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**ANALYSING ESTONIAN X-ROAD AS A
COLLABORATION TOOL FOR PUBLIC-
PRIVATE PARTNERSHIPS**

Master's Thesis

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**EESTI X- TEE KUI VAHEND AVALIKU JA
ERASEKTORI KOOSTÖÖ
KORRALDAMISEKS**

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Tallinn 2017

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

The concept of Public-Private Partnerships found indirect treatment already in the 1980s when a broad wave of privatization took place. Since then, the concept has found a large variety of different approaches and each country has found its own interpretation. As far as it leads to an interoperability, each and every one of these interpretations is equally correct. In later years, Estonia have also strengthened a collaboration between public and private sector, while a data exchange layer X-Road, initially developed for the public data sets to communicate, is now also been open for private entities to use for last few years and thus shows the great potential for Public-Private Partnerships to grow further. As there are still quite a small amount of private sector entities attached themselves to the X-Road, there must be the reason, why the private sector has not gone along with the platform. In order to find out how to design a unified platform for public agencies and private entities, the author has conducted face-to-face interviews as well as an online questionnaire among different private sector organizations. As a result, five different problem areas arose: (1) the complexity of the process, (2) abundance of different stakeholders, (3) a number of costs, (4) a little awareness and (5) a little understanding of profitability. As the goal of this research is to find solutions to these problem areas, based on the interview analysis and the comparison of real-life situation with the idealistic model, author will provide a various recommendations, in order to make platform more acceptable for both public as well as private entities, and to strengthen the intersectoral collaboration.

This thesis is written in English and is 70 pages long, including 6 chapters, 10 figures, and 4 tables.

Annotatsioon (In Estonian)

PPP mõiste leidis kaudset käsitlust juba 1980ndatel aastatel, kui maailmas levis laiaulatuslik erastamislaine. Alates sellest perioodist, on PPP mõiste leidnud erinevaid käsitlusi ning iga riik on valinud nende hulgast endale sobivama. Seni, kuni iga valitud lähenemine viib soovitud koosvõimeni, on iga variant võrdselt sobiv lahendus koostöö korraldamiseks. Viimastel aastatel on Eesti tugevdanud sektoritevahelist koostööd, mil andmevahetuskiht X-tee, algselt arendatud kui avaliku sektori asutuste vaheline andmevahetuskeskkond, on avatud kasutamiseks ka erasektori ettevõtetele, pakkudes seega potentsiaali avaliku ja erasektori koostöö korraldamiseks veelgi laiemalt. Kuna X-teelega liitunud ettevõtete hulgast on endiselt üsna väike arv erasektori ettevõtteid, võrreldes nende koguarvuga, siis on tõenäoliselt olemas põhjused, miks erasektor ei ole platvormi kasutusele võtnud. Selleks, et saada teada, kuidas arendada ühtset platvormi era- ja avaliku sektori ettevõtete jaoks, viis autor läbi individuaalsed intervjuud erinevate erasektori ettevõtete esindajatega ning koostas veebiküsitluse X-tee Kogukonna liikmete hulgast. Analüüsi tulemusena kerkis esile viis probleemvaldkonda, milleks olid: (1) protsessi keerukus, (2) osapoolte rohkus, (3) kulude suurus, (4) vähene teadlikkus ja (5) vähene arusaam platvormi kasumlikkusest. Kuna uurimuse lõppeesmärk on leida võimalikke lahendusi esilekerkinud probleemidele, on autor, lähtuvalt intervjuude analüüsist ning X-tee mudeli võrdlusest tegeliku olukorraga, välja pakkunud mitmeid soovitusi. Soovituste eesmärk on muuta platvormi ülesehitust nii, et see oleks vastuvõetav nii era kui avaliku sektori organisatsioonidele ning tugevdaks sektoritevahelist koostööd riigis tervikuna.

Lõputöö on kirjutatud inglise keeles ning sisaldab teksti 70 leheküljel, 6 peatükki, 10 joonist, 4 tabelit.

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Thank you!

List of abbreviations and terms

PPP/ P3/ 3P	<i>Public Private Partnerships</i>
SSM	<i>Soft Systems Methodology</i>
NPM	<i>New Public Management</i>
OST	<i>Open Source Technology</i>
SOE	<i>State-Owned Enterprise</i>
OSG	<i>Open Source Government</i>
EISA	<i>Estonian Information System Authority</i>
EGA	<i>Estonian E-Governance Academy</i>
CEE	<i>Central and Eastern Europe</i>
RIHA	<i>State Information System</i>
SK	<i>SK ID Solutions AS</i>
EU	<i>European Union</i>
UK	<i>United Kingdom (England, Scotland, Wales and Northern Ireland)</i>
ASO	<i>Data Communication in Public Administration</i>

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1 Introduction

1.1.Purpose of the study

The 21st century can be regarded as the era of interoperability, with the aim to make different information systems and organizations to work together in order to form a whole, that will support citizens, as well as organizations from different spheres (Ministry of Economic Affairs and Communications, 2011). Currently, several initiatives have appeared in Estonia, that increase the need for the exchange of data between the public and private systems, which has thus brought the concept of Public-Private Partnerships increasingly on the agenda.

Estonian e-Government infrastructure backbone X-Road is one of the main parties in the organization of interoperability in the country, that provides a unified, secure platform for organizations, in order to exchange data and communicate on different levels (public-public, private-private, and public-private). Although the readiness of the platform to be used by both, public agencies and private entities, is created, out of all Estonian private entities, only few hundred are attached themselves to the X-Road. This situation is the main reason why, Estonian Information System Authority (EISA) has the interest to explore the depths of the situation, in order to find out the obstacles that private sector entities face in process of becoming an X-Road member. This is not only a platform-centric problem, but it inhibits the overall interoperability management in the country, which makes it a national weight issue.

1.1.Motivation of the study

The author of current thesis is a student of E-governance Technologies and Services program in the Tallinn University of Technology, specializing in E-governance services. As the current topic includes basically the whole electronic public service provision in Estonia, author found it first, challenging to research, but on the other hand interesting, as author is also herself working in a private company, that could actually benefit from

the X-Road membership, but is among those, who have not taken the next step towards it, so there is also a little more personal interest in this topic.

The outcome of this research is going to be a practical tool for EISA, by giving actual recommendations and overview of the problem areas, that emerged from the analysis in connection with the X-Road platform, in order to be able to improve the platform as well as strengthen the interoperability and Public-Private Partnerships in Estonia. The author didn't want the thesis to be merely a theoretical piece of writing, but wanted to provide a practical value with it for the society as a whole, and is convinced that this is, what the current thesis also provides.

1.2. Research questions

In order to achieve the objectives set by this research, the author is looking for answers to two main research questions, which in turn are divided into additional sub-questions. Questions read as follows:

- *How to organize collaboration between public agencies and private entities?*
 - *What are different approaches and methods for organizing collaboration?*
 - *What are the main platforms that public agencies and private entities use?*
 - *Why intersectoral collaboration is important? Why it is beneficial for different parties?*

Under this research question, author tries to find out, how PPP is defined in different contexts, and how Public Private Partnerships trends have changed over time and has been influenced by the socio-economical changes. In addition, author wants to know, how intersectoral collaboration can be built up, why is it important and what are the different methods to use in order to design a unified platform for public and private sector. In order to answer these questions, pros and cons about the PPP approach will be pointed out as well.

- *What are the main obstacles for designing a unified collaboration platform for public agencies and private entities?*

- *How can these obstacles be overcome?*

This research question is focusing on the practical part of the research, where via individual face-to-face interviews and an online survey, the author tries to map the bottlenecks of the Estonian X-Road platform, as an example of a ready-to-use unified platform for organizing intersectoral collaboration. In order to answer, how these obstacles are overcome, the author will provide an overview of different recommendations, emerged from the qualitative data analysis.

1.3. Outline of the thesis

After the current Introduction, the thesis will continue with the Research Methodology chapter, where the author will analyze the philosophy of Interpretivism, chosen as a supportive idea for the research, as well as the main research methodology, Soft Systems Methodology. All traditional seven stages of the methodology will be pointed out and associated with all parts of the current thesis.

In the third chapter, State of Art, the author will analyze the previously written literature on Public-Private Partnerships, how the concept has historically grown and which are the different approaches of PPP, used in various contexts. In addition, the author will provide an overview of the advantages and disadvantages, of the concept.

In the fourth chapter, Estonian E-Governance context overview, the author will analyse Estonian E-governance main developments, regulations, and stakeholders, based on the previously written literature. In this chapter, the author will also explain the nature of the X-Road, that is used as an example in order to show, how to design a unified platform for both, public and private sector organizations.

The fifth chapter will bring out the research results, discussion, and recommendations, where author analyses main findings of the interview and survey data and points out problematic areas, emerged from the research.

The sixth chapter is a summarizing chapter, that will represent the conclusions of the thesis. Here, future developments of the topic will also be pointed out.

2 Research Methodology

First, as a supportive idea for the research, the research philosophy of Interpretivism will be outlined, that defines the world through different experiences. Interpretivist philosophy is inherent in qualitative data collection, which is usually obtained from a small number of respondents and analyzed in a detailed manner. (Tuohy, et al., 2013, p. 18) In contrast to the classical Positivist philosophy, which stands for more scientific approach and quantitative data collection, separating researcher from the situation under an analysis, Interpretivist philosophy can be rather subjective, taking into account different personal experiences that can vary considerably, as there is no such thing as an identical experience. Interpretivist philosophy also sees that the situation and the person involved (researcher), cannot be separated. (Weber, 2004, pp. 4-5) When thinking about some particular situation, there is always, so to speak, the predictable scenario of how it looks like in real life, which is why there is a need for analysis, in order to assess the conformance of the prediction with the actual situation and real experiences. This philosophic approach is easily compatible with the research methodology— Soft Systems Methodology, chosen for this paper, which also considers it important to take into account different viewpoints and experiences in connection with the situation under an analysis (Public-Private Partnerships) and thus interpret the essence of the situation, so that it can be improved in the future (Graham, 2003, pp. 1-2).

As the main methodology for conducting this research, Soft Systems Methodology (SSM) will be used. SSM is a methodology that takes a real-life problematic situation, analyzes its every aspect, and based on that, draws up an idealistic model that will be compared with the real situation in order to make suggestions for future change and improvement (Kotiadis, et al., 2013, p. 126). According to the traditional approach, SSM is defined through a seven-staged process, starting with the problematic situation definition and ending with the actions for improvement (Watson, 2012, pp. 442-443). Despite the fact that the methodology has been updated over time, mainly by compressing different stages, the author has decided, however, in favor of an original approach, where all significant steps have been shown separately and thus are more visible during the research.

Current research is focusing on the topic of Public-Private Partnerships (PPP) and how to organize intersectoral collaboration. As a more practical approach to PPP concept, Estonian X-Road platform will be analyzed as one possible tool for collaboration. Right now, mostly based on Estonian example, a collaboration between public and private sector exist but is rather fragmented, agencies are developing their systems and organizational principles from scratch, without communicating with others or learning from their mistakes or best practices. From X-Road perspective, there is still quite a small amount of private sector organizations who have attached themselves to the X-Road, so there must be the reason why private sector still spends resources on development and constant maintenance, although the state has already built up a platform that is ready to use.

This topic of how to develop a unified platform for both public sector agencies and private entities and how to strengthen collaboration can be seen as quite problematic, with the need for an intervention. Soft Systems Methodology is the most beneficial in that sense, where the problematic situation is analyzed based on real-life experiences and suggestions for future improvement are pointed out as a result. In order to find out these different experiences with the process of becoming an X-Road member, qualitative data will be collected by first, conducting face-to-face interviews with different size Estonian private sector companies and second, by composing an online questionnaire among the X-Road Community, that is a group of people (developers, specialists, administrators etc.), who wants to have a say in matters of the X-Road and who face X-Road related issues on daily basis. Mostly open-ended questions will be used in both data collection techniques, not just to get answers, but to collect experiences, that will give a more detailed understanding of the problem situation.

