it will look at best practices of Estonia, as a country with the „World's Most Tech-Savvy Government" (Tamkivi, 2014).

1.4 Research methodology

The research method used in this thesis will be design science research. The research will mostly be a reactive research (Iivari, 2007, p. 50) that will analyse the selected interoperability frameworks and related e-governance solutions to provide a recommendation for methodology improvement, as the research method is good for "solving a known problem in a more effective or efficient manner" (Hevner et al., 2004, p. 82). The design science research often concentrates on the issues with the design of the information system (Hevner et al., 2004, p. 84), whereas this paper also looks at the different interoperability frameworks and which inspiration or additional value they would provide to the governments and consultants in e-governance field.

The problem in this field is that there is no clearly defined methodology supported by scientific approach. Since e-governance is in early stages of development globally, then knowledge transfer and the reuse of components is becoming more and more relevant in the field. The further objective of the research would be to create a methodology handbook for e-governance knowledge transfer. This is not a part of this Thesis. The current thesis will give recommendations to improve the methodology used today but which has not been documented or scientifically proven. The recommendations for improvement of the methodology of e-governance knowledge transfer are being communicated in the end of this paper in chapter 5.5.

Hevner looks at design-science paradigm as a „problem solving paradigm" (Hevner et al., 2004, p. 76). It is also a useful tool to improve the methodology implementation and as a result e-governance improvement, which solves the problem of lack of e-services and e-democracy for citizens. For evaluation of the frameworks, the analysis method will mainly be used in this paper (Hevner et al., 2004, pp. 86–87) Hevner also refers to Zmug (1997), who says that is is important to evolution to generate "knowledge concerning both the management of information technology and the use of information technology for managerial and organizational purposes" (Zmug 1997 in Hevner et al., 2004) in the world of information systems.

The research paper will make recommendations for a methodology creation for better knowledge transfer of e-governance know-how. Estonian examples are being presented while doing this. Iivari (2007) proposes four main components to the design science research, which are: „practical problems and opportunities, existing artifacts, analogies and metaphors "and „theories" (Iivari, 2007, p. 52). He also emphasises, that most of the outcomes of using design science research have provided improvements to existing systems (Iivari, 2007, p. 52)

As design science research is used for identifying organizational issues, its improvement and provision of innovative solutions, research design is used in this work (Hevner and Chatterjee, 2010, pp. 13–15). The thesis will also analyse if some elements or ideas of the frameworks could be used and if they are helping with providing a new methodology recommendation.

The research method is good for analysing system trust (Nunamaker et al., 2013, p. 2), which can also be seen as the trust to e-governance solutions and creation of a unique framework.

1.5 Literature overview

The literature is mainly based on available interoperability frameworks as well as different research papers, books, European Union documents etc. Digital Single Market (DMS) is to be achieved as one of President Juncker's priorities. The topic of data exchange and e-governance improvement is intensively being discussed on EU level and there is much material available about the subject. (European Commission, 2015) In addition, there will be company based materials and documents included by e-Governance Academy side, which will be generalized for this thesis and conclusions will be drawn.

In my thesis, I am going to analyse data available from different resources and also EGA's work documents and different Estonian national e-governance websites as well previous research papers done about Estonian e-governance and e-government. The data was also collected analysing previously done studies and researches about e-government data exchange in public sector.

1.6 E-Governance Academy in Estonia

E-governance Academy is a non-governmental Estonian institution, that was founded by Open Society Institute, UNDP and Estonian Government in 2002 and has consulted about 50 countries and more than 3000 government officials and IT staff members. ("e-Governance Academy," 2016) With practitioners and experts that have been holding high level positions in government institutions, also experience with many other countries than Estonia, EGA has a broad knowledge and expertise about implementing e-Governance framework in a country or other administrative regions.

The main areas EGA is competent in consulting:

- Central & local e-government
- E-democracy & e-participation
- Interoperability, open data

- Cyber security
- E-identity
- Change management (“e-Governance Academy,” 2016)

I chose e-Governance Academy as an example, as eGA is an Estonian NGO, that has consulted and trained more than 50 countries and thousands of government officials and ministries all over the world in the field of e-governance during the past 15 years and is highly experienced in the field, but on the other hand is also an organization that needs to have sufficient information about the existing frameworks of e-government and e-government, to better assess the e-readiness of the country, as well as help the country to reach a technology implementation phase. (“e-Governance Academy,” 2016)

1.7 Why I chose Estonia

I chose Estonia as an example because it is one of the “World’s Most Tech-Savvy Government” (Tamkivi, 2014). Estonia is a country with decentralized government, where all the ministries can use its own system, but all the systems are interconnected with the help of a data exchange layer X-Road (e-Estonia Showroom, 2016) Estonia is also the country where I live and study myself and know its systems the best.

2 Knowledge transfer

Knowledge transfer in organizational theory is referred to as a knowledge transfer tool from one organization to another. (Hildreth and Kimble, 2002)

2.1 Tacit and explicit knowledge

Tacit knowledge is mainly acquired from learning by doing (Alavi and Leidner, 2001), for example a dentist is not able to become a dentist before having practice. Explicit knowledge on the other hand is a jointed knowledge and more general. There are also several other types of knowledge.

In the following figure, we can see the different knowledge types and their definitions.

Knowledge Types	Definitions	Examples
Tacit	Knowledge is rooted in actions, experience, and involvement in specific context	Best means of dealing with specific customer
Cognitive tacit:	Mental models	Individual's belief on cause-effect relationships
Technical tacit:	Know-how applicable to specific work	Surgery skills
Explicit	Articulated, generalized knowledge	Knowledge of major customers in a region
Individual	Created by and inherent in the individual	Insights gained from completed project
Social	Created by and inherent in collective actions of a group	Norms for inter-group communication
Declarative	Know-about	What drug is appropriate for an illness
Procedural	Know-how	How to administer a particular drug
Causal	Know-why	Understanding why the drug works
Conditional	Know-when	Understanding when to prescribe the drug
Relational	Know-with	Understanding how the drug interacts with other drugs
Pragmatic	Useful knowledge for an organization	Best practices, business frameworks, project experiences, engineering drawings, market reports

Figure 1:Knowledge Taxonomies and Examples (Alavi and Leidner, 2001)

When we are talking about tacit and explicit knowledge linkage, then only people with previous knowledge can acquire and exchange information easily. The less people have information, the more difficult it is to make decisions and bigger amount of contextual information is necessary to provide (Alavi and Leidner, 2001).

Tacit knowledge is mostly understood without many additional explanations about it. Explicit knowledge on the other hand is described as a thorough knowledge where not much is left for imagination. Explicit knowledge also involves manuals and different descriptive documentation for creating a better understanding. (Hildreth and Kimble, 2002)

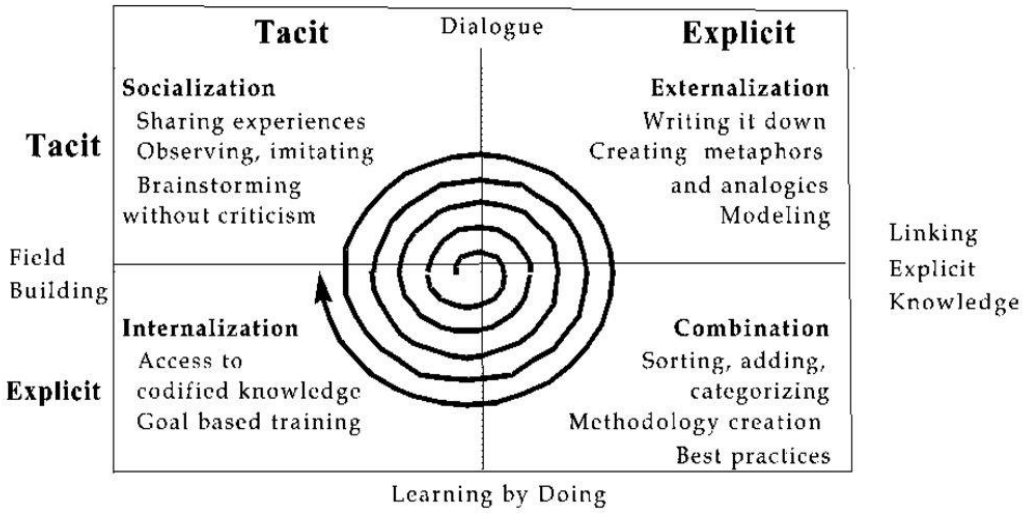

Figure 2: Nonaka's spiral of knowledge (Hildreth and Kimble, 2002)

Nonaka's spiral explains knowledge transfer in four cycles, which are socialization, externalization, internalization and combination, whereas, socialization is an interaction, where knowledge between people is distributed by sharing experience, observation and imitation. In externalization phase dialogue occurs and things are being written down. Combination guides the way through organization by sorting, adding, categorizing and creation of methodology as a result. Internationalization is considered as the provider of explicit knowledge in the form of tacit knowledge. (Hildreth and Kimble, 2002)

There are six different ways how knowledge is perceived:

1. *Knowledge vis-à-vis data and information* – facts, raw numbers,
2. *State of mind* – being understood and acknowledged,
3. *Object* – knowledge as an object being stored and manipulated,
4. *Process* – knowledge ready to be used in practice,
5. *Access to information* – information is available,
6. *Capability* – to influence results with the knowledge.

(Alavi and Leidner, 2001)

2.2 Knowledge transfer as an important issue

Yogesh Malhotra looks at knowledge transfer like information exchange and communication between people, especially people with similar interests. Knowledge transfer is seen as *"Movement of knowledge from one location to another".* (Malhotra, 2002)

"Transfer = Transmission + Absorption (and Use)

No Action => Useless Knowledge [Transfer]" (Malhotra, 2002)

Regarding knowledge transfer, there are two different kind of knowledge transfers, explicit and tacit. Tacit knowledge is difficult to forward via paper for example, for this kind of communication dialogue is considered as the best solution. Explicit knowledge on the other hand works also via e-mail and paper communication and sharing documents. (Malhotra, 2001, p. 203)

2.3 Cultures of knowledge transfer

The cultures of knowledge transfer are:

- Lack of trust
- Different cultures, language, mental models
- Lack of time and meeting places
- Status and reward issues
- Lack of absorptive capacity
- Not-invented-here syndrome
- Intolerance for errors and mistakes (Malhotra, 2002)

3 Knowledge transfer in the context of e-governance

In this chapter I will explain the definitions of terms e-governance and e-government and will give an overview of e-government measurement tools. I will also go into e-governance export options and stages of e-government development in general, as the basis of creating an environment for successful e-governance. In the end of this chapter I bring out some examples of the challenges and opportunities in e-governance knowledge transfer.