In order to analyze the data, gathered from qualitative interviews, the author is mixing SSM last phases with the thematic interview analysis method, which is one of the most common tools what regards to the qualitative content analysis. Braun and Clarke (2006) have defined thematic analysis as follows: “(...) a method for identifying, analyzing and reporting patterns (themes) within data.” (Braun & Clarke, 2006, p. 79). Thematic analysis has six individual phases, which need to be passed in order to analyze interview data in a detailed manner. First, it is important that the researcher knows the data and is familiar with it's every aspect. In this phase, transcription of the verbal, recorded interviews is crucial, in order to be able to map different patterns in later steps (Aronson,

1995, p. 2). The second third and fourth phase are collectively called as a synthesis phase, where first, via repeated reading of transcripts, note-taking, and marking/labeling significant aspects contained in the data, will be formed into codes. As a second part of the synthesis phase, created codes will be gathered into initial themes, based on similarities and relationships between them, with the aim to bring out the most important and meaningful parts of the interview data. (Thomas & Harden, 2008, pp. 8-9) The third part of the synthesis phase is the reviewing of themes, where author analyzes and reviews initial themes in order to see if these represent the findings of the entire data and also if themes are in connection with the proposed research questions. The tool for conducting such an analysis is making a thematic map, where all the relationships are visually demonstrated. Fifth phase of the thematic analysis is naming and defining themes, so that author has a clear overview what composed themes actually express and what is the nature of themes. The sixth and final phase of thematic analysis is a results presentation and discussion phase, where the author presents, how chosen themes relate to the findings and research results and bring out different examples and visualizations in order to show the validity and the importance of the research. (Braun & Clarke, 2006, p. 91)

In order to show how the Soft Systems Methodology is applied in this study, each of the seven stages of traditional SSM approach are described in more detail. The reflection of SSM during the current thesis is also illustrated in Figure 1.



Figure 1. Reflection of 7-stage SSM during the thesis.

SSM starts with defining the problematic area under an analysis. In this stage, it is important to gather as much information as possible about the situation in which the alleged problem is located so that the researcher has a sufficient background the basis of which to analyze a specific problem situation. (Burge, 2015, p. 2) This stage of SSM will be presented in chapter number three, State of art, where based on previously written academic literature, the nature, and definitions about PPP will be presented, different approaches and methods, how intersectoral collaboration can be organized and how both side organizations can benefit from the relationship will be pointed out. In addition, the analysis will be illustrated with the examples of PPP trends among EU countries and best practices will be pointed out.

In the second stage of SSM, the specific problem situation will be described in an unstructured form. This stage has also been called as a “rich picture”, where all the key factors about the issue should be pointed out. (Hardjosoekarto, 2012, pp. 500-501) Keeping the eye on this stage, Estonian X-Road components will be discussed, based on different sources, to clarify, how the system works, which parties are involved, how it has changed over time and why it is beneficial. This analysis will be presented under the chapter number four, where in addition to the X-Road example, Estonian E-government structure as a whole will be introduced.

In the third stage of SSM, the structured models of two different perspectives on the problematic situation under an analysis will be examined, which are, according to the topic, public sector perspective and private sector perspective. The developer of SSM, Peter Checkland, recommends here putting perspectives through a CATWOE model, which brings out Customers, Actors, Transformation, Worldview, Owner and Environment, that are relevant to the situation and will help to understand different viewpoints and intentions (Hardjosoekarto, et al., 2013, pp. 237-238). The CATWOE models will be interpreted under the chapter four, where the author will bring out the illustration of how actual services or operations work through the X-Road and how different stakeholders are involved in the process, in order to achieve the final result and to serve citizens. Important parties, their functions, and intentions will be described in order to have conjecture visions of different parties already mapped out, before collecting real-life experiences.

The fourth stage of SSM is simply the modeling stage, where previously mapped perspectives are combined into an idealistic model, that needs to show what are the minimum resources needed in order to achieve the desired results (Checkland, 2000, pp. 14-15) (Hardjosoekarto, 2012, p. 500). The model should be idealistic, but realistic enough that it can be compared with the real world situation. As an architecture model, considered idealistic based on past experiences, for Estonian X-Road is already developed, the author will focus more on the examining of the existing idealistic model. The main goal is to see, how this model will find the application in the real world and what are the differences and bottlenecks that will arise from the comparison with the actual experiences. The Estonian X-Road architecture is presented in chapter four.

The fifth stage of SSM drives the research back to the real world, where previously observed idealistic conceptual model will be compared with the real-life situation (Wang, et al., 2015, p. 565). This stage will be introduced under a chapter five, where research results and analysis will be brought out, in order to examine, how idealistic model is applied in real-life situations. For the comparison, face-to-face interviews with Estonian private sector entities, from different fields of activity will be conducted. Questions will be open-ended, so to bring out more personal experiences with the process of becoming an X-Road member as well as with the platform use. In addition to interviews, the questionnaire among X-Road Community will be prepared, in order to find out overlapping ideas and to add an additional viewpoint to the analysis of the platform, as among X-Road community, there are both, private as well as public sector specialists.

Sixth and seventh stage of SSM are focusing on interventions and improvement (Hardjosoekarto, 2012, p. 504). This stage will be analyzed under chapter five, where, according to the research results, the author will point out suggestions for future improvement of the system and illustrative correlation table for problems and suggestions will be added. Although SSM points out under the sixth stage, that owner analysis will be a great tool to consider for suggestions part of the research, author decided that, since Estonian Information System Authority (EISA) as an owner of the X-Road was closely involved in the sample selection process, it will be unsuitable to induce the outcomes towards owner's vision. As the aim of this research is to find out the main problem areas and to give the owner a toolkit to work with, it is important to conduct the analysis without the intervention of the owner.

In conclusion, the researcher will outline, how current research will take into account the matters of ethics, generalizability, and limitations.

In this research, participants of the questionnaires and interviews are all operating in legal companies, registered in Estonia. Interviewees are informed that the information collected, will be used in a master's thesis and researcher will use real names so that confidentiality is not guaranteed. All interviewees are participating voluntarily and can choose how much information they are willing to give out. Answers are translated, but no idea or statement is made up by the researcher.

As the research focuses on a quite specific system or the environment, it is not as generalizable as some other topics, although as Finland and Azerbaijan are having something similar to an Estonian X-Road, they could use this research to avoid future mistakes and to learn from our members' experiences. The main goal of this research is to analyze nationally operating platform and to give suggestions for the improvements. Here, the researcher does not have in mind the cross-border profitability, which would allow the research to generalize the use in different systems outside of the country.

From the limitations point of view, answers will be subjective and every interviewee is free to give out as much information as he or she is willing to, and researcher does not know if it is the whole picture or some of the aspects could be left out. In addition, X-Road as a platform is quite unique, which is why there is no comparison from other societies to take into account and no proven solutions, how the system could be built up and developed further, which can be a limitation as well.

3 State of Art

Government, private sector, and citizens must have a collaborative network to ensure the functioning of the social and economic stability of a country, thus many theories have discussed the topic from different angles. As current research is focusing on Public-Private Partnerships concept and one of the main research questions, set by this research, is focusing on how to organize intersectoral collaboration, it is important to give an overview of the concept nature.

The following theoretical overview focuses on the first stage of the SSM, where the author will analyze the area and an environment, where the problematic situation, little cooperation between different sectors, is situated and gives a theoretical background, based on which the following practical analysis will be built up.

In the 1980s the movement of privatization took place, led by British Prime Minister Margaret Thatcher, where free-market supporters started to battle against the liberal welfare state. Another big privatization wave arrived in the 1990s, after the disintegration of the Soviet Union, when newly independent states started to develop their economies from scratch. (Kitsos, 2015, pp. 17-18) During the privatization, a large number of state-owned enterprises, which dominated the market, were forcibly closed and reorganized in an attempt to reduce the role of the state in the economy and to eliminate sectoral boundaries (Megginson & Netter, 2001, pp. 4-5). Privatization process emerged two similar, but slightly different worldviews: neoliberalism and neoconservatism, first of which saw the state as inherently inefficient with the need for privatization, second found that state tries to do too much and is, therefore, overloaded and needs to be privatized (Linder, 1999, p. 41). Main goals of privatization has been pointed out by Price Waterhouse (1998) and they read as follows: “(...) (1) raise revenue for the state, (2) promote economic efficiency, (3) reduce government interference in the economy, (4) promote wider share ownership, (5) provide the opportunity to introduce competition, and (6) subject SOEs [state-owned enterprise] to market discipline.” (Megginson & Netter, 2001, p. 324).

Privatization was also influenced by the New Public Management (NPM) approach, which spread around the world in the 1980s, with the aim to convince governments, that public sector should be developed and managed according to the rules of private entities, in order to be effective (Randma-Liiv, 2008, p. 3). NPM supported the government decentralization idea of privatization and the fact that public service provision will be partially delegated to the private sector in order to promote the competitiveness of the market (Kitsos, 2015, p. 19). The movement of privatization also laid the foundation for the Public-Private Partnerships, that were used as an alternative for full privatization in cases where it wasn't reasonable. It can be said that the cooperation between public and private sector was at that time mostly organized due to state fiscal problems and according to Bovaird, T. (2004), built up as "marriage for money, not love" (Bovaird, 2004, p. 201). The private sector was able to keep prices down and quality up for different products, services and therefore reduced the role of the state and helped the public sector to scatter risks (Linder, 1999, p. 36). Public-Private Partnerships were also seen as a form of a lower-intensity privatization method and has found increasingly widespread use in different countries ever since (Kitsos, 2015, p. 23).

3.1 Public-Private Partnerships

Public-Private Partnerships (PPP) concept has found a wide variety of approaches and it is not clear what is considered to be the most appropriate definition for it. Governments have chosen from different approaches mostly depending on which makes it possible to solve the emerged problem in the most effective manner, and thus the use of the PPP has mainly been need-based. Various authors have pointed out classifications for PPP, with the uniform end goal to bring governments closer to the market. According to the Linder, S., H. (1999), Public-Private Partnerships can be divided into six approaches, where PPP can be seen first, as a management reform, second as a problem reformation, third as a moral regeneration, fourth as a risk scattering, fifth as a reformation of public services and sixth as a power sharing (Linder, 1999, pp. 41-48). The first approach focuses on, how PPP can change the way company's administration is built up. According to this, PPP is a tool to help the state to become more private-like, more flexible and innovative. The second approach sees PPP as a solution for public service delivery problems. This view brings out the financial as well as know-how aspect of collaboration, when with less money, the government can purchase in public services from the private sector, who has


the needed competence and specialists. Third, PPP can be more than an agreement between two parties, instead, it can change the character of concerned parties. The author sees that PPP can be considered as a movement during which private sector entities can help to change public sector managers' character towards more market-oriented and creative, which can help to see market needs more clearer. The fourth approach focuses on the burden division between the public and private sector, which helps to scatter risks. This approach can also be seen as fully finance-oriented, but it needs to be pointed out that PPP goal according to this approach is not to replace public resources with private ones but to provide leverage. The fifth approach is about work force and the flexibility of moving between different sectors and therefore deregulating employment relations with the help of PPP. The sixth approach of PPP, power sharing, is about dividing different tasks between two sectors and to let loose of so-called command and control principles and replacing these with cooperation. This approach is all about sharing responsibilities and sharing trust. (Linder, 1999, pp. 41-48)