3.1 Background and concepts

Information is power and the access to it via web can make the decision-making process easier (Kolsaker and Lee-Kelley, 2008) and faster. Which means, that with the help of e-services it would be possible to fasten up decision-making process and also make data more accessible. For example, the Government meeting in Estonia used to take four or five hours a week before the e-Cabinet system was adopted in year 2000. Now the process has speeded up to thirty to sixty minutes per week, as well as it is not necessary to waste resources to print out massive amount of paper, which reduces on one hand the cost and on the other hand saves the environment. (e-Estonia, n.d.)

To understand the difference between terms e-governance and e-government a bit better, I will hereby give an overview of some examples of the definitions of these two terms.

3.1.1 E-Governance concept

E-governance, also mentioned as electronic governance is an answer by public sector to the rising level of information society. It is suggested for the countries to take e-governance tools in use to measure, design and evaluate e-governance in the society. (Council of Europe, 2005)

E-governance has different definitions given by different organisations:

- *"E-governance is about the use of information technology to raise the quality of the services governments deliver to citizens and businesses. It is hoped that it will also reinforce the connection between public officials and communities thereby leading to a stronger, more accountable and inclusive democracy"* (Council of Europe, 2004)
- According to UNESCO: *"Governance refers to the exercise of political, economic and administrative authority in the management of a country's affairs, including citizens' articulation of their interests and exercise of their legal rights and obligations. E-governance may be understood as the performance of this governance via the electronic medium in order to facilitate an efficient, speedy and transparent process of disseminating*

information to the public, and other agencies, and for performing government administration activities." (UNESCO, 2005)

- Kate Oakley has defined e-governance as, *"a set of technology-mediated processes that are changing both the delivery of public services and the broader interactions between citizens and government."* (Oakley, 2002)
- *„The use of ICTs, and especially of the Internet, to adopt a new conception and attitude of governing and managing where participation are required of all partners linked in a network."* He also calls e-governance as *„a new way of coordinating, planning, formulating and implementing decisions and operations related to governance problems, using ICTs as a medium of communication and partnership-development."*, or simply *„Governance with and of ICTs".* (Misuraca, 2007)

UNESCO also brings out three areas of e-governance execution, which are e-administration as the public sector's ability to improve online processes, e-services as the public services brought closer to people via online means and e-democracy, which can be seen also as increasing citizen participation in democracy. (UNESCO, 2005)

EGA uses definition for balanced e-Governance as *"Combination of electronic services and participatory services",* which is a combination of e-government and e-democracy defined as *"e-Government is a transaction of user-oriented services offered by government that are based on information and communication technologies*", and *"e-Democracy means digitally conveyed information (transparency) and the political influence (participation) exerted by citizens and business on the opinion-forming processes of public – state and non-state –institutions"* (Ott, 2016b)

3.1.2 E-Government concept

E-government, sometimes also referred as an electronical government or digital government (Misuraca, 2007, p. 24) has been defined differently by different authors. I will give an overview of some of the definitions.

- The European Union has defined e-government as follows: the E-government means the *„use of ICT tools and systems to provide better public services to citizens and businesses… eGovernment allows citizens, businesses and organisations to carry out their business with government more easily, quickly and at lower cost."* (European Commission, n.d.)

- *"E-government refers to the use of information and communication technologies (ICT) - such as Wide Area Networks, the Internet, and mobile computing - by government agencies."* (United Nations, 2010)
- *"E-Government refers to the use by government agencies of information technologies (such as Wide Area Networks, the Internet, and mobile computing) that have the ability to transform relations with citizens, businesses, and other arms of government...The resulting benefits can be less corruption, increased transparency, greater convenience, revenue growth, and/or cost reductions."* (World Bank, 2015)
- OECD has defined e-government in "The E-Government Imperative" paper as follows: *"The use of information and communication technologies, and particularly the Internet, as a tool to achieve better government."* (OECD, 2003)

3.1.3 E-Governance versus E-government

From the previous chapters, we can see that the terms e-government and e-governance are strongly independent to each other. E-governance helps to provide better government and e-government actually is of help to provide a better governance.

"E-governance is generally considered as a wider concept than e-government, since it can bring about a change in the way how citizens relate to governments and to each other." (UNESCO, 2005)

Below we can see a relationship graph about how interconnected governance, government and e-governance vs e-government are. To understand the relation between e-governance and e-government we should look at government and governance first. Governance regulates to processes of government and the same happens with the e-equivalents. Some see e-governance as an interaction tool between the citizen and the government. E-governance is also seen as tool of providing services with ICT means to the citizens and to boost citizen participation in democracy. (Bannister and Connolly, 2011) We can also see the figure as connection between paper based systems and e-systems.

According to Misuraca, Professor Dele Owolu in a book published by United Nations Economic Commission for Africa (UNECA) has defined e-governance as follows: *"All the information and communication technology platforms and applications in use in the public sector or the use of the internet for delivering government information and services to citizens."* (Misuraca, 2007, p. 26)

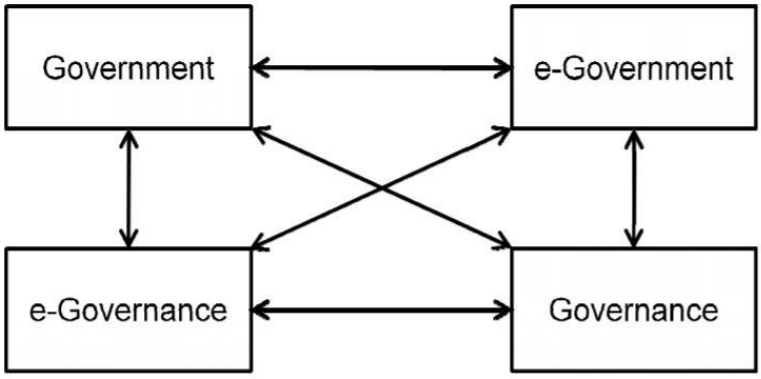

Figure 3: Relationship between (e)governance and (e)government (Bannister and Connolly, 2011)

3.2 Outcome of e-governance in e-government

In 2001, Reynolds and Regio have emphasized six possible benefits that come as a result of a successful e-government implementation. (Rabee and Reffat, 2003)

- Implementation and availability of government services (government one-stop shop).
- Minimizing the digital divide, (computer) illiteracy.
- Online learning makes lifelong learning possible and education more accessible.
- Using new technology and coming closer to the citizens with the help of e-services, the government becomes more trustworthy.
- Better economy, higher living standards and higher employment rate.
- Increase of e-participation, which means also increase in engagement of government activities. (Rabee and Reffat, 2003)

There are three different kinds of e-government, which are directed to citizen (G2C), business (G2B) and government institutions (G2G), whereas the latter means interaction between government organizations (Almarabeh and AbuAli, 2010).

Six stages of e-government implementation are distinguished:

Stage 1: *Using internal network and setting up an email system;*

Stage 2: *Enabling inter-organizational and public access to information;*

Stage 3: *Allowing 2-way communication;*

Stage 4: *Allowing exchange of value;*

Stage 5: *Digital democracy;*

Stage 6: *Joined-up government.* (Almarabeh and AbuAli, 2010)

3.3 Export of e-governance know-how

If the country does not have professional specialists in e-government implementation area, then often external consultants are being used. For this kind of knowledge transfer some skills are necessary. Mark Lavigne (2001) brings out a five-component skillset that is necessary for e-government implementation, that are analytical, information management, technical and communication and presentation skills. (LaVigne, 2001)

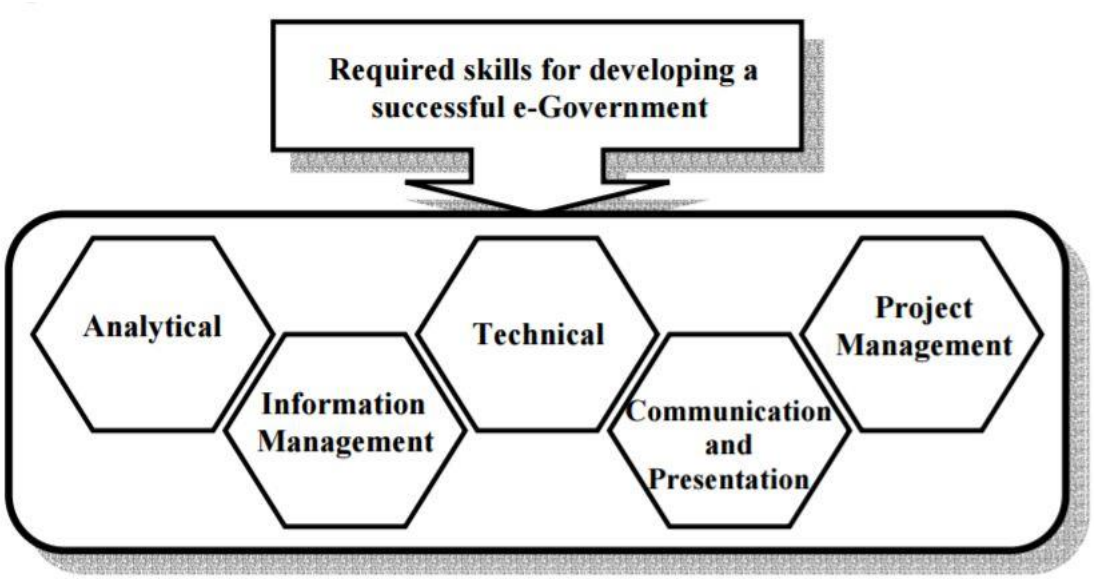

Figure 4: "Five kinds of skills required for developing a successful e-Government." (Rabee and Reffat, 2003)

Analytical skills - Analytical skills are important throughout the project from the primary analysis to prototyping and final results. (LaVigne, 2001) Analysis includes the review of the situation how organizations are working and what is the current state of data collections, finally analysis leads to final results and action plan. (Rabee and Reffat, 2003)

Information management skills – Information management includes data management and data security as well as sharing data with other institutions. (LaVigne, 2001) *"Information content, quality, format, storage, transmission, accessibility, usability, security and preservation"* (Rabee and Reffat, 2003) all are necessary in information management.

Technical skills – To understand what e-government as such is, technical skills are necessary. (Rabee and Reffat, 2003) in this phase, development, design and implementation skills are important,

also transformation of data and creation of data repositories. Technical skills also include basic computer knowledge like the ability to use computer and web services, as well as e-mail and the understanding of security protocols. (LaVigne, 2001)

Communication and presentation skills – Presentations skills are important as during the implementation of e-solutions and analysis a lot needs to be communicated with different kinds of people on managerial positions or also regular staff. The skills include both oral and written communication skills as it goes both to face-to-face and online communications. (LaVigne, 2001)

Project management skills - to successfully implementation a project, project management skills are crucial. *"Project management skills include the ability to plan, organize, estimate and allocate resources, negotiate, track progress, measure results, troubleshoot and, most importantly, to communicate. Another way to think about project management is the way you handle scope, time, cost, quality, and risk."* (LaVigne, 2001)

E-government projects would develop faster in developing nations, when the knowledge and experience, that developed countries have would be distributed in developed countries. (Yousif and Sulaiman, 2015)

3.4 Stages of e-government development

In 2001 authors K. Layne and J. Lee have presented a model for e-government development. Different integration phases of e-government are explained with four stages, that are *"(1) cataloguing, (2) transaction, (3) vertical integration, and (4) horizontal integration"* (see Figure 3). (Layne and Lee, 2001)

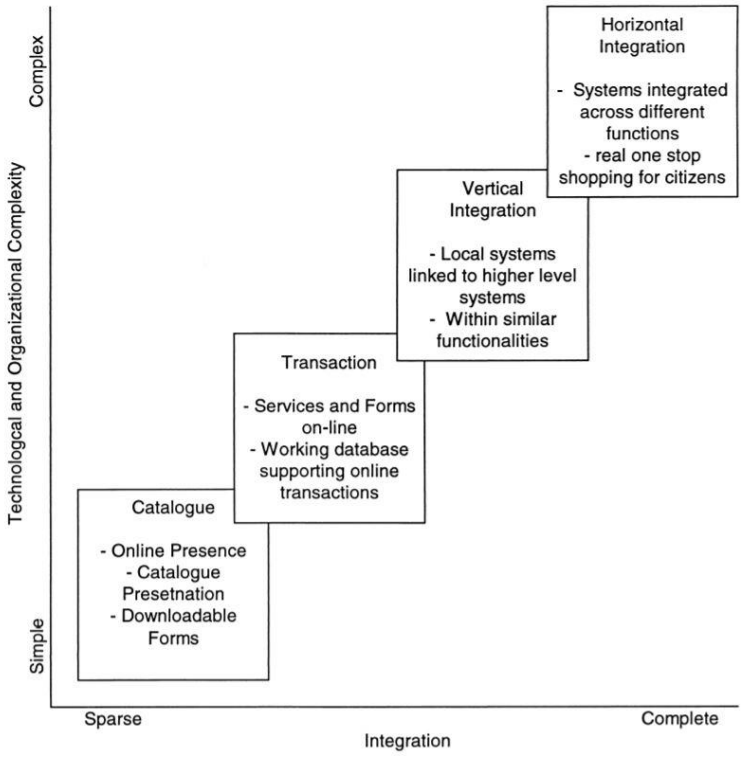

Figure 5: "Dimensions and stages of e-government development" (Layne and Lee, 2001, p. 124)

3.5 Evaluation of e-readiness of a country

E-governance implementation and quality is being measured annually by several publications. One of them is United Nations, which publishes an annual United Nations E-Government Survey 2016 (United Nations, 2016). The e-government readiness Survey measures the effectiveness of the service delivery in five areas, which are education, employment and labour, finance and social welfare. The Survey gives an overview about all 193 United Nations (UN) member states (MS) and is a good tool for government officials, policy makers as well as e-government consultants and everyone else that works in the area. Countries can compare and learn from each other's results. (United Nations, 2016)

For example, by 2016 already 111 countries had a Chief Information Officer (CIO) position fixed in the country, which makes 58% of the countries of UN (United Nations, 2016), that have a person in government that deals with information technology development and e-government services. The Survey also gives an overview about the e-government related legislation in the MS-s. E-participation in UN E-Government Survey is evaluated according to the elements listed in Table 2 below. (United Nations, 2016, chap. 3)

Assessed e-participation features in UN E-Government Survey
Availability of sources of archived information use of digital channels and open data technologies in the areas of education, health, finance, social welfare labour, environment
Availability of online information on citizens' rights to access government information (laws)
Evidence about government partnership/collaboration with third parties (civil society, private sector) to provide services
Evidence about free access to government online services through the main portal, kiosks, community centres, post offices, libraries, public spaces or free WiFi
Availability of open datasets, related policies/ guidance
Evidence about collaborative co-production, crowdfunding
Evidence about engaging citizens in communication to improve online services and raise citizens' satisfaction with them
Evidence about engaging citizens in communication on education, health, finance, social welfare, labour, environment
Availability of "personal data protection" legislation online
Evidence about opportunities for the public to propose new open datasets to be available online
Availability of e-participation policies/mission statements
Availability of public procurement notifications and tender results online
Availability of online tools (on the national portal) to seek public opinion and other input in raw form policy formation
Evidence about decisions made that included the results of consultation with citizens online in the area of education, health, finance, social welfare, labour, environment
Evidence about governments' publishing the outcomes of policy consultations online

Table 1: Assessed e-participation features in UN E-Government Survey

UN Survey also presents a list of countries according to the E-Participation Index (EPI), which is evaluated as very high, high, middle and low. There are 36 countries all together, that belong to the "very high" group (including Estonia) and 26 countries that are level "low", mostly developing countries. Also E-Government Development Index (EGDI) is provided, which shows, that according to the last Survey 15% (29 countries) of the MS countries had a "very high" level of e-government development index and 16% (32 countries) had a "very low" level of EGDI as "high" and "middle" are between those two accordingly with 34% (65 countries) and 35% (67 countries). (United Nations, 2016, p. 108)

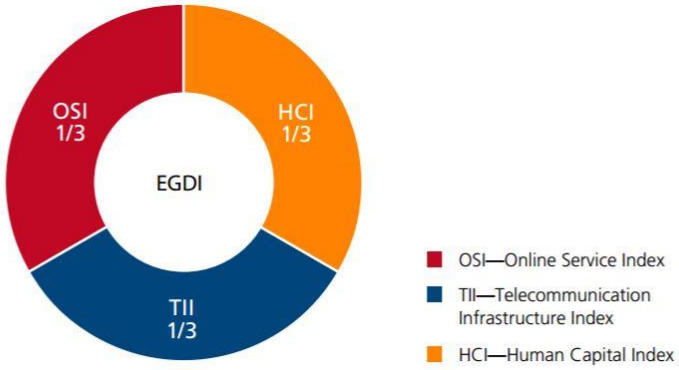

Figure 6: The three components of the E-Government Development Index (EGDI) (United Nations, 2016, p. 134)

E-Government Development Index consists of Online Service Index (OSI), Telecommunication Infrastructure Index (TII) and Human Capital Index (HCI) as illustrated on Figure 4. TII consists of five equal components (Figure 5) and HCI of three components (Figure 6), whereas OSI is calculated with a specially created equation.

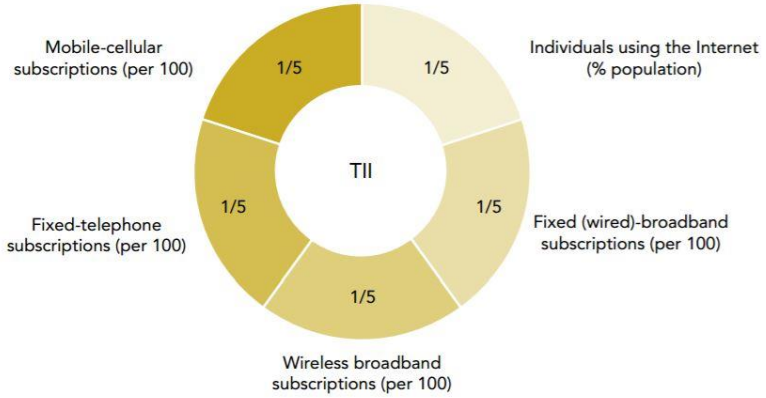

Figure 7: Telecommunication Infrastructure Index (TII) and its components (United Nations, 2016, p. 135)

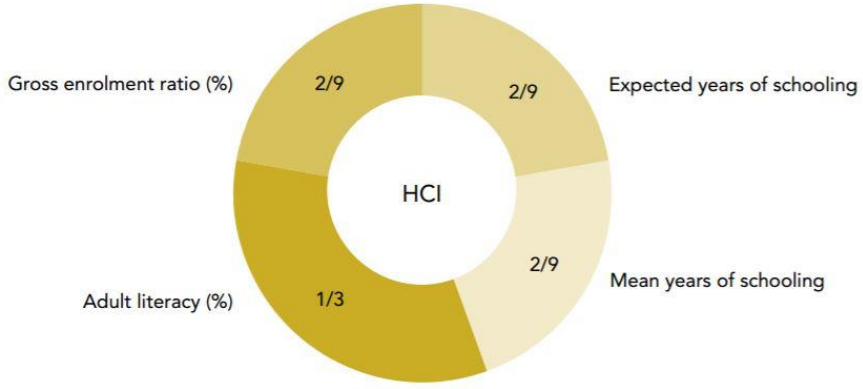

Figure 8: Human Capital Index (HCI) and its components (United Nations, 2016, p. 136)

3.6 Challenges and opportunities in e-government implementation and knowledge transfer

The E-Government Handbook for Developing Countries published in 2002 by the Center for Democracy and Technology lists 17 main challenges and opportunities in e-government development and implementation, which are being presented in Table 1 in current paper.