In addition, Khanom, N., A. (2010) has proposed a similar distribution for PPP, as discussed above, but instead of six approaches, author divided PPP into four main approaches or interpretations, which has been used in the various literature. The first approach sees PPP as a tool of governance, which brings together different aspects, mentioned before, like PPP as a management reform, as a risk shifting and as power sharing. The author points out that this approach is used and mentioned mostly by those, who pay the most attention to managerial and administration sides of the cooperation. The second approach is calling PPP as a tool of financial arrangements (Khanom, 2010, pp. 151-153). This is also quite similar with the goals of Linder's (1999) second and third approach, which described PPP as an opportunity for the public sector to get the financial boost from the private and to do more with less (Linder, 1999, pp. 43-45). As an example, the author brings out the infrastructure, since a big amount of PPP projects have been initiated due to infrastructural developments. The third approach, PPP as a tool for the development process, also allows drawing parallels with the earlier arguments, especially with the restructuring of public service. Khanom N., A. (2010) sees that intersectoral collaboration helps to favor the development and innovation of enterprises, when sharing know-how, experiences, resources etc. and mutual learning from mistakes, promotes the growth and achieving the objectives of each party. The fourth approach is a little different from all the foregoing, providing the Public-Private Partnerships as a language game

where a number of meanings are given to one word-pair. Author has gathered together different meanings that are given to PPP in previously written literature and points out that PPP has been called as follows: a debate between sectors, an alternative delivery system, a privatization process, an arrangement and a contract. (Khanom, 2010, pp. 153-154)

Previously it has been discussed, how authors see the meaning and different concepts of PPP and how it can be treated in various contexts. Although it is quite a vague term, however, one specific understanding can be identified throughout the previously written literature— contracting-out, where public sector signs a contractual agreement with private sector in order to achieve greater efficiency in service provision, spread risks and to get financial leverage from the private (Dobrowolski, et al., 2015, p. 514). In this approach, there is also conflicting opinions and PPP can often be seen as an alternative tool that will substitute contracts instead. It is also quite common, that governments try to avoid using the term, while describing PPP projects, in order to attract private collaborators into the process without mentioning any legal relationships. (Hodge & Greve, 2007, pp. 545-547) Petković *et al.* (2015) have pointed out that there are also all kinds of contracts that can arrange Public-Private Partnerships and these contracts often are built up, based on the needed services and the level of responsibility that is required of the private contractor. For example maintenance contracts, design and build contracts etc. (Petković, et al., 2015, p. 7) Different levels of contractual agreements, or in this case Public-Private Partnerships, can be divided into six categories, based on the level of private participation, and are presented in Table 1 (Martin, 2016, pp. 199-200).

Table 1. Public-Private Partnership types. (Martin, 2016)

DB: Design-Build contracts		Less participation
DBM: Design-Build-Maintain contracts		
DBF: Design-Build-Finance contracts		
DBFM: Design-Build-Finance-Maintain contracts		
DBFO: Design-Build-Finance-Operate contracts		
DBFOM: Design-Build-Finance-Operate-Maintain contracts		More participation

Contract length also depends on a participation level of the contractor and contracts are signed, based on the rule, the greater the involvement, the longer connectedness (Martin, 2016, p. 202). Usually, PPP contracts are considered as a long-term, a duration of 25 years

and more, but in case of a DB: Design-Build type contract, the collaboration can, for example, last only a few months until the contractor finishes the job due to which the involvement was made (Flinders, 2005, p. 220). A good example of long-term contracts are big infrastructural projects (roads for example), where PPP can take even up to 50 years, including BOT: Build-Own-Transfer and BOOT: Build-Own-Operate-Transfer aspects, where the level of participation is the highest, similarly to the taxonomy, discussed earlier. PPP contracts differ from traditional contracts in many terms, such as, involvement to policy-making, where private sector can have more say in the process; the impact, where PPP is more oriented to long-term results and improvements; risk-scattering, which can be better to carry out in the PPP context; and also in terms of a financial resources, while big PPP projects include bigger financial flows compared to traditional contractual agreements. (Hodge & Greve, 2007, pp. 546-547)

In order to sum up various aspects, that should be kept in mind while defining and using Public-Private Partnerships as a tool for intersectoral collaboration, Martin (2016) has provided a suitable unity definition for PPP, and it reads as follows: “Public-private partnerships (P3s) are a class of public contracts for the construction or rehabilitation of public facilities and public infrastructure and for the provision of supportive or ancillary services. P3s generally involve a mix of the following component parts: design, construction, financing, operations and maintenance.” (Martin, 2016, pp. 197-198).

3.1.1 Advantages and disadvantages of PPP

Like every approach, Public-Private Partnerships also have its advantages and disadvantages, what needs to be discussed. First, PPP can be considered as a tool to help public sector provide more, with an additional private sector funding, as fiscal problems are seen one of the key driving forces towards using PPP. Second, more and more governments are interested in e-governance developments, but without needed competence and know-how, they cannot be successful. Here PPP helps to cooperate with the ICT sector, in order to get additional funds as well as expertise from specialists, so that the common learning process can take place. (Bovaird, 2004, p. 201) Third, PPP provides power sharing possibilities, when different tasks and fields can be divided between people with varying competencies and from different sectors. Power sharing will allow every specialist to do tasks they do best and to be responsible for it. (Petković, et al., 2015, p. 2) Fourth, PPP will bring an improvement of public sector performance and

helps to provide better public services with the help of private sector know-how as well as technical skills. Fifth, PPP will help the public sector to achieve cost-efficiency, which is one of the main expectations of the public sector of the PPP process. (Pongsiri, 2002, pp. 488-489)

Besides the advantages, Public-Private Partnerships also have several disadvantages. First, PPP can lead to a situation where the public sector is motivated by profit-taking and thus leaves the main objectives of public services in the background, which should be meeting citizens' needs and expectations, making their lives easier, and to enable access to services for everyone, regardless of their financial status. Such a situation is a clear threat to citizens for becoming a race for profit targets. Second, as mentioned above, PPP often means long-term contracts, signed between different parties, that can, in turn, reduce the competitiveness of the market. If the public sector is tied with specific private contractors for such a long period (25 years and more), there is no chance for other service providers to participate and show what they have to offer. The more parties are involved in the PPP process, the greater number of competing for service provider's opportunities can remain unused. (Bovaird, 2004, pp. 203-204) Third, PPP has been admonished for fragmenting processes and structures, which will, in turn, lead to a situation, where the liability is ambiguous, functions are not clear and none of the involved parties know who leads the process and is responsible for it. Fourth, PPP is not suitable for a stable system, that can be a problem especially for the public sector, which is used to the stability of the system, management, working environment and tools that do not depend on market conditions. For stable system, it can be quite challenging to readjust well-established practices according to the market needs or rapidly changing society. Fifth disadvantage is also connected to the last stability aspect when personnel is convinced that PPP will reduce jobs, and positions that remained stable so far can be endangered due to new performance-based approach. (Pongsiri, 2002, pp. 488-490)

3.1.2 PPP examples from EU countries

Public-Private Partnerships is gathering more and more popularity among the European Union (EU), when some member states are using PPP already in various areas and extending the scope of the PPP even further, while some others have still little or no experience with PPP projects whatsoever (Kappeler & Nemoz, 2010, p. 3). According to the statistics, in 2016 the biggest amount of PPP projects in Europe were conducted in the

United Kingdom (UK) and the most popular field in which, PPP was used, transport sector (European PPP Expertise Centre, 2016, p. 3). UK is using PPP projects in almost 20 different sectors, dominated by transport with 50%, followed by the defense (11%), health (10%) and education (7%) (McQuaid & Scherrer, 2014, p. 11). It is also possible to distinguish three, or in some cases four, different types of PPP used in the UK, which is first, ownership, meaning that private entities can have the ownership in SOEs, that is quite similar to the traditional Thatcher's privatization approach; second, service provision, where private sector provides financial as well as know-how support to the public, in order to develop infrastructural projects (for example schools, hospitals, roads etc.); third, public service extension, when with the moral and financial involvement of the private, public sector is extending services to broader users (research, for example); fourth, UK PPP goal is also to develop a broadband strategy, in order to promote different development policies. (McQuaid & Scherrer, 2014, pp. 11-13) UK does not have a concrete law for PPP, but the state has developed a few guidelines, which should be taken as a base for PPP projects. There is also no single agency that deals with PPP projects and tasks are divided between several bodies. (CMS Legal Services EEIG, 2010, pp. 141-142) UK PPP projects are mostly motivated by the fact that partnering with public sector will bring efficiency to the organization of public management and into service-provision, here macroeconomic budget factors are not playing a significant role (McQuaid & Scherrer, 2014, pp. 14-15).

In comparison with the UK experience, Germany and Austria have slightly different approaches, in fact, they have been also called as late-comers, regards to the development of PPP, but are catching up slowly to the leading countries in PPP development. In Germany and Austria, federal states are mostly using PPP in infrastructure projects, especially those related to the traffic sector. In Austria, more than a half, 58 percent of PPP projects are actually dominated by the municipalities in various fields like health, energy, wastewater, and sewage etc. Since municipalities have limited funds, Austria's PPP projects are mostly small scale and contractual agreements are dominating. In Germany, the situation is quite similar to Austria, when municipalities are more active. Both countries are more or less struggling with budget issues, that's why PPP are developed with the aim to get financial leverage from the private in order to be able to implement several initiatives. (McQuaid & Scherrer, 2014, p. 14) None of the countries have any specific law or central body for PPP development, but both have a strong support

for PPP initiatives by several government agencies. In Germany the PPP Simplification Act will soon be launched, to create clarity in PPP processes and to eliminate tax issues. The country also sees the need for further regulations, as there have been numerous problems arising with PPP financing and tax issues. (CMS Legal Services EEIG, 2010, pp. 56-57)

It can be said, that PPP experiences among EU countries have been mostly positive. Taking UK success as an example, the number of PPP using countries are in a rapid rise. Although in most countries, there is no specific law for PPP, countries are moving towards the development of the legal framework for PPP and for example, in Slovenia, Bulgaria, Croatia and Bosnia and Herzegovina PPP legislation has already been introduced (CMS Legal Services EEIG, 2010).

4 Estonian E-Governance context overview

In Estonia, Public-Private Partnership projects are started to gain popularity and the cooperation between two sectors are becoming more and more frequent. Mostly, PPP in Estonia is considered as a public procurement, where private entities can apply for a certain job and by considering at least three offers, public sector procurement organizer will choose the most suitable company for the job. The choice is often made based on the price and PPP in that sense can be considered more as the needs-based contractual agreement. (Güldenkoh & Silberg, 2016, pp. 44-45)

Although in recent years, PPP has got a broader meaning in the country, where Estonian backbone platform of the E-governance, X-Road in addition to being required for public sector agencies to use, is now being open for private sector as well, in order to involve private sector into public service provision process and to give them the opportunity to communicate with the state. As one of the research questions, set by this research is focusing on the analysis of what are the main obstacles for designing a unified collaboration platform for public agencies and private entities, author has decided to involve Estonian X-Road platform as an example of how a unified platform is developed, what are the obstacles and how Estonia reached this situation after all. This chapter will start a little bit beyond the development of the platform and analyzed first, how Estonian E-governance is built up and how it interacts with the PPP concept.

This chapter will illustrate the second, third and fourth stage of the Soft Systems Methodology, where the problematic situation will be analyzed, different perspectives and the idealistic model will be presented in order to compare the ideal situation with the practical real-life analysis in following discussions part.

4.1E-Government vs. E-Governance

In order to give an overview of the Estonian context, where the problem, under an analysis, is situated, it is important to clarify, how researcher has defined the concept of E-governance, how two similar approaches: E-government and E-governance differ in

scope and why E-governance concept was chosen in order to analyze the Estonian digital developments.

Palvia, S. C. J., and Sharma, S. S. (2007) have pointed out a general definition that illustrates the main principles of E-government and it reads as follows: “E-government is a generic term for web-based services from agencies of local, state and federal governments. In e-government, the government uses information technology and particularly the Internet to support government operations, engage citizens, and provide government services.” (Palvia & Sharma, 2007, p. 1). This definition sees service delivery as e-governments’ main function and narrows the definition to the public sector context. However, on the basis of the Marche and McNiven (2003) vision, the government should deal with the service-delivery process and the governance will help to decide the necessity of the service (Marche & McNiven, 2003, p. 75). In addition, e-governance is not just for public sector and it treats decision-making as an intersectoral collaboration, where any interested party, public, private or third sector, can and should be involved (Palvia & Sharma, 2007, p. 2). This approach, compared to the E-government, gives a lot broader picture by taking into account different opinions from different stakeholders and also gives a better understanding of the Estonian context, where the legislation, technological development, and the cooperation between the institutions have all influenced the development of PPP projects.

4.2 Estonian E-Governance main developments

Estonia has been considered one of the most successful countries in the development of e-governance, where the greatest strength can be seen in the variety of public services available online. Latest statistics show that 99 percent of Estonian public services are available online and accessible 24 hours a day, 7 days a week. For example, for today, 97 percent of tax declarations are filled in digitally. (Roosna & Rikk, 2016, p. 9) The wide introduction of e-services and e-governance principles has also led by the fact that by the year 2015, 87 percent of households and 97 percent of businesses in Estonia had access to a broadband connection (European Commission, 2016, p. 5). Today, E-governance concepts are introduced in almost all policy areas in Estonia, and one of the biggest goals is to harmonize the levels of E-service delivery in different fields and to strengthen the

cooperation between different agencies, so to achieve an integrated E-society (Ministry of Economic Affairs and Communications, 2013, p. 12).

The most influential and full of changes period in the development of Estonia's administrative management is considered to be the one immediately after Estonia regained independence from the Soviet Union in 1991. This period is also referred to as the time when the Estonian administrative system was at its peak, while barely standing newly independent state needed the transformation of old systems and the creation of new ones. Essentially, the country had an administrative system to build from the very beginning and precisely because of these reasons, 1991 was crucial for Estonia, from which country had created all the prerequisites to continue to move only uphill. (Viks, 2002, p. 8) After independence, when country's economy was on the rise, Estonia started developing advanced technologies as one of the key areas, which can be considered as a prosperous ground for the further development of E-governance (Björklund, 2016, p. 915). People now had the ability to learn and gain technical competence to move towards a more digitalized society.

In 1990s Estonian local IT Community was the most important party that styled country's information technology policies, introducing the document on how to manage IT systems in public sector in 1993, which was the one document, in line with political leaders' understanding of state functions and the level of intervention, which encouraged them to think more about digitalization. (Kitsing, 2011, p. 8) In the whole development process, there were two main stakeholders: IT Community and political leaders, first of which wanted to have a practical output to their technical knowledge and second, wanted to build a thin, efficient state (Björklund, 2016, p. 919). The idea of a minimal, also known as thin state was strongly affected by the neo-liberal management system, dominated worldwide in the 1990s, which also meant a great receptivity to New Public Management (NPM) ideas, that suggested to run a state following private sector management models and involve private sector specialists into public decision-making processes (Randma-Liiv, 2008, p. 3). Both stakeholders saw the potential in digitalization and E-service development, but as governments changed rapidly during this uncertain period, not all agencies shared the excitement of E-governance development, which led to the uneven spread of information technology in public management (Kitsing, 2011, pp. 6-7).

E-services development began from the private sector when E-banking was launched in 1996 and became one of the three main activities conducted online that days, next to the E-mail and search engines. In addition, E-banking has also considered as the main IT innovator in Estonia. (Kalvet, 2012, pp. 15-16) As the digitalization was much quicker in private sector than in public, political leaders looked for cooperation opportunities to bring the delivery of public services to the next level and to keep pace with the rapidly evolving digital world. As E-banking was already quite popular among citizens, public sector saw it as a profitable tool for E-services' verification purposes and also for intra-service purchases which in turn also benefit the banking sector (Kitsing, 2011, pp. 9-10). It can be said that, connecting E-banking and public E-services was the beginning of public-private partnerships in Estonia, when private companies saw the opportunity to use their existing potential in favour of country's E-governance development and state saw the possibility to involve specialists from private sector to take another step towards more "E" governance and digitalized society.

In 1998 EEBone was launched to connect all public sector computers into one system and to offer a safe connection to the Internet. Now EEBone provides around 50% of management services of the entire sector (European Commission, 2016, p. 35). In 2001, Estonia launched data exchange layer X-Road, that finally allowed different public organizations to connect with each other and to exchange and share information safely. After using E-banking features for e-service verification for some time, Estonia introduced electronic ID-cards in 2002, which allowed having a greater level of security and also provided a solution for citizen identification. ID-cards weren't only physical documents, in addition, they brought a new feature of digital signing, which became an alternative to the classic signature and become equally legitimate with the adoption of the Digital Signature Act by the Estonian Parliament (Roosna & Rikk, 2016, p. 45). At first, ID-cards did not receive positive feedback and E-banking was used instead. Since collaboration is a two-way process, banks started to allow user authentication via ID-cards, offering a bigger volume of transfers compared to the old E-banking features and also divided free ID-card readers to citizens. ID-cards also found widespread use in major cities in Estonia, where private companies offered local authorities the possibility to use ID-card based tickets for city buses. (Kitsing, 2011, p. 10) Here, ID-card behaved as an alternative to the classic bus tickets and thus increased the usage of ID-cards as well as public-private partnerships, where in addition to private companies who created the ID-

ticket solution, mobile operators, banks and local municipalities were involved in the process.

In 2003, the currently known as “state portal eesti.ee” was created (historically it was launched as the set of portals for citizen, entrepreneur, and officials), which gave the access to all public services available online from one place and gathered all the information from different state databases into one environment. In 2007 portal was updated, providing three different views according to the role: citizen, entrepreneur or state official in order to prioritize services for the user. (European Commission, 2016, p. 34) In order to access the information stored, authentication via ID-card or E-banking solution was needed so to guarantee that only person, related to the data can access it (Kalvet, 2012). In 2007 Mobile-ID was added to the existing authentication mechanisms, allowing faster and more convenient authentication solution. In addition to the existing E-services, the development of state portal favored the creation of new E-services like E-Health, introduced in 2008, which has now culminated with the delivery of digital prescriptions all over the country (Roosna & Rikk, 2016, pp. 22-23). Although the country took a significant step further in E-service delivery, the portal has been criticised as being too complex, where simple processes have been made confusing and are requiring much more time (Kitsing, 2011).

The year 2005 was historic for Estonia, as well as for the whole world when country carried out the very first Internet voting, which allowed citizens to cast their vote over the Internet. In the first year, the percentage of votes that were given electronically reached around 2 percent and the amount has been increased ever since. The highest range of e-votes, 31 percent, was reached at the parliamentary elections taken place in the year 2015. (Roosna & Rikk, 2016, p. 18) The duration of the e-election period is 4 to 10 days before the election day (parliamentary elections three days, local elections seven days), during which votes can be changed electronically countless times, excluding the situation in which the voter could have been affected by someone during the voting process (Kalvet, 2012, p. 16). It is also possible to change the vote in the polling station, which will erase all previously issued e-votes. Since 2013, according to the survey conducted by International IDEA, Estonia has become one of the 15 countries out of 130 countries included in the survey, who are using Open Source Technology (OST) in their electoral processes, next to, for example, Canada, India, Norway, Egypt and Colombia (Clouser, et al., 2014, p. 25). The reason why Estonia changed to OST is quite clear: first, it gives

an opportunity to oversee the source code, second, it gives an opportunity to make sure that everything is done correctly and helps to fix bugs, third, it is a clear possibility to actually achieve an understanding of the process itself and be involved in it and fourth, OST allows marginal cost savings (Applewhite, 2003, pp. 90-91). OST also refers to a direct intersectoral cooperation, where according to Matei, A., and Irimia, S. I.: “(...) nonstate organizations contribute or are expected to contribute with resources (material or logistical) that entitle them to equal rights to decide in the collaborative projects” (Matei & Irimia, 2014, p. 815). This illustrates the expectations of Open Source Government (OSG)¹ from the private sector, in order to design E-governance solutions through inclusive policy.

4.3 Estonian E-Governance regulations

During the first years of Estonian E-governance development, the state has been a lot admonished by the lack of a specific plan of action for information technology usage in public administration processes (Kitsing, 2011, p. 9). At the same time, various authors see the legal framework as one of the main reasons for Estonian unexpected success story in E-governance field (Ernsdorff & Berbec, 2007, p. 171). According to Kalvet, T. (2014), although Estonia doesn't have a concrete law for E-governance, different acts are already covering the most important regulations in the field (Kalvet, 2012, p. 7). Compared to the other Central and Eastern Europe (CEE) countries like Latvia, Slovenia and Slovakia, the most important regulations were adopted at a quite same period of time with the exception of Data Protection Act (See Table 2).

Table 2. The adoption of E-Government regulations. (Kitsing, 2011, p. 8)

Act/Document	Estonia	Latvia	Slovakia	Slovenia
Strategy for e-government	NA	2002	2004	2001
e-Signature and e-document	2000	2002	2002	2000
Strategy for information society	1998	1999	2001	2003
Data protection	1996	2000	2002	1999
Access to public information	2001	1998	2000	2003

¹ “(...) [OSG is] a governing arrangement that promotes the usage of the open source production and development model as *modus operandi* for engaging citizens constructively across the boundaries of public agencies and levels of government, in order to enhance, via ITC platforms acting as a go-between, the design and the implementation of public policy, goods, and services.”(Matei & Irimia, 2014, pp. 813-814).

Estonian regulations, unlike the rest, have been described as more development-based, which gives a greater level of concreteness and thus reflects clear decisions that are made for specific new improvements to be legally valid. (Kitsing, 2011, p. 8) (Kalvet & Aaviksoo, 2008, p. 52). The latest development plan for Estonian E-governance (Digital Agenda 2020 for Estonia) aims primarily to the further developments of the efficient electronic environment, which in turn will help to provide more and higher quality E-services as well as increases the capacity of cross-border cooperation that Estonia has been trying to achieve in latest years (Ministry of Economic Affairs and Communications, 2013).

4.4 Estonian E-Governance main stakeholders

Various publications have dealt with the Estonian E-governance, as the rather distributed system, where all the main digital developments are led by the central government, following the main leadership of the Ministry of Economic Affairs and Communications (Roosna & Rikk, 2016, p. 29). It has also been pointed out that centralized direction can more easily lead to a situation in which, E-government concepts will be designed and equipped according to the pattern, where government is the only interested stakeholder (Björklund, 2016, p. 917). The best example of an orchestrated platform in Estonian E-governance ...that is governed by EISA, located under the, previously mentioned, Ministry of Economic Affairs and Communications (Roosna & Rikk, 2016, p. 64). In addition to X-Road, EISA is also responsible for the coordination of other Estonian E-governance infrastructure components, like Data Communication in Public Administration (ASO), state portal eesti.ee, State Information System (RIHA), discussed below, and for the legislative side of the system (European Commission, 2016, p. 28). EISA is an institution which is responsible for ensuring that backbone systems concerning state information system is operational, safe and ensures the continuous basis for the development of E-solutions (Estonian Information System Authority, 2016). Although the overall system is considered as centralized and the concept of PPP has rather found a general treatment, there are various private sector stakeholders, who play a significant role in the development of Estonian E-society. First, Cybernetica AS, the research, and development company and the actual creator of the biggest Estonian E-governance success stories, like X-Road, E-voting, E-Customs, digital signature and who also provides a continuous development of E-solutions, being Estonian government's biggest

private partner over 15 years (Roosna & Rikk, 2016, p. 8) (Cybernetica AS, 2016). Second, E-Governance Academy (EGA), a non-governmental organization that spreads the word about Estonian experiences in E-governance around the world and have supervised tens of societies by means of a digital society. On the example of Estonia, countries like Finland and Azerbaijan have introduced their X-Road-like frameworks, first of which Estonia have reached a joint collaboration with (E-Governance Academy, 2016) (Roosna & Rikk, 2016, p. 67). The third important private party is SK ID Solutions AS (SK), that is the qualified trust service provider in Estonia. It provides necessary trust services (certification authority, certification validity services and timestamping) to ensure legal support for electronic signatures, seals and other trust related issues. In addition to certificates, SK provides time-stamping services, which are required for every inquiry performed over X-Road, with the aim to leave a mark (European Commission, 2016, p. 30).