Challenges and Opportunities in e-government development		
1	Infrastructure Development	The existing of ICT infrastructure, possible partnership with private sector and mutual project developments. The level and quality of wireless internet. Technology usage in the country and e-literacy.
2	Law and Public policy	The accordance of governance and e-governance activities according to the law. Legal and regulatory framework for e-government.
3	Digital Divide	Digital divide is a big problem in mostly developing countries. The accessibility of e-services and services in general to the most vulnerable groups. In this area, also the society could be involved by donations.
4	- E-literacy	Provision of access and education in the field of computer skills.
5	- Accessibility	Public Internet access points. Suitable solutions also for the disabled people.
6	Trust	Trust between all participants in e-governance, consultants, public sector and private sector.
7	- Privacy	Protection on personal information.
8	- Security	Protection of government websites and databases, for example from cyber attacks. Backups and security awareness training necessary.
9	Transparency	To provide a transparent government and government decision-making process. Avoidance of corruption and transparent communication between the government and citizens.
10	Interoperability	Creation of IT infrastructure (for example Estonian solution X-Road - author's note), for organisations separately and also creation of an infrastructure solution so that the data exchange would be possible.
11	Records Management	For managing huge loads of data, record management systems are necessary to understand the capacity and the existence of a relevant data.
12	Permanent Availability and Preservation	Private sector entities collecting and storing historical data necessary for the future ruling or future data preservation to keep the knowledge.
13	Education and Marketing	Communication of e-services to the citizens so that they would not only exist but also be used.

14	Public/ Private Competition/ Collaboration	Encouragement of public-private sector collaboration. Ensuring, that necessary laws and policies exist.
15	Workforce Issues	Engagement of the staff to e-government developments, which ensures innovation to be taken over faster because the of the previous knowledge.
16	Cost Structures	The balance between costs and achievable goals.
17	Benchmarking/ Qualitative Methods	Creation of realistic goals to be fulfilled. Periodical evaluation of the e-government prerequisites to be fulfilled and the benefits of the developments in the field.

Table 2: Challenges and opportunities in e-government development (Center for Democracy and Technology, 2002)

The implementation of public services can sometimes be problematic in developing countries as the e-readiness of the country is not on a very high level. The aim of e-governance is to provide effective government and to bring citizens, government and businesses closer to each other with the help of e-government solutions. (Yousif and Sulaiman, 2015) The major challenges that occur during the implementation phase of e-government are listed by AbuAli and Almarabeh (2010), which are *infrastructure development, law and public policy, digital divide, e-literacy, accessibility, trust, privacy, security, transparency, interoperability, record management, permanent availability and preservation, education and marketing, public and private collaboration and competition, workforce issues, cost structures and benchmarking.* (Almarabeh and AbuAli, 2010)

Later in this paper European Interoperability Framework (EIF) is being discussed and it can be seen, that EIF addresses most of the issues mentioned in Almarabeh and AbuAli's paper.

Reynolds and Regio in 2001 have pointed out three shareholders in implementing e-government, which are businesses, citizens and government. (Sarrayrih and Sriram, 2015) brings out the main technical points of e-government, which should be concentrated on, that are ICT Infrastructure, IT Security, IT Standard, Technical Expertise. (Al-Rahbi et al., 2012) There are four dimensions in e-governance security defined, in which also are the biggest challenges. The four dimensions are cultural, legal, social and political areas, which are the prerequisite fields in e-government implementation. (Wimmer and Bredow, 2002)

One of the challenges is also the existence of prerequisites of the country and the overall e-readiness. For example, one of the biggest challenges while looking at e-governance solutions implementation is the lack of relevant legal acts related to e-services (Yousif and Sulaiman, 2015).

United Nations lists all together eight challenges when it comes to developing e-participation:

1. The objectives of e-participation and citizen engagement should be clear, as well as the strategy should be in place how to engage also vulnerable user groups, then a suitable technology can be chosen.
2. Transparent policy-making processes and citizen engagement.
3. Development of service-orientated mindset in the public administrations, provision of e-services and the necessity to technologically aware public sector staff.
4. Technology dependency, how to smoothly implement new technologies so that the systems are not needed to be rebuilt.
5. Reconnection with the civic society, different channels for that are necessary to meet citizen needs and offer e-services and additionally offer other alternative means of communication.
6. A huge obstacle is digital illiteracy of people and access to information technology.
7. Lack of political will and the necessity of *"processes and workflows to ensure that consultations contribute to decision-making."*

(United Nations, 2016)

4 Interoperability solutions in e-government

As there is no generally accepted e-governance framework available, then many countries have failed in implementing e-governance during several years (Hakikur, 2010). In this chapter I will have a look at European Union interoperability framework materials and other materials related to e-governance to learn the difference of the frameworks and how the knowledge transfer of e-governance know-how would be improved using those frameworks.

4.1 Interoperability solutions for public administrations, businesses and citizens in EU (ISA[2)])

After its predecessor, ISA, the Council of European Union and European Parliament confirmed a new program for interoperability solutions for public administrations, businesses and citizens, that lasts from 1 January 2016 until 31 December 2020. European Commission regarding this program has published two key interoperability documents, which are:

- European Interoperability Framework
- European Interoperability Strategy (European Commission, 2016a)

4.1.1 European Interoperability Framework

European Interoperability Framework (EIF) is created to support public administrations in cross-border interoperability, offer guidance to public administrations in their work of providing citizens and businesses public services and to provide support and guidelines in connecting different European level National Interoperability Frameworks (European Commission, 2010a).

The purpose of EIF is to provide guidelines for designing public services in EU member states (European Commission, 2010a). EIF emphasizes, that not only interoperability on local level is important, but this is also an important issue on European Union level, as to meet the customer needs, services should be provided to citizens and businesses. The main task of EIF is to give guidelines about how to harmonize the system of EIF and National Infrastructure Frameworks (NIF) to provide better European public services. (European Commission, 2010a)

EIF also lists the possible European public services, which are:

- *Business development,*
- *Taxes for citizens,*
- *Certificates and licenses,*

- *Education,*
- *Social security,*
- *Supply of statistical data,*
- *Work,*
- *Customs.* (European Commission, 2010a)

There are four main interoperability levels that are introduced in EIF, which are all equally important and should be taken into consideration when developing cross-European public services. These four levels are surrounded by **political context**, which means successful cooperation between public administrations, timely actions as well as relevant agreements. (European Commission, 2010a)

As follows, I will give a brief overview of all four main interoperability levels.

- **Legal Interoperability -** In addition to national legislation, EU member states should also think about how the data exchanged would keep their legal effect while exchanging data with other member states.
- **Organisational Interoperability -** means having the organizational structure and business processes in place, as well as related data exchange. This interoperability level also needs to ensure that the services are accessible and available to users, also in case changes occur. Business processes should be identified for better cross-European interaction.
- **Semantic Interoperability -** This is a relatively new area on EU level and means a creation of a collection of semantic interoperability assets. Data exchange between member states, that have a very different cultural and linguistic background, it is difficult to ensure that during data exchange, the meaning of the data remains the same. Semantic Interoperability helps to achieve that.
- **Technical Interoperability –** While political, legal, organizational and semantic aspects are related to public administration, then technical interoperability does not have to be precisely public administration specific. Still it is important to achieve technical interoperability to provide the technical solution for data exchange between different parties. (European Commission, 2010a)

4.1.2 European Interoperability Strategy

European Interoperability Strategy (EIS) is created to give guidelines for public administration to move towards EU level interoperability. This is important for the development of the Union and making sure that the solutions used by member states are compatible with each other. (European Commission, 2010b)

EIS lists two types of strategical approaches, which are *top-down (global)* approach and *bottom-up (sectoral)* approach, whereas the former concentrates on political and economic changes on international scale and takes EIF, EIS and for example Digital Agenda for Europe and Europe 2020 strategy into account and the latter deals more with sectoral specific topics and developments to deal with interoperability challenges. (European Commission, 2010b)

4.1.3 Knowledge Transfer in EU level

European Commission supports knowledge transfer with a project National Interoperability Framework Observatory (NIFO), which provides information about national interoperability frameworks to share knowledge and experience between MS public administrations. (European Commission, 2010a)

4.1.4 Estonian Interoperability Framework

NIFO Factsheet gives an overview about Estonian Interoperability Framework. First of all, it confirms, that Estonia is fully in compliance with the recommendations and guidelines of EIF (Viik, 2015). Most of the criteria is met using Estonian data exchange layer X-Road. Except for interaction processes between administrators, all levels of interoperability are being monitored by Estonian State Information System's Authority (RIA) and all services and changes are an object to be registered in State Information System RIHA. (Viik, 2015)

4.2 Government interoperability framework

Government interoperability framework has four main components:

1. Interconnection – the possibility to communicate with different systems.
2. Data integration – the compatibility of the system with other public sector systems, so that information could be exchanges.
3. Information access and presentation – e-government services accessible for the citizen.
4. Content management and metadata – storage or necessary documentation and data collections.

(Shrivastava et al., 2010)

Interoperability is one of the biggest challenges, as mostly there is no central web service or one-stop-shop for e-government services. All the ministries and government organizations develop their own solutions and later it is difficult or almost impossible to make the systems to communicate to each other or exchange information. (Shrivastava et al., 2010)

For example, the e-government in India has following interoperability issues:

- *E-Governance Applications are developed independently, as stand-alone*
- *Applications are tightly coupled to their own sets of data & processes*
- *Too much data, and not enough information*
- *Isolated domains of information*
- *Too expensive to bridge to meet the requirements of Interoperability*

(Shrivastava et al., 2010)

4.2.1 ITU framework

International Telecommunication Union (ITU) has published a document about giving an overview of e-government dimensions' framework and tools for the evaluation of e-governance readiness in the country. ITU has developed a *"e-Government Readiness Quick-check Tool"* to assess the country's e-readiness. (International Telecommunication Union, 2009) *"The tool provides a graphical illustration of a country's readiness status on four dimensions of the e-government environment: Infrastructure, policy, governance and outreach."* (International Telecommunication Union, 2009) E-government can mostly be seen in countries as information provided online via internet on public sector institutions' homepages, but some countries also are providing e-services online for the citizens. Providing e-government services online can reduce costs, bring government services closed to citizens and lead to more effective governance, which thanks to e-participation leads to wider e-democracy and increases transparency of government interactions. (International Telecommunication Union, 2009)

ITU's framework differentiates four main areas, which it uses for analysing e-readiness of a country, which are infrastructure, policy, governance and outreach. (International Telecommunication Union, 2009)

Three additional indicators apply to the four main areas of e-readiness measurement areas:

"Indicators and indices on general aspects of a state, economy or society;

General e-readiness indicators, describing how different sectors of an economy or society are positioned to make use of ICT;

Core e-government readiness indicators, which target the thematic more narrow aspect of government using ICTs" (International Telecommunication Union, 2009)

The quick-check tool lists another five indicators to evaluate and produce information about them in a checklist, that are:

- Access through which means of communication,
- Width of service,
- Depth of service,
- Service coverage,
- Quality of service. (International Telecommunication Union, 2009)

Outreach

The result of governance, when services have reached the citizens and final users, how many people actually do have access to the services. The aim is to create a "one-stop shop" with e-government services, that could be reached also from the distance. The challenge is how to reach the older people as well as people from rural areas and how illiteracy is influencing the provision and usage of e-services. (International Telecommunication Union, 2009)

Indicators

Outreach gives an overview about how many e-services are provided and how accessible they are, as well as if the demand of services actually meets the demand and vice versa. United Nations Department of Economic and Social Affairs (UNDESA) in *"UN E-Government Survey"* measures indices like *"Web Measure Index"* and the *"E-Participation Index".*

"Human Development Index" (HDI) of the United Nations Development Program (UNDP)

"Human Capital Index" by UNDESA

"ICT Development Index" (IDI) and "ICT skills" sub-index by ITU

(International Telecommunication Union, 2009)

Governance

Public sector services and "good governance", the speed and quality of services provided. (International Telecommunication Union, 2009)

Indicators

The indicators about governance are related to the quality and quantity of governance in general. The rule of law, corruption, freedom, the level of democracy and other areas are measured and there are several different indicators by different institutions provided annually like:

"TI Corruption Perceptions Index" by Transparency International (TI)

"World Development Index" by the World Bank

"Worldwide Press Freedom Index" by Freedom House

"E-Readiness Report" by Economist Intelligence Unit

"Bertelsmann Transformation Index" provided by Bertelsmann Stiftung

"Global Competitiveness Report" collected by the World Economic Forum

"World Governance Indicators" (WGI), collected by the World Bank

(International Telecommunication Union, 2009)

Policy

Policies and laws set by the government related to e-government and e-governance. The availability of e-government strategy, cyber security and data protection laws. (International Telecommunication Union, 2009)

Indicators

The policy dimension part of the framework includes the government policies, legal framework, action plans and e-government strategy. The World Economic Forum's (WEF) main indices used are the legal framework of (1) the electronic commerce, (2) digital signature and (3) consumer protection. (International Telecommunication Union, 2009)

Infrastructure

Technical solutions for the transportation of information and provision of services. Some preconditions are considered to be, electricity, internet subscription and mobile access. (International Telecommunication Union, 2009)

Indicators

As there is no data collected in general about the infrastructure in the countries, then this remains the responsibility of the ministries of their own. Sometimes even the country's institutions itself are not aware of the situation of relevant infrastructure. The situation is a bit better, when it comes to the services that are provided to the citizens and businesses. ITU itself published a new index in 2009, which is *"ICT Development Index" (IDI),* that consists of the indices the *"Digital Opportunity Index" (DOI)* and the *"ICT Opportunity Index" (ICT-OI). ICT access sub-index* and the *ICT use sub-index* are also a part of the e-Government Quick-check Tool provided by ITU. The use of these indicators is useful, when the real usage of services can be measured. (International Telecommunication Union, 2009)

The Economist Intelligence Unit (EIU) is using three new indicators in their yearly "E-readiness Rankings" paper, which are (1) use of internet in general, (2) use of public services by citizens and (3) use of public services by businesses. In addition, it is said that it is difficult to actually receive valuable information to be compared. (International Telecommunication Union, 2009)

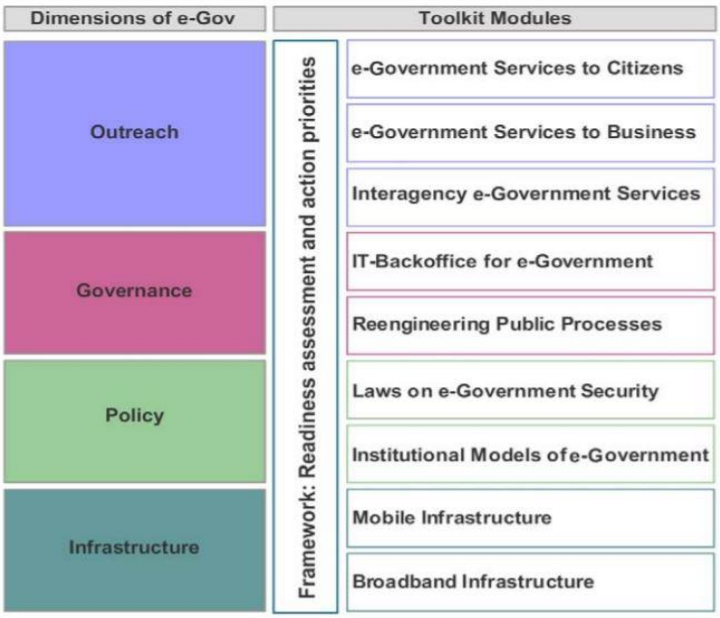

Figure 9: Four dimensions of e-Government environment (International Telecommunication Union, 2009)

Above (Figure 9) we can see the proposed e-government framework by International Telecommunication Union (International Telecommunication Union, 2009).

4.2.2 ITIL

The Information Technology Infrastructure Library (ITIL) framework, initially provided by the British government, is a framework mostly concentrating on government and business interaction meant for IT Service Management (ITSM). ITIL was founded already in about year 1980, when the first data centres appeared. ITIL helps to "standardize the selection, planning, delivery and support of IT services to a business." (Rouse, 2014)

ITIL framework is published in five main books, which are constantly updated during the technology development process. Each of the five books concentrates on one phase of the IT service lifecycle*." ITIL Service Strategy explains business goals and customer requirements. ITIL Service Design shows how to move strategies into plans that help the business. ITIL Service Transition shows how to introduce services into the environment. ITIL Service Operation explains how to manage the IT services. ITIL Continual Service Improvement helps adopters evaluate and plan large and small improvements to IT services."* (Rouse, 2014)

ITIL Framework	
Service strategy	Strategy management for IT services Service portfolio management Financial management for IT services Demand management Business relationship management
Service design	Design coordination Service catalogue management Service level management Availability management Capacity management IT service continuity management Information security management Supplier management
Service transition	Transition planning and support Change management Service asset and configuration management Release and deployment management Service validation and testing Change evaluation Knowledge management
Service operation	Event management

	Incident Management Request fulfilment Problem management Access management Service desk function Technical management function IT operations management function Application management function
Continual service improvement	Seven-step improvement process

Table 3: Processes and functions across the ITIL service lifecycle (AXELOS, 2013)

ITIL provides a set of 30 different questionnaires for an organization's self-assessment, in order to understand, on which level the organization currently is and which areas need to improve according to ITIL framework. (AXELOS, 2013)

Not all aspects of ITIL are applicable to all organizations, in this sense the framework is customizable. ITIL mostly concentrates on e-governance services analysis on the basis of service delivery and service support. (Hesson et al., 2012) ITIL is not specifically an e-governance framework but since it is service specific, it could be used in designing and implementing e-services.

4.3 Transfer of E-government frameworks

The E-Government Handbook for Developing Countries (2002) presents five elements of successful e-government transfer, that are *„process reform, leadership, strategic investment, collaboration and civic engagement".* (Center for Democracy and Technology, 2002) If those five requirements are fulfilled, then the cooperation between different collaborators is easier and flows naturally, it means that all parties are interested in the development of processes and all the relevant parties are participating in the development, decision-making and integration process.