4.5 Estonian Information System Architecture: X-Road

X-Road is a secure, distributed data exchange layer of information systems, whose one of the main tasks is to provide a one-stop-shop solution to ensure access to all of Estonia's public sector data. In addition, X-Road is considered as a backbone for Estonian e-governance, which has been in use from the year 2001 on and further developed since then. (Cybernetica, 2013) Based on the statistics, in 2016 X-Road had 246 databases, 975 affiliated institutions, 1789 services defined and executed over 574 million transactions, which shows that X-Road has become an everyday tool for communication for many organizations (Estonian Information System Authority, 2017). X-Road has made information exchange easier, quicker and cost-effective, without the need for additional system development, processing of paper documents, sending information via e-mail or making other alternative connections, as all needed queries can be made from one place, that is secure, user-friendly and available at any time (Estonian Information System Authority, 2016).

X-Road architecture (Estonian Information System Authority, 2017) (See Figure 2) is based on cooperation between affiliated organizations and databases and thus not only made for public sector organizations but an explicit tool for intersectoral collaboration, being easily combinable with the various information systems in use by different agencies

(Estonian Information System Authority, 2016) As public sector does not have the capability to offer all services needed, X-Road is a tool to delegate some responsibilities to the private sector by giving them the access to needed information and the ability to solve potential emerging problems in more quick and professional manner. X-Road makes the collaboration less fragmented when all sectors could use a unified platform to exchange documents, and this pattern can also reduce the amount of data that is doubled in various places (once only principle).

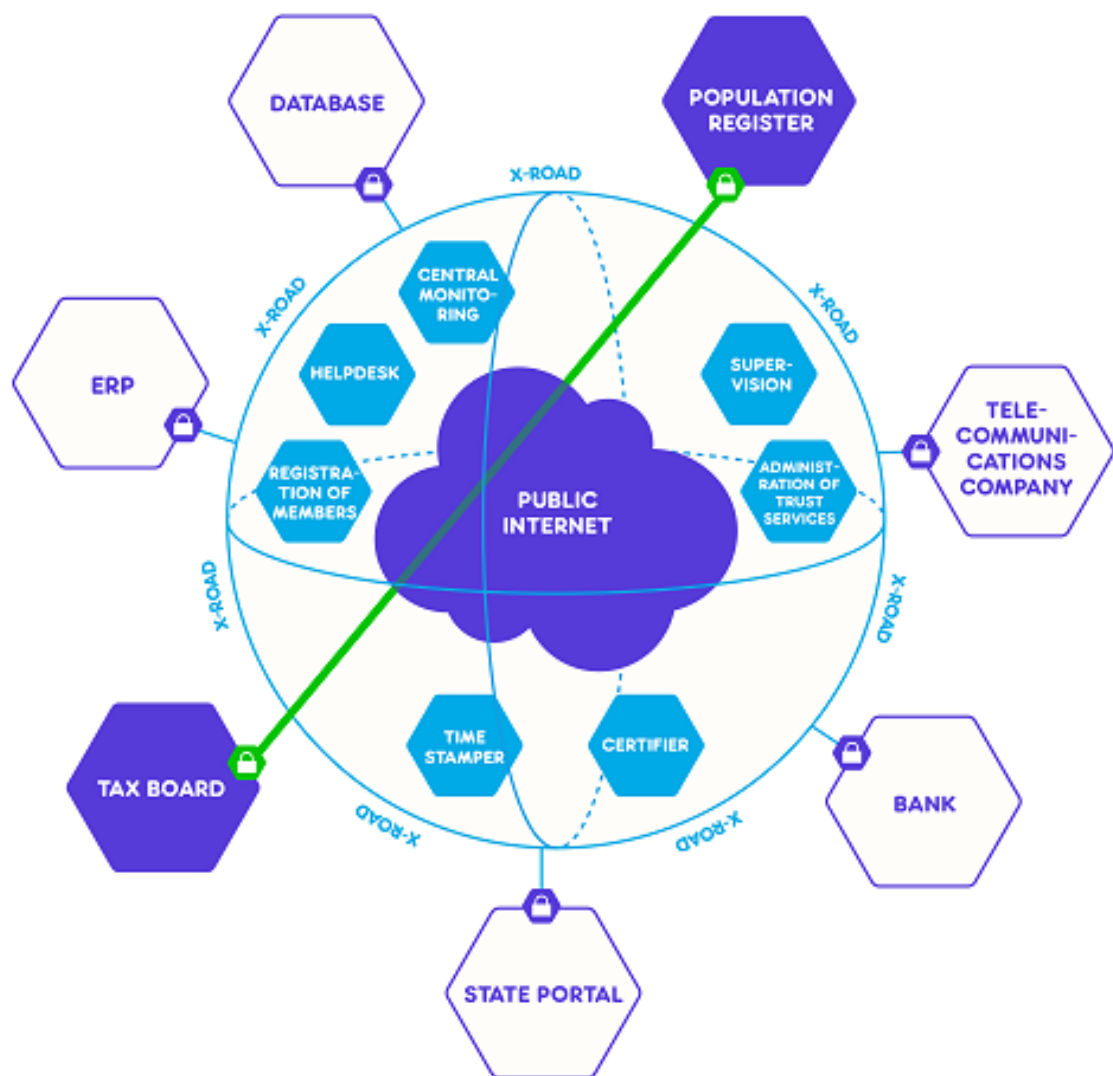


Figure 2. The architecture of the Estonian Information System.

(Estonian Information System Authority, 2017)

X-Road is essentially distributed platform, enabling secure continuous operation for 24/7 access to most governments databases, without managing business content centrally or examining its quality. The accuracy of the data and the ownership responsibility is not

changed. The original owner of data preserves its responsibilities—including who can have an access to their data. (Estonian Information System Authority, 2016)

X-Road allows security solutions, excluding the possibility of failures, as evidenced by the survival of cyber-attack in 2007 (Cybernetica, 2013, p. 1). Data exchange environments' security measures include authentication, log treatment features, authorization, encrypted and time-stamped data traffic. Information systems that are connected to X-Road, must define their own sufficient ways of how human users can access necessary data services. The authenticity, integrity, and confidentiality of all data exchanged, is guaranteed by X-Road messaging protocol that is implemented by standard component—the security server. It signs, timestamps, encrypts and logs all activities done through the X-Road. (Estonian Information System Authority, 2016)

In order to explain, how a concrete service works on X-Road, which parties are involved and how the responsibilities are divided between them, the author is providing an example of an electronic proceeding of building permit in Estonia. An example is illustrated in Figure 3.

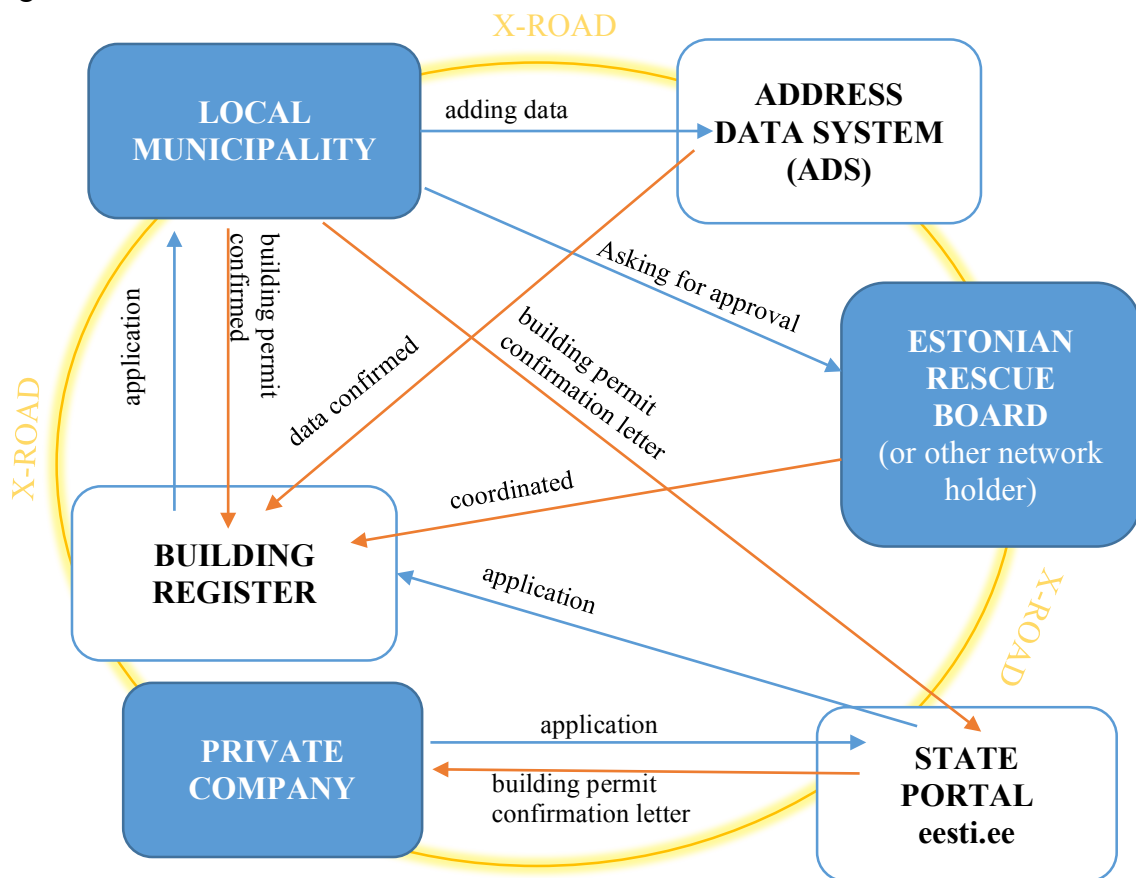


Figure 3. Electronic proceeding of building permit.

In order to map the “rich picture” as SSM suggests, the author has pointed out a CATWOE model for the service, illustrated above, that will show relevant systems of the process. As via X-Road loads of different stakeholders, databases and services are interacting with each other, it is more clear to explain the situation based on one real-life example.

- **C**ustomers: In this case private company, but as private company is probably a service provider itself (some engineering company), the end customer can probably be some third company or a person.
- **A**ctors: Private company, local municipality, Estonian rescue board (or other network holder).
- **T**ransformation: The application for building permit to transform into an actual permit, coordinated and accepted by every related stakeholder.
- **W**orldview: The transformation is important, because without a building permit, construction work can not start.
- **O**wner: As an owner, EISA can be seen, who is the administering authority of the X-Road.
- **E**nvironment: Process is indirectly affected by the workload of the authorities, as well as by the electronic platform work efficiency.