Misuraca mentions in his book, that there are no overall assessment frameworks exist regarding the assessment of ICT and public sector interaction. (Misuraca, 2007, p. 4) Ming (2013) in book „e-Governance for Small States", has brought out one possible e-governance framework (Figure 17), which emphasizes the importance of e-government strategy on top of everything and then puts the necessary components together. We can also see, that Ming distinguishes the service interaction between citizens, businesses and government. (Ming et al., 2013)

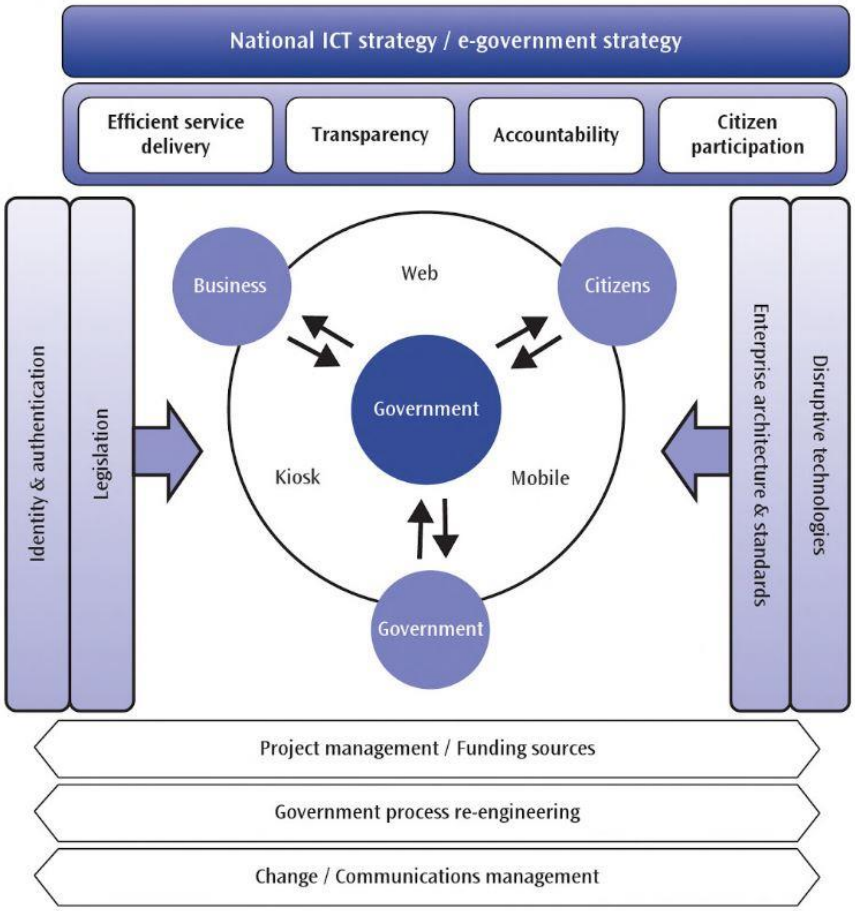

Figure 10: E-governance framework (Ming et al., 2013)

European Commission has called an initiative *JoinUp*, which provides data collections about the member states e-governance situation to have this as a tool of sharing knowledge and best practices. For every country, there is a data sheet, where an overview can be seen, this is done by National Inferoperability Framework Observatory (NIFO). The material is precisely created to help with reusing e-government data and overviews from year 2014, 2015 and 2016 are available (European Commission, 2016b) NIFO Country Factsheet about Estonia is being analysed previously in thesis and the Factsheets could also be a good tool for Estonia to learn from others as this Factsheet is being produced about every member state and the final reason for doing so is to make knowledge transfer between member states easier.

5 Improvement of Estonian e-governance knowledge transfer

As Estonia is seen as a trendsetter in e-governance in Europe (Crouch, 2015), then in the following chapter I will have a look at Estonian example. Currently in Estonia there are several agents already used for better knowledge transfer in the field of e-governance. I will bring some examples of them in chapter 5.1.

5.1 Agents of e-governance knowledge transfer

5.1.1 E-governance Academy

E-governance Academy (EGA) is an Estonian NGO, which is consulting countries all over the world and is the institution created in 2002 by Estonian Government, Open Society Institute and UNDP. EGA is an organization, which is spreading Estonian e-governance know-how all over the world helping other countries to learn from Estonia's mistakes and success stories. ("e-Governance Academy," 2016)

5.1.2 Tallinn e-Governance Conference

Tallinn e-Governance Conference is an annual conference hosted by EGA at the time of Estonian ICT week. The conference is mainly meant for the *government decision-makers, donor organisations and companies* dealing with technology development in the field of e-government. Also, students are welcome to the conference. Every year key people from e-governance field from all over the world including Estonia are giving speeches and participating in the panels. This is also a great place for making necessary new contacts in the field. (EGA, 2016) In year 2015 more than 200 people from 35 countries attended the conference. (Vahtra-Hellat, 2016)

5.1.3 Estonian ICT week

Estonian ICT week is another annual event that brings together people and area specialists from all over the world. Tallinn e-Governance Conference is a part of it as well as Nordic Digital Day and Latitude 50 tech and start-up conference. The week is full of different other conferences, events for ICT sector and start-up society. (Enterprise Estonia, 2016)

5.1.4 E-Estonia Showroom

E-Estonia Showroom is hosting international delegations and introducing the e-Estonia success story. Showroom has hosted visitors from more than 120 countries and it is possible for everyone to visit the centre with a prior booking. During presentations, a broad overview is being given about

different Estonian e-solutions for example e-voting and also hands-on live demonstrations are possible. (e-Estonia Showroom, 2016)

The Showroom is situated in Tallinn, the capital of Estonia and is very close to the airport so that delegations arriving and leaving the country can even drive directly by while on the way from or to the airport.

5.1.5 E-Governance Technologies and Services Master's program

This is a 2-year long Master's program in Tallinn University of Technology (TUT) (Tallinn University of Technology, 2016), which is a very good tool for knowledge transfer, as people come to Estonia from all over the world to study e-governance. During the same time, they also spend two years in Estonia and they have plenty of time to use many of the provided services online and to try different e-solutions out with the knowledge gained from the lecturers and also with the help of local fellow students.

The program gives an overview about the creation of technologies and services as well as marketing the solutions. The graduates have a broad overview about what e-governance and e-government are and get an overview of the evolution of it starting from historical background to this day with all the necessary legal frameworks and other necessary components. The program was first introduced in year 2013 and since then people from all over the world have joined it. There have been students all together from 22 countries like Georgia, Turkey, Ukraine, Norway, United States of America, Palestine, Sri Lanka, Nigeria, China, Russia, Hungary, Moldova, Indonesia, Belgium, Bangladesh, Namibia, Nepal, Pakistan, Zambia, Germany, Netherlands and of course Estonia. (egov.ee, 2016)

As I am also one of the students who has now passed this program, then I know that some of the students still are living and working in Estonia but many of them have already gone back to their home countries and some also working on not only transferring the knowledge but also to cooperate with Estonian companies providing the technology to also transfer the related technological solutions from Estonia to their homeland.

5.1.6 Estonian ICT Cluster

Estonian ICT Cluster, operated by the Estonian Association of Information Technology and Telecommunications (ITL) unites together Estonian ICT companies mainly with the interest in exporting to foreign countries. *"It is ICT enterprises co-operation platform, which objective is to*

increase the usability of ICT in other economic sectors of domestic and foreign markets." The Cluster introduces Estonian solutions abroad as well as is helping with the cooperation with Estonian companies and encourages also the local companies to cooperate. (Estonian Association of Information Technology and Telecommunications, 2013)

5.1.7 Former Estonian President Toomas Hendrik Ilves

The previous Estonian President Toomas Hendrik Ilves has been the real ambassador of e-Estonia. He has been giving many interviews and mentioned Estonian e-success story in many of his speeches. For example, Ilves has been talking about Estonian e-solutions in a video published by the World Economic Forum, where he is introducing the e-services that Estonian citizens are able to use, emphasizes the trust and security of the systems and tells about the importance of a two-factor authentication system. (Work in Estonia, 2016)

President Ilves had ICT development in his agenda as a main priority in a country so small like Estonia, he saw ICT Estonia's biggest strength and has been promoting e-Estonia all over the world. (Keen, 2016) He is also using Facebook (Facebook, 2016) and Twitter (Twitter, 2016) very actively for expressing his ideas and thoughts and sharing information that he thinks is important, which in many occasions is again about the ICT developments.

5.1.8 Estonian e-Residency

In December 2014 Estonia was the first country in the world to introduce a solution called e-Residency, which means that the applicants receive an ID-card which contains a special chip, that allows them to use the services offered by Estonian private and public services, use digital signature for signing documents and file encryption (Alender, 2016).

Estonian e-Residency card does not replace a personal identification document, neither is it a travel document. Still it allows you to *digitally sign documents, verify the authenticity of signed documents, encrypt and transmit documents securely, establish an Estonian company online, administer the company from anywhere in the world, conduct e-banking and remote money transfers, access online payment service providers, declare Estonian taxes online.* (e-Estonia, 2016)

As of today, the statistics of e-Residency program shows that there are already applicants from 136 countries all over the world. The main applicants divided by gender are 88% men and only 12% women. From the whole amount of 15 662 applicants already 14 603 have received a positive answer to their application, which makes 93% of positive answers to from all applicants. In November 2016,

the amount of companies owned by e-Residents in Estonia was 2302 companies, 2063 companies had someone from e-Residents engaged in their activities and all together 1147 new companies had been established by e-Residents. (e-Estonia, 2016)

E-residency program has got a lot of publicity in the local as well as foreign media since the publication of the program and the numbers show that it has actually been very successful. With the help of this program definitely the awareness about where Estonia is located will improve about the success story in the field of our e-solutions will be told in more and more places in the world.

5.2 E-governance Academy

On EGA's example we can see the reuse of one existing (Estonian know-how) knowledge, that is transferred to other countries and organizations with the help of different knowledge transfer tools.

5.2.1 Prerequisites of knowledge transfer according to EGA

Currently, the evaluation of e-Government readiness made by EGA consists of 2 phases, which is being followed by the 3rd, technology phase.

In evaluation, there are three phases that are being assessed:

1. Organisational readiness,

2. Legal Framework existence,

3. Technological readiness.

Usually every country already has some systems or data collections in place. As the first step, it is necessary for the representatives to fill out the given questionnaire to get a broader picture of what prerequisites for e-government solutions are already in place. Additionally, it would be useful to Google the country's documents and databases, because often it also happens that there are already some systems in place or documents existing but the representatives that turn to EGA are not aware of those materials. It also happens often that there are different data collections existing, which do not have web services built on them, so they are not actually available to the citizens neither different government authorities.

Following the questionnaire to be filled out, there starts a cooperation part including a lot of teamwork. As the first step, mostly the country's delegation comes to Estonia for a study trip, they spend about a week in Estonia, have training and can familiarize themselves with the positive examples of Estonian e-services and e-governance solutions.

After that also the specialists from EGA, Estonia also go to the target country to see what services are already in place and working and to better analyse what else should be done and what suggestions there would be to the target country. After those study visits a real project plan will come up from.

The readiness analysis and existing infrastructure analysis will be prepared after the first phase. It also includes a pilot or a test application.

The country will finally have a precise description in place what should be done towards developing to an e-country. Regarding from that description it is possible to put together the documents for calling a procurement, which brings us to the third phase, which is technology implementation. It is not possible to achieve the third phase without not going through the first two phases as the country might not do right decisions based on not knowing what would be necessary to further develop. If the proof of concept will not be made, then it is very difficult to be sure what is actually needed. Mostly the country lacks also background knowledge about what services and regulations are already in place.

The steps to take usually vary country by country, as some countries already have some solutions or want to restructure the system, also the speed of the outcome depends on the size of the country. Depending on the size the pilot project could be implemented from 2 weeks, but it could also take several years.

Some countries on the other hand have everything on paper and no electronic data collections exist. On the other hand, some of the countries have data collections in place but they are not connected to web services.

The outcome of the work would be that the country will have a general overview and a structure place, which is the basis on creating e-governance solutions. The structure is something, which in Estonia is put into system named RIHA. RIHA, which is mainly meant for X-Road implementation is one of the best semantic asset management systems in Estonia. A solution similar RIHA would be the tool/instrument to implement large e-government solutions.

5.2.2 Work method of EGA

In this chapter I will give an overview of the current work method of EGA by using the questionnaire they have created for e-government readiness analysis used by the organisations. To analyse the questionnaire that EGA is currently using analysing the country's current state in e-government, the questions need to be reviewed. I. The questions have varied a bit depending on the

country being analysed. The questionnaire has two parts, the first one is related to implementing e-government architecture and the second part related to electronic ID. (Ott, 2016a)

I have analysed the questionnaire used and will give a brief overview of the content. The questionnaire has 7 big chapters for which the answers are needed:

1. *Organisational structure* - the existence of CIO, responsible organisations etc.
2. *Infrastructure* – the existence of a government information exchange system.
3. *Legislation and strategy* – different legislations related to e-government.
4. *State databases and information systems* – registries in the country, do they exist at all and are they digitised or on paper.
5. *Digital identity management, digital signatures and trust services.*
6. *Interoperability framework* – which web services are available etc.
7. *E-government development priorities* – are there any priorities listed in some national document. (Ott, 2016a)

5.3 Best practices of Estonia

The main components of Estonian e-infrastructure are X-Road, semantic asset management system RIHA, Public Key Infrastructure (PKI) and state portal Eesti.ee (Raidmaa, 2016). In Estonia, the *re-use of Public Sector Information (PSI)* is regulated in Public Information Act (2001) (European Commission, 2016b).

The processes delivered in Estonian e-government are as follows:

- *Strong Digital Identity (ID-card);*
- *Digitalized Information Systems & Databases;*
- *The X-Road to provide a data exchange layer.* (Pappel, 2015)

The Estonian e-government backbone - X-Road illustration can be seen on Figure 11.

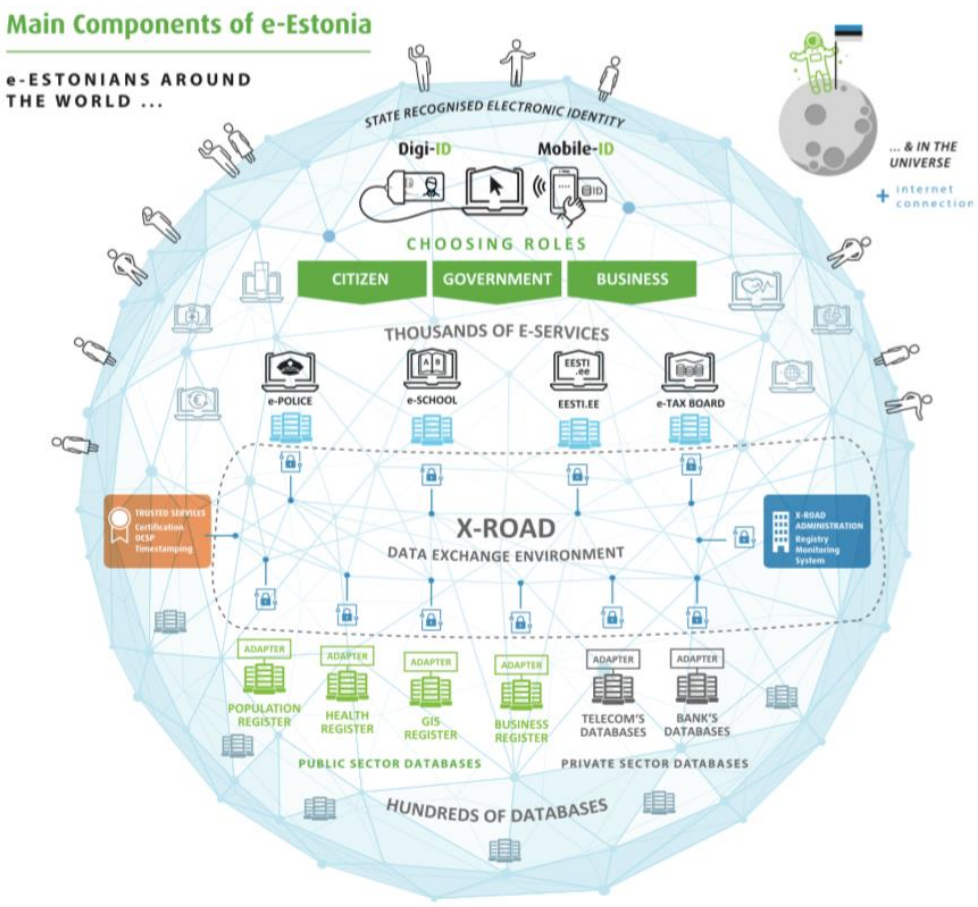

Figure 11: Estonian X-Road platform and connected services (EGA, 2016)

From the previous figure, we can see that there are hundreds of databases and thousands of e-services, that communicate to each other via X-Road data exchange environment. The locks on the figure illustrate the security of the system, as authentication is required every time when logging in to a registry or data repository to be sure the data is not being misused. There are two different ways of authentication recognized by the state, which are either with the ID card or mobile ID. X-Road connects citizens, businesses and governments and makes the communication easy and time-efficient.

Estonian System Architecture framework would look like this:

The major principles behind e-Estonia are the following:

- *Centralized policy development*
- *Decentralized implementation*
- *Transparent and efficient public sector*
- *Neutrality of technological platforms*
- *Citizen/ customer orientation*

- *Functioning model for protection of personal data*
- *Measures against digital divide* (Rikk, 2016)

5.3.1 X-Road

X-Road is a government data exchange layer, a secure internet-based tool with what different government institutions can exchange data. X-Road is a good tool for data exchange, but it does not store any data repositories in itself, it only requires data from other repositories, registries or data collections via X-Road. Joining X-Road will automatically give an organization authentication tools via ID card, mobile ID or bank. X-Road includes "*authentication, multilevel authorization, high-level log processing and monitoring, encrypted and time stamped data traffic".* (Vassil, 2015)

Recent developments also allow big quantities of data to be send over internet and the possibility to simultaneously use data, that is stored in different databases. (European Union, 2015)

5.3.2 PKI

PKI, the eID Public Key Infrastructure, is a way of secure digital authentication with the possibility to digitally sign documents. There are several institutions in Estonia that dealing with maintenance of PKI system, different responsibilities are divided by many institutions. For example, Estonian Information System Authority (RIA) is responsible for different applications necessary for PKI usage, Department of State Information Systems (RISO) is responsible for the legal framework around PKI, Police and Border Guard Board is offering means for secure authentication and signing and ID card base software help is provided by ID card help centre by Certification Center. (Raidmaa, 2016)

5.3.3 Eesti.ee

Eesti.ee is a secured gateway to 99% of the e-services provided online in Estonia. This is a single point of contact solution (Rikk, 2016), where you can access almost all of the provided e-services online may it be your prescription and health information, education information or your assets like cars and real estate and even pets (eesti.ee, n.d.), the list is very long. In year 2014 Estonians from more than 200 countries all over the world visited eesti.ee using all together 815 e-services (Rikk, 2016).

5.3.4 RIHA

Semantic asset management system RIHA. For all the government data and data repositories it would be good to have a semantic asset management system to have an overview about the structure

and components. Estonia has a unique system called RIHA, which I am going to explain a bit in the next chapter. (RIHA, 2016)

What is RIHA

RIHA is Estonian State Information System (European Commission, 2016b). RIHA is an environment for requirements and procedures and is supporting and classifying Estonian e-government backbone X-road system. RIHA is a national information system management tool in Estonia, but also unique in whole Europe and has also been internationally recognized.

CatIS

CatIS is a system like RIHA, but developed by E-governance Academy and used to help the countries which they consult to better understand their country's frameworks. EGA in its work uses the system named CatIS, which is a catalogue of interoperability solutions. ("CatIS - Home," 2016)

5.4 What Estonia could learn from other practices

As I mentioned in the beginning of my thesis, that the reusable components and legal framework of e-governance most often does not exist at all in a country (Ott, 2016a). This is also a very big problem for example in India, where systems are developed in isolation and when needed, then there is no possible infrastructure, how different public sector solutions should communicate to each other so the solutions are called *self-contained islands of isolation.* (Shrivastava et al., 2010)

Actually, all the necessary elements are already existing in Estonian e-government system so my suggestion would be to use the Estonian best practice knowledge and use European Commission and UN materials as complementary information sources, that could provide extra information as well as preliminary information about a country's e-government readiness state.

While governments start to plan their e-government developments, then as the first thing, an e-government strategy should be in place, which is not only a document, but gives direct guidelines with measurable results. For example, how to avoid several separate isolated data collections, would be to plan the e-government infrastructure as a one project not only ministry by ministry. Planning this all together makes integration later easier, even internationally. As an example, I would like to bring Finland, who took over Estonian solution X-Road and as the solutions are developed on a same platform, then it is easy to start exchanging data also between countries not only inside one country.