As an additional reliability measure, in 2016 X-Road core software (security server and essential central components) source code was revealed, which means that the source code is freely accessible for everyone, the environment is more transparent and the overall security is easily verifiable (Estonian Information System Authority, 2016). The big reason for revealing the source code is also the growing cooperation with Finland, while in 2015, Finland introduced their own X-Road based solution (Palveluväylä). In order to strengthen the relationship, Estonian Information Authority and Finnish Population Register Centre signed the cooperation agreement for creation of trust federation and soon it will be possible to make queries over X-Road from Estonia to Finnish databases and vice versa, that could be helpful for many agencies, as many Estonians living permanently or temporarily in Finland. (Estonian Information System Authority, 2017)

X-Road member can be every legal body registered in Estonia (Estonian Information System Authority, 2016). Becoming an X-Road member, candidates must take into account the criteria set down by the system, which will help them to prepare for the usage of X-Road. First, accession process starts with the selection of the environment, which company wants to join, as there are three different environments on the X-Road: production environment, test environment, and development environment, all of which have different requirements, objectives and technical indicators. Second, every company, who wants to join the environment, with the exception of the development environment, must be registered in RIHA in order to become an X-Road member. Registration will be done by expressing the desire of joining in RIHA and by accepting the terms of the accession process. (Estonian Information System Authority, 2016) In order to be able to use the platform and to start exchanging data, it is important also to go through the following three steps. First, security server installation and configuration, the prerequisites of which, in addition to membership are the hardware signature device and the created opportunity to use trust services. During this stage, a company also needs to choose trust services' provider from the provided trust list. Second, the registrations for subsystems, in order to interface with the X-Road. Subsystems can be chosen by the company, taking into account their specialties (For example state portal eesti.ee has three subsystems: citizen, official and system). Third, data service development and registration, which is the requirement, without, it is not possible to exchange data via X-Road. The important part here is data form and information transmission. After these steps are company ready to start using and providing data services via X-Road. (Estonian Information System Authority, 2016)

5 Research results and discussion

In order to collect detailed experiences with X-Road platform, the author conducted individual face-to-face interviews among different size Estonian private sector entities. The sample was composed, based on the X-Road usage history, so to be able to map as wide spectrum of opinions as possible. Potential companies, fit to the context, were primarily suggested by the Estonian Information System Authority (EISA), who has the statistics about the X-Road usage as well as about the frequency of inquiries done via X-Road. Since there are a lot of private entities in Estonia, without a direction it would have been very difficult to select which companies to involve into the research. Companies' membership of the X-Road was verified from the Administration System for the State Information System (RIHA), where it is possible, after authenticating yourself with an ID-card or Mobile-ID, to search for members and find out their join date and company category (public or private). Every interviewee was contacted personally via E-mail and interviews were agreed up to an hour long meetings in different meeting places, chosen by interviewees. In total, eight private companies from different business areas: healthcare, finance, logistics, information, and communication technology, participated. An overview of participants is presented in Table 3.

Table 3. Interview participants.

COMPANY NAME	FIELD OF ACTIVITY	PARTICIPANT PROFILE	X-ROAD JOIN DATE
Kreedix OÜ	FINANCE Credit management	X-Road user	20.10.2011
Põhja-Eesti Regionaalhaigla SA	HEALTHCARE Hospital services	X-Road user	19.01.2009
SPIN TEK AS	IT Software and hardware services	Service provider	12.10.2009
Ericsson Eesti AS	IT / COMMUNICATION Communication Technology	Service provider	Non-member
Interinx OÜ	IT Software development	Service provider	13.04.2009
Webware OÜ	IT Software development,	Service provider	30.12.2008
SIA unicredit insurance broker eesti filiaal FIL	FINANCE Financing solutions, Leasing products	Potential user	Candidate member
Live Technologies OÜ	LOGISTICS Customs affairs	Potential user	Candidate member

Interviews were conducted in Estonian and recorded by using Voice Recorder application, provided by TapMedia Ltd. All interview questions were open-ended and therefore required a longer discussion about different aspects of company's experiences with the X-Road platform. Questions were built up, on the basis of from general to specific approach, where first, the author asked questions about the platform, for example: (a) What do You think is the most important function of the X-Road? (b) When was Your first contact to X-Road, and in relation to which?, and then moved to more specific questions about the usage and the accession process, like (c) What do You think is the most difficult in the process of becoming an X-Road member? Why? (d) What changes/expenditure Your company had to make in order to prepare for X-Road membership?. All interview questions are presented in Appendix 1.

Based on the X-Road user experiences, three different participant profiles emerged from the prepared sample: 1) user, 2) service provider and 3) candidate user/potential user, each expressing a slightly different approach to the topic. First, users shared more personal approaches, expressing problems and successes connected to the system, which they have had to cope with during the accession and usage. Often, users had to figure out the process themselves, from the very beginning, therefore they have developed a very

clear outlook about the X-Road platform. Second, service providers shared more of their clients' views and little actual user experience was expressed. Third, candidate users described more of their expectations of the process of becoming an X-Road member and they analyzed more of the groundwork and requirements to be met before the accession process. In addition to three participant profiles, discussed above, the author met with the representative of a company, who were not user and also not X-Road member, but who had a clear vision of how X-Road could be implemented in order to attach more companies to join and to raise the awareness of the possibilities of the platform.

All responses were analyzed on an ongoing basis in order to adapt, if necessary, interview questions according to the participants' profiles. The course of each interview depended on first, the participant's profile and second, on what the interviewee considered company's most important part of the process or in connection with which they had the biggest experience. Taking these aspects into account, author/interviewer asked additional questions in order to clarify interviewee's statements and to find out important details, associated with stated research questions. The most alterations needed to be done during interviews with candidate members, when, for example, questions related to the usage and to the queries' semantics etc. could not be asked and the focus needed to be more in the process of becoming an X-Road member and on expectations for the platform.

Although SSM and Interpretivist philosophy emphasize that researcher and research form a whole and cannot be separated, the author tried to be neutral and did not provide leading questions to interviewees. Additional questions were used only due to the fact that the author wanted to clarify some of the aspects pointed out by the interviewee and be sure that answers will not be misinterpreted. Interviewees were informed of the objectives of the research and parties jointly agreed that confidentiality will not be guaranteed and company names and fields of activities will be presented in later analysis. In the analysis, no idea or opinion is invented by the interviewer, all interviews were analyzed in their original language and in original wording, after which the results of the study were translated into the required language of the current thesis.

5.1 Thematic analysis

For the data analysis, the author transcribed recorded interviews into the form of written text, that is one of the key aspects in order to start with the thematic analysis. Transcripts of the interviews were performed by handwriting so that the author had a chance to remind details of the interviews, and to write them through, so that already at the beginning of the analysis it is possible to notice similar patterns among different interviews. Transcripts were re-read several times and original recordings were listened over to be sure that no important detail would be lost.

In the next step of the thematic analysis, author mapped all interesting characteristics into different codes, that required in-depth analysis of the whole transcribed data. First, different labeling techniques were used, like highlighting and underlining, where keywords, considered important for the analysis, were marked with specific color or line throughout each transcribed interview data. After the entire data was looked through in several times, all codes were written on post-it notes in order to reorganize these in following analyze phases. Next, codes were grouped together, based on similarities and relationships between them, in order to create potential themes onto which, the following analysis will be built up.

As there were many questions asked during the interviews and thus a lot of codes and themes emerged from the analysis, the author decided to narrow down the selection of themes, based on which were also important from the perspective of chosen research questions. Two main research questions were asked at the beginning of the research:

- How to organize collaboration between public agencies and private entities?
- What are the main obstacles for designing a unified collaboration platform for public agencies and private entities?

As a result, five themes were selected: (1) process nature, (2) resources, (3) interoperability, (4) awareness and (5) advantages. These themes represent the main findings of the X-Road usage, as well as about the process of becoming an X-Road member. Themes and codes, grouped below them, are presented as a thematic map in Figure 4.

Process nature

Participants' descriptions of the X-Road nature and functions were quite alike, when words like data exchange layer, data sharing environment, data interchange service, secure channel in order to communicate with datasets, data exchange tube, and standard, were used. Out of all eight participants, there was no interviewee, who didn't equalize X-Road with data exchange.

As interview moved towards the actual processes, related to the X-Road, there were more contradictory opinions. One group of participants considered X-Road usage and accession process as difficult, where lots of stakeholders and bureaucracy are involved, registration in Administration System for the State Information System (RIHA) is time-consuming and complex. The replies showed, that the registration process in RIHA was by far considered to be the most difficult part. Respondents also pointed out the increasing requirements for security measures, stricter requirements for hardware and software, and the fact that for smaller private sector companies, it is hard to integrate the system, without having a separate IT-department and X-Road competence within the company. The other group of respondents considered the process of becoming an X-Road member rather easy, when platform manager has prepared a useful toolkit, including several instructional materials like user manuals, installation guides, recommendations etc. In addition, it is possible to contact the helpdesk via phone or E-mail, that will guide companies through the process. If company doesn't want to or is not able to develop servers themselves, it is possible to buy in these competencies from different service providers. Respondents also pointed out that once you have made system clear to yourself, achieving next steps will be no problem, but they also agreed with the other group, that X-Road competence is crucial in order to go through the process smoothly.

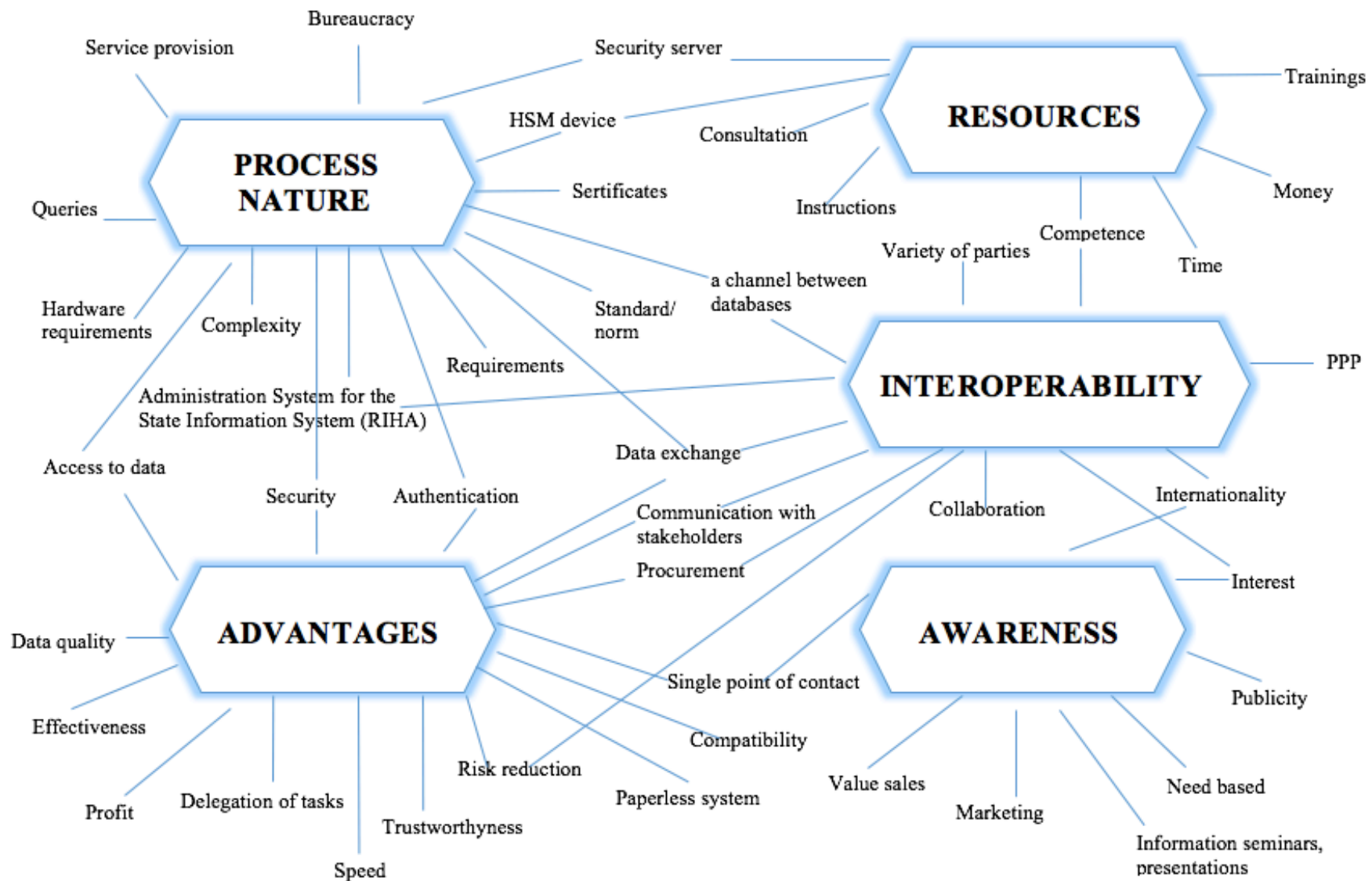


Figure 4. Thematic map.

Resources

The resource part of the platform created the main talking point in interviews, where author composed questions from different angles of the subject: (a) What changes/expenditure Your company had to make in order to prepare for X-Road membership? (b) What resources and in what extent X-Road has helped your company to save/reduce?. First, participants pointed out that the biggest amount of resources needed to spend in order to ensure security measures, both financial resources and time. For example, the fact emerged from the interviews, that security server costs about two times more than hardware server and with the additional requirement for Hardware Security Module (HSM) device with X-Road version 6, overall costs will be raised multiple times. The time expenditures were also considered the biggest in connection with the security server installation, obtaining certificates and with the selection of HSM device. Second, participants said that registration in RIHA, also illustrated under the previous theme, is time-consuming and interviews revealed that one company needed to change the system, in order to get coordination from RIHA, a record five times. Third, interviewees stated, that for public sector, all queries are free of charge, but private entities have to pay a fee for each of the queries, made through the X-Road. As the volume of queries can extend very high, the private sector has no interest in paying a fee for them. For example queries from Population Register. Participants also pointed out, that often, the private company only needs to communicate with one or two data sets, which makes it unreasonable to spend such amount of resources on the X-Road accession and usage monthly, if it can be done an alternative way, in a worst case, manually. As to the second question, concerning resources, respondents found little or no place for savings through X-Road usage. Less than half of the interviewees pointed out, that X-Road will help to reduce time, company's employees can perform other tasks and if one system or service is already done/written, it can be used in other systems as well. For example, North Estonia Medical Centre Foundation (PERH) is doing 1 query in a second (solely digital prescription requires 3 different queries) and therefore significant time saving will be achieved and the company is able to conduct approximately 1000 appointments in one day. The second example, credit companies, one customer profiling can take up to one day, where each customer proceeds separately. Via X-Road, the operation time can be reduced to minutes.

Interoperability

As the research is mostly focusing on Public-Private Partnerships, the author asked participants to evaluate, in what extent X-Road will contribute in organizing PPP and is it important to develop a unified platform for both sectors. All respondents, except one answered, that X-Road can significantly contribute in organizing PPP and is the most suitable platform, if not the only one in Estonia, which creates favorable conditions for intersectoral cooperation. For private entities, X-Road is an option to communicate with the public and to get access to the information held in public databases. For example, interviewees pointed out, that companies with the X-Road experience, can participate in public procurement processes, that is one of the key places, where public sector agencies and private entities create relationships and communicate with each other. According to general PPP principles, respondents thought that X-Road can help to scatter risks. For example, credit companies said that X-Road allows them to be sure, that the information, gathered into state databases are reliable and company can have a much wider picture of their customers, in order to make reasonable financial decisions. X-Road can also help public sector to get guidance from private competencies, as one of the reasons, why PPP was first introduced in countries, was the growing interest in the development of E-government systems and therefore cooperating with ICT companies. There are several public agencies, who buy an IT service for the X-Road usage from private entities. For example, among respondents, Spin Tek AS provides IT services for most of the Estonian municipalities and has built up a specific system just for municipalities to integrate their information systems.

Awareness

One of the key reasons, why private sector companies don't attach themselves to the X-Road, according to the participants, is awareness. Interviewees said that X-Road has not been made visible enough for companies and lack of awareness of the system is related to the fact that out of tens of thousands private companies operating in Estonia, only few hundred are X-Road members. Respondents also pointed out that among private sector is spreading an opinion, that X-Road is "some state stuff" and is not meant for private entities and therefore private sector do not take the trouble to investigate the system in more detail. In addition, interviewees also pointed out the historical aspect, when initially, X-Road was developed in order to allow public agencies to communicate with each other

and exchange data. Participants also pointed out the fact that is related also to the next theme, private companies are not aware of different possibilities and opportunities that the platform offers and that is also the reason, why private companies are rather modest in relation to the process of becoming an X-Road member.

Advantages

According to the interviewees, X-Road has several advantages, for example, it helps to communicate with different data sets from one place, it is secure and users can be sure if security requirements are guaranteed, that all data is safe and processed only by connected people. In addition, participants pointed out that X-Road makes processes quicker and promotes paperless management that will as a result save time. X-Road also allows to delegate certain liabilities of the company and platform will take care of these tasks instead. X-Road also takes care of data quality, which can only improve, if all registers keep their data up-to-date. From the perspective of PPP, X-Road helps private sector companies to communicate with government agencies and access to certain data, that is not possible outside the platform. Interviewees have also pointed out one problematic aspect, related to the advantages and profit, that is the situation where most of private companies are not understanding the benefits of the X-Road. As private companies' aim is to earn a profit, they cannot see how this platform can help to get this profit. Interviewees said that maybe if companies who use the platform, share their experiences and concrete examples, how X-Road can be profitable compared to other systems or manual processing, then the interest of the platform will raise as well.

In connection with chosen themes, discussed above, the author found related problem areas, which help to answer the most important research question about the obstacles for designing a unified platform for the public and private sector, illustrated by the case-study of the Estonian X-Road. These problem areas read as follows: (1) the complexity of the process, (2) abundance of different stakeholders, (3) a number of costs, (4) a little awareness and (5) a little understanding of profitability. In order to confirm or rebut these problem areas, author composed, in addition to the face-to-face interviews, an online questionnaire among X-Road Community. Among the X-Road Community members are represented both, private and public sector specialists, developers, administrators, business process managers etc., which makes the scope of different worldviews even wider for this research. In total 21 community members participated in the survey.

Questions were composed, using Google Forms feature and divided into three categories: (1) resources, (2) becoming an X-Road member/X-Road use and (3) Public-Private Partnerships, under which different questions, related to the emerged problem areas where asked. Questions included both, multiple choice questions and open-ended questions in order to specify the reasons why each respondent chose the given option. For example, the author wanted to know: (a) Do You think that X-Road use, will help businesses reduce resources? (answers: helps largely, rather helps, rather does not help, does not help at all, can not answer), and in order to specify, the author asked an additional question: (b) Which resources X-Road helps to reduce?(answers: investments, running costs, time, workforce, other).

Respondents/community members were contacted via E-mail, where Estonian Information System Authority (EISA) transmitted the link of a questionnaire to community's mailing list. The questionnaire was conducted in Estonian and results were later translated into the required language for the current thesis. Questionnaire was anonymous, the only question that helped to group responses was the one, where participants needed to choose the sector in which they currently work. Respondents had three options to choose: public-, private- or non-profit sector. The chart with shares between three sectors is presented in Figure 5.

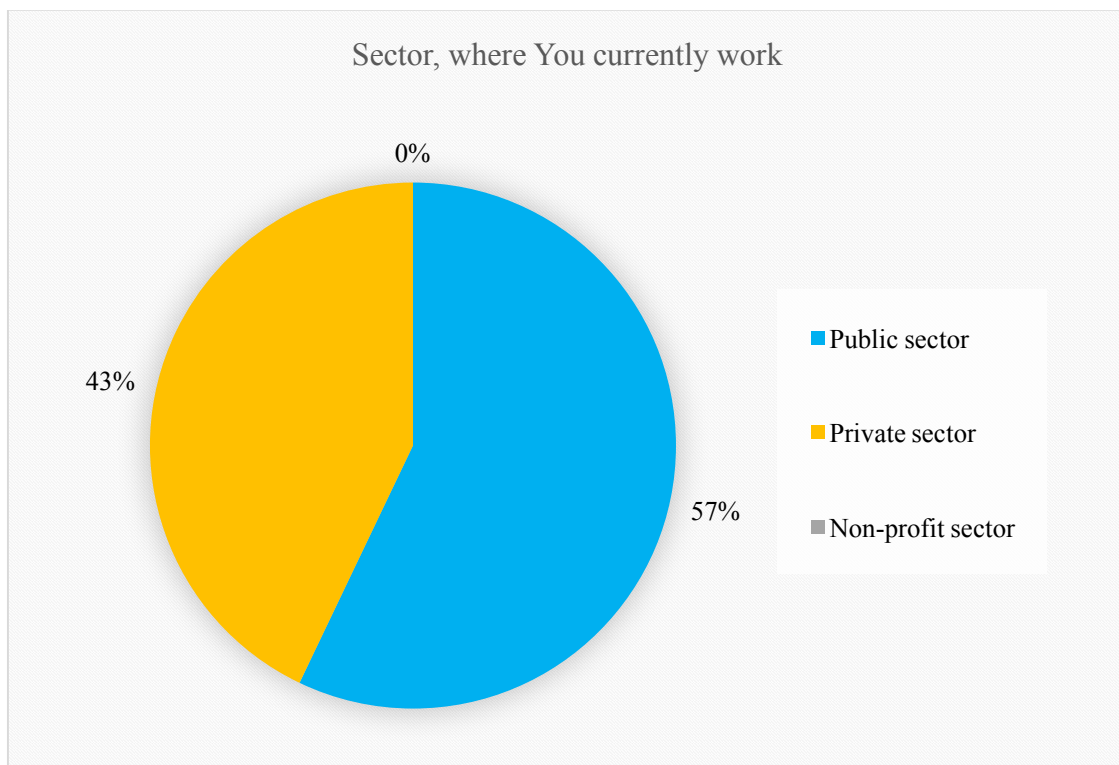


Figure 5. Online questionnaire participant shares.

Resources

Participants were asked (a) Do You evaluate costs, accompanied with the X-Road usage, reasonable? And the possible answers were yes, rather yes, rather no, no and can not answer. The survey revealed that more than a half, 52,4% of the respondents considered costs, accompanied with the X-Road usage reasonable and chose “rather yes”, answer “yes” was chosen by 9,5% of the respondents. Remaining 38,1% divided between “rather no” 19%, “no” 14,3% and “can not answer” 4,8%.

Similarly to interview questions, the author wanted to know: (a) Do You think that X-Road use, will help businesses reduce resources? Possible answers were help largely, rather helps, rather does not help, does not help at all, can not answer. Nearly half, 42,9% of the respondents answered that X-Road use rather helps to reduce company’s resources, 9,5% thought that it helps largely and 28,5% thought that X-Road plays a little or no role in reducing resources, 19% left the question unanswered. In addition to this question, an additional question was asked, in order to clarify, which resources X-Road helps to reduce and answers were divided as follows (see Figure 6). Numbers are presenting a number of respondents who chose the answer.

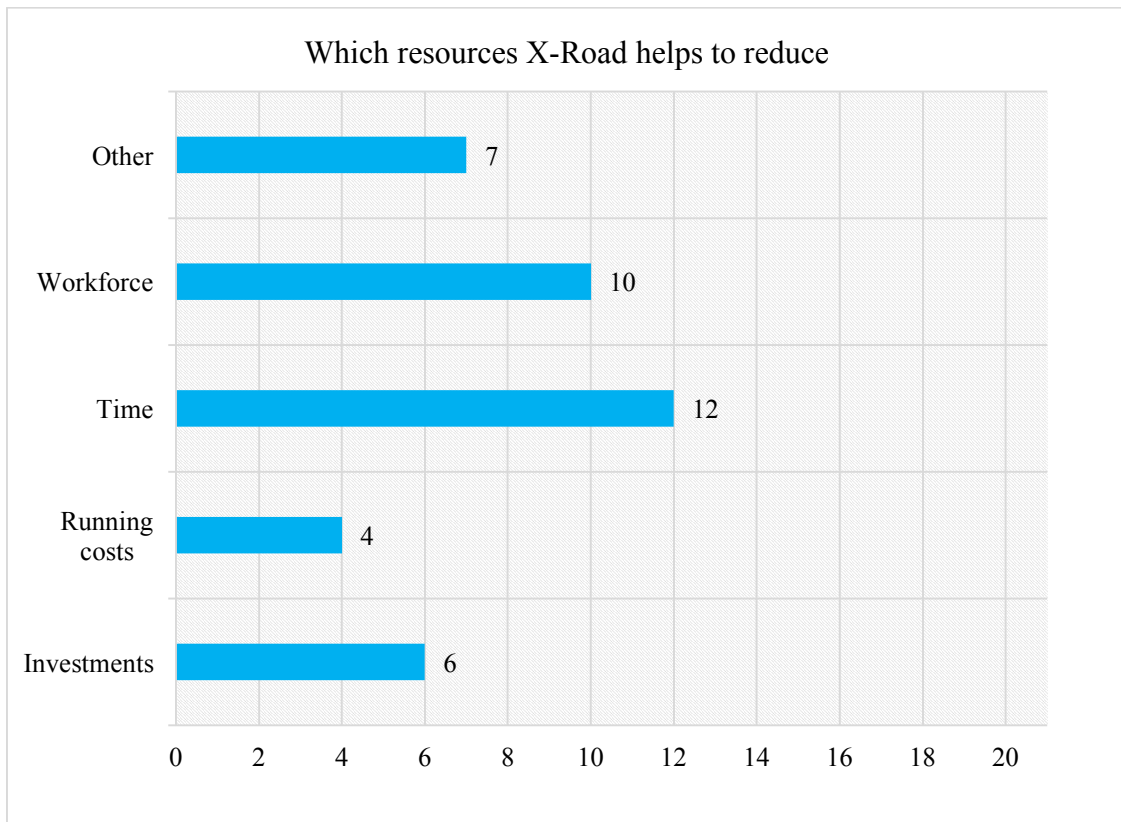


Figure 6. Which resources X-Road helps to reduce.