The result would look like this, where government is not an isolated data island, but all counterparts would communicate with each other proximately:

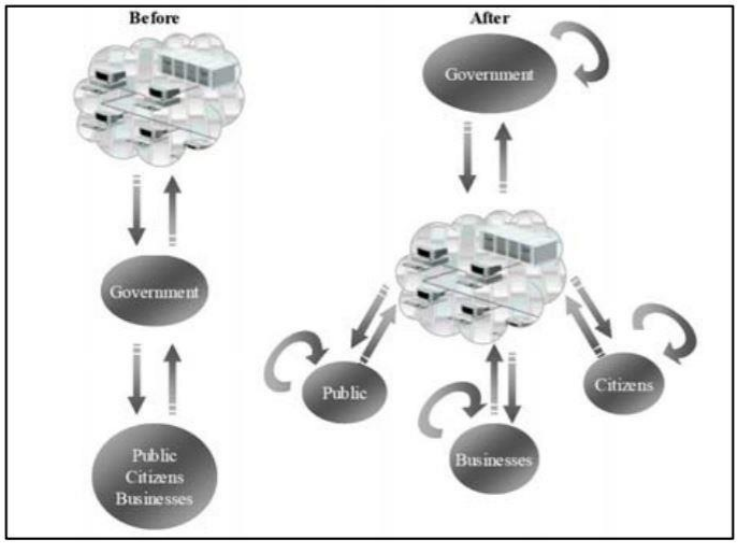

Figure 12: E-government "Go on-line instead of in-line" (Almarabeh and AbuAli, 2010)

5.5 Methodology recommendation for e-governance knowledge transfer

As I was giving an overview about knowledge transfer in the second chapter in this thesis, then we could actually see that the interaction and interaction between different knowledge types is very important, as it creates a bigger knowledge base and higher return in value.

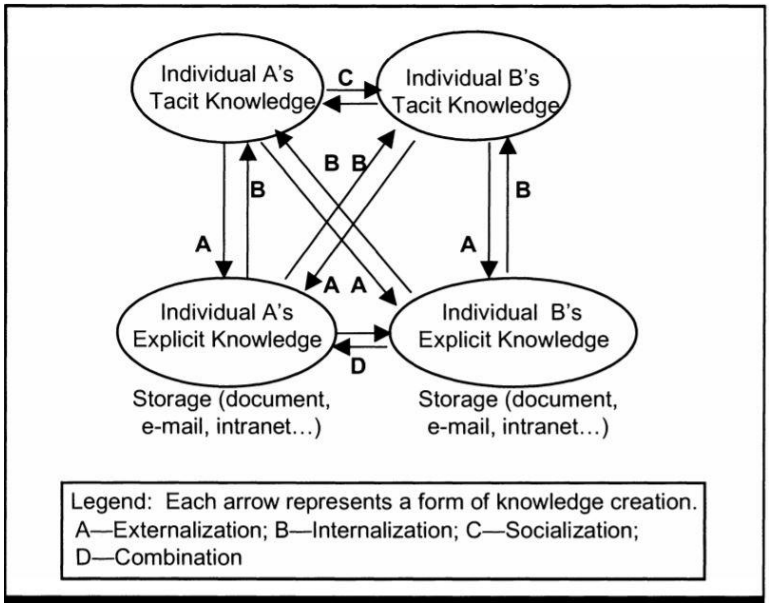

Figure 13: Knowledge Creation Modes (Alavi and Leidner, 2001)

As Estonia is a ‘market leader’ in e-governance solutions and e-services then it would be good to learn from its experiences. My recommendation would be to create a new e-governance framework by the experts in the field of e-Governance Academy in Estonia, which would be recognized as the five main frameworks that are discussed in this thesis. For creation of the methodology knowledge transfer would be a good option to use, thinking about the four phases of Nonaka’s spiral of knowledge, combining explicit and tacit knowledge (Figure 2). This would be a basis of international knowledge transfer and as the author went through a lot of findings then it seems that no complex e-governance frameworks, that is acknowledge internationally exists yet, so here is a gap to fill.

Also, the questionnaire of EGA should be reviewed and improved, which means a future analysis would be necessary to define the gaps which are not covered yet with the questionnaire. As a forward-thinking e-Country Estonia, I would also suggest to virtualize the questionnaire, after it is modified, to have a bigger variety of questions to answer online with the helping comments, so that more detailed data about the country would be received. Virtualization enables also to use analyzing tools better and as well as create reports of the results easier with not much additional work. It would also save time and make knowledge transfer more efficient.

5.5.1 Methodology proposal in the context of EIF

As a first step in methodology creation the four main interoperability levels, as well as political context in addition, introduced in EIF (European Commission, 2010a) could be used.

- **Political context –** if there is any political will of the changes. Analysis of corruption level of the country and if transparency of e-government would be wanted at all.
- **Legal Interoperability –** Local and international legislation that applies. The existence of data collections and state databases.
- **Organisational Interoperability –** Business processes written down and understood. Here it must be looked at if the country has decentralized or centralized government. A decentralized government (for example Estonia and the United States of America) is where decision-making process is distributed within the system and usually is not the responsibility of one person, place or legislative institution, on the other hand a centralized government (for example Singapore or France) is one in which the power is centralized in one institution or legal authority, which then coordinates the subject institutions (Way, 2015).

- **Semantic Interoperability -** In chapter 5.3.4. Estonian State Information System RIHA was explained, which is one of a kind in Europe. CatIS as a catalogue for interoperability solutions developed by EGA could be used as a tool for countries in the process of knowledge transfer.
- **Technical Interoperability –** X-Road or other technical solutions that will be suitable for the country to be implemented and which allows to communicate with other Ministries or Institutions databases and acquire information from them.

5.5.2 Methodology in knowledge transfer perspective

I analysed the methodology, while putting it in knowledge transfer perspective explained in the current thesis chapter 2 and using Nonaka's (Hildreth and Kimble, 2002) knowledge transfer spiral a very simplified model would look like presented in the following table.

	Tacit	Explicit
Tacit	**Socialization:** Study visits discussions	**Externalization:** Filling in the questionnaire
Explicit	**Internalization:** Training public sector institutions and government officials, pilot test projects	**Combination:** Writing strategy and action plan how to implement the solutions, creation of eGov documentation

Table 4: E-governance knowledge transfer using Nonaka's spiral

6 Summary and conclusions

In this thesis is about knowledge transfer in e-governance. I used Estonian example as a source for best practices with its four main components data exchange layer X-Road, semantic asset management system RIHA, government portal Eesti.ee and PKI.

The thesis begins with an introduction where the theoretical background is being explained, as well as research problem, methodology and questions presented. Introduction also contains literature overview and a brief overview about e-Governance Academy as well as the reason why I chose Estonia.

The second chapter gives an overview about what is knowledge transfer, the discussion continues in the third chapter, where knowledge transfer is put into e-governance perspective. In chapter three, also concepts e-government and e-governance are explained and compared to each other as well as I had a look into how e-readiness is evaluated and e-government developed at all and what are the challenges in this field.

The fourth chapter gives an overview about European Interoperability Framework and European Interoperability Strategy where knowledge transfer is being implemented with the help of National Interoperability Framework Observatory.

In fifth and last chapter, I came to the topic knowledge transfer on the example of Estonia and how the process could be improved. In this chapter I gave an overview about the tools that are already successfully used for e-governance knowledge transfer. I also gave an overview about the four main components of e-Estonia infrastructure, that are X-Road, RIHA, PKI and Eesti.ee. In the end of this chapter I proposed a methodology recommendation for future development.

6.1 Limitations

As in Chapter 2 and 3 in this thesis knowledge transfer and knowledge transfer in e-governance is explained, then according to the theory there might occur some limitations. It might be difficult to transfer knowledge when for example the other side does not want to acquire the knowledge, does not want to learn. No one wants to hear that they are missing something and someone else is better than they are. It might also occur as a problem with government officials or regular IT staff. When the other side is not ready to learn, then it is almost impossible to transfer knowledge to the other side.

Technology cannot be implemented before the basic framework and legislation exist. For that the JoinUp initiative (European Commission, 2016b) and also this paper suggests reusability of e-government components that already exist. The reusability of components would need more advanced development and better cooperation between the countries. Technology implementation would be the last step, because then we can also be sure, that we get the expected result and can avoid for example the failure of government institutions mutual communication.

6.2 Conclusions

In this thesis, I had a look at what is knowledge transfer and how knowledge could be transferred in e-governance field. I also discussed in the thesis the problems of so called isolated islands, that are e-government solutions created, which are entirely separately from a central system and the result is that every ministry in a country has its own data collection but no information exchange between the data collections occurs.

Estonia in means of e-governance solutions is a good role model. As President Toomas Hendrik Ilves has said, that Estonia had to create a solution like X-road, because we were too poor to afford ourselves a fancy expensive solution, which actually is not even as functional (Bershidsky, 2015) For solving the isolated island problem, it is good to have a look at Estonian decentralized system, where data exchange between different institutions is possible via data exchange layer X-Road.

I also gave an overview about current actions in the field in European Union, as well as about Estonian success stories in the field of e-governance, which are X-Road, state portal Eesti.ee, Public Key Infrastructure for secure authentication and state information management system RIHA. As a result of the thesis I suggest recommendations for methodology creation using knowledge transfer principles, which could be the first complex e-governance framework. According to European Interoperability Framework there are four main elements of interoperability framework, that are organizational, legal, semantic and technical elements, which are surrounded by the political context. We can see that technology only is not enough for e-government implementation but all the necessary elements need to be considered. As every country is different, then those elements could be the basis of analysis and implementation, but it is impossible to implement one country's solution to the other without previously analysing the elements in the context of the target country but every time political, organizational, legal, semantic and technical aspects should be considered.

6.3 Proposal for future work

As a future work, I suggest creation of a new complex e-governance framework on the basis of knowledge transfer processes. A lot of research has to be done in this area, as there are many sources about the goodness of Estonian e-government as such but not many methodological approaches are to be found. First of all, it is important to identify the preconditions and possible gaps that need to be filled in e-governance when transferring knowledge to another country or an organization.

Also, I proposed as a future work in my thesis the improvement of the aspects that EGA today has a look at when analysing a country's e-readiness, and one of my suggestions would be to virtualize the questionnaire for better usability.

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