To conclude, compared to the interview results, questionnaire brought slightly different outcomes, where resources were considered more as reasonable. Such outcomes might arise because of the fact that over a half of the respondents of the online questionnaire were from public sector agencies, who are likely having different experiences with the platform, as it is required for them to use. Despite the differences, we can see that the problem with resources is not lost from the questionnaire as well and about one-third of the respondents still see the resource part as one of the platform-related problems. As far as reducing resources, interviews, and questionnaire have more or less similar outcomes, where the main source of savings are seen time.

Becoming an X-Road member/ X-Road use

According to the X-Road accession process as well as to the usage, the author asked two main questions: (a) How would You rate the awareness of the possibilities of becoming an X-Road member and of the X-Road use? Possible answers were very low, rather low, rather high, very high, and can not answer. 42,9% of participants thought that awareness is rather low and 19% thought that it is very low, 9,5% left the question unanswered and remaining 28,6% divided between very high 9,5% and rather high 19% awareness. Answers are also illustrated in Figure 7.

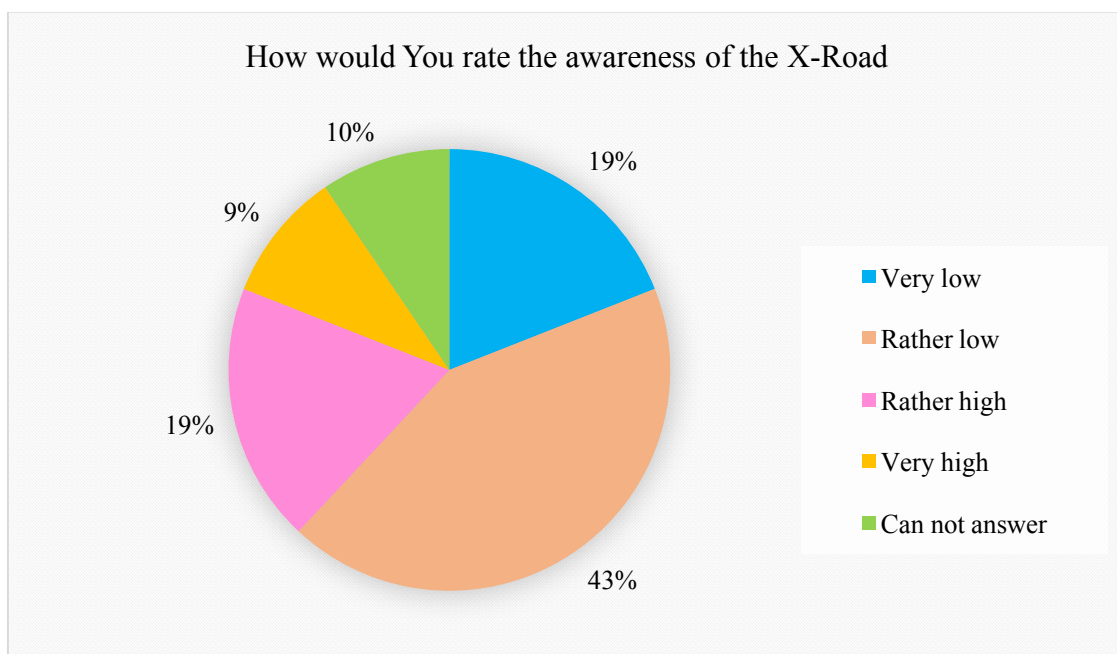


Figure 7. The awareness of the X-Road platform.

The author asked also an additional question, in order to clarify the situation with examples: (b) What would help to raise awareness of businesses? This question had no

proposed answers and participants needed to come up with their own solutions. Following aspects were pointed out as possible solutions: providing briefings and informational materials, via integrating RIHA requirements, wider use of X-Road in government institutions (instead of sending files, using only X-Road services), information dissemination through various channels, the development of example embodiments and the introduction of achievable benefits/savings, cutting the red tape.

In order to find out the bottlenecks of the platform, the author asked the participants: (c) How do you evaluate the complexity of the X-Road process? Provided answers were very complicated, rather complicated, rather simple, very simple, can not answer. 42,9% of participants evaluated the platform usage and accession rather complicated, 23,8% considered it very complicated. In total, 19,1% of participants evaluated the process rather simple or very simple and 14,3% left the question unanswered. Complexity evaluations are illustrated in the Figure 8.

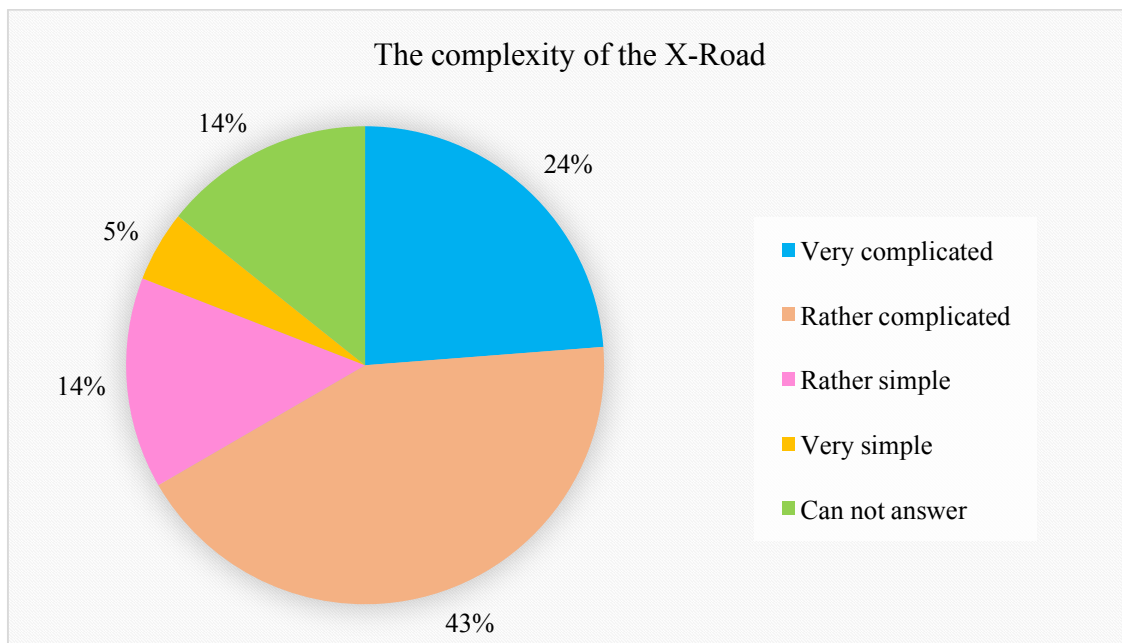


Figure 8. The complexity of the X-Road.

Based on interview outcomes, author specified the previous question by providing seven possible factors that might make the process difficult and the factors read as follows: process itself is complicated, instructions are complicated, the amount of parties (RIHA, SK etc.), communication with service providers, registration in RIHA is complicated, security server installation is complicated, the implementation of the requirement of

security measures, other. The distribution between different factors is illustrated in Figure 9.

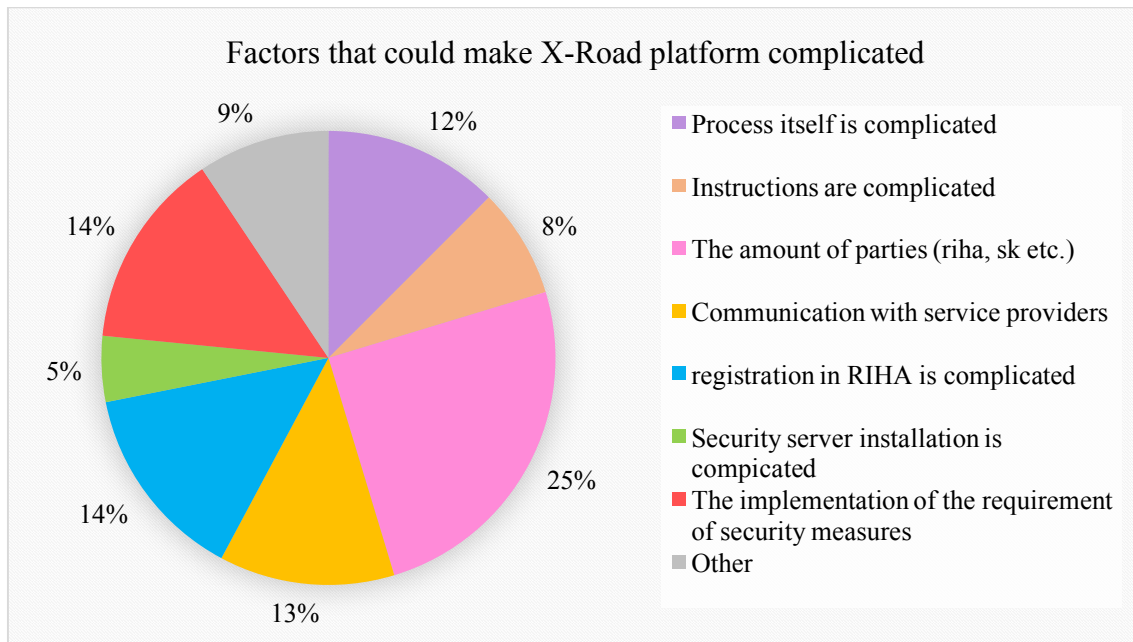


Figure 9. The factors that could make X-Road platform complicated.

By comparison between interview and survey results, opinions are largely overlapping, where both participant groups considered X-Road platform usage and the process of becoming an X-Road member rather or very complicated. As for possible bottlenecks, both respondent groups pointed out a number of different parties involved, registration process in RIHA and the implementation of different security measures. It can be said that the problematic situation around the complexity of X-Road platform remains essential and several recommendations, discussed below, were given in order to explain the process to potential users more in detail and to give as much help and support from the government side as well.

Public-Private Partnerships

In connection with Public-Private Partnerships, author composed following question for X-Road Community members: (a) Do You think that X-Road will contribute in organizing public-private partnerships (including data exchange)? Possible answers were helps largely, rather helps, rather does not help, does not help at all, does not have to help, can not answer. More than a half of participants, 57,1%, thought that X-Road platform rather contributes in organizing PPP, 23,8% even found that platform contribute in

organizing collaboration largely. Remaining 19,1% was distributed equally between does not help at all and can not answer. Answers are illustrated with chart in Figure 10.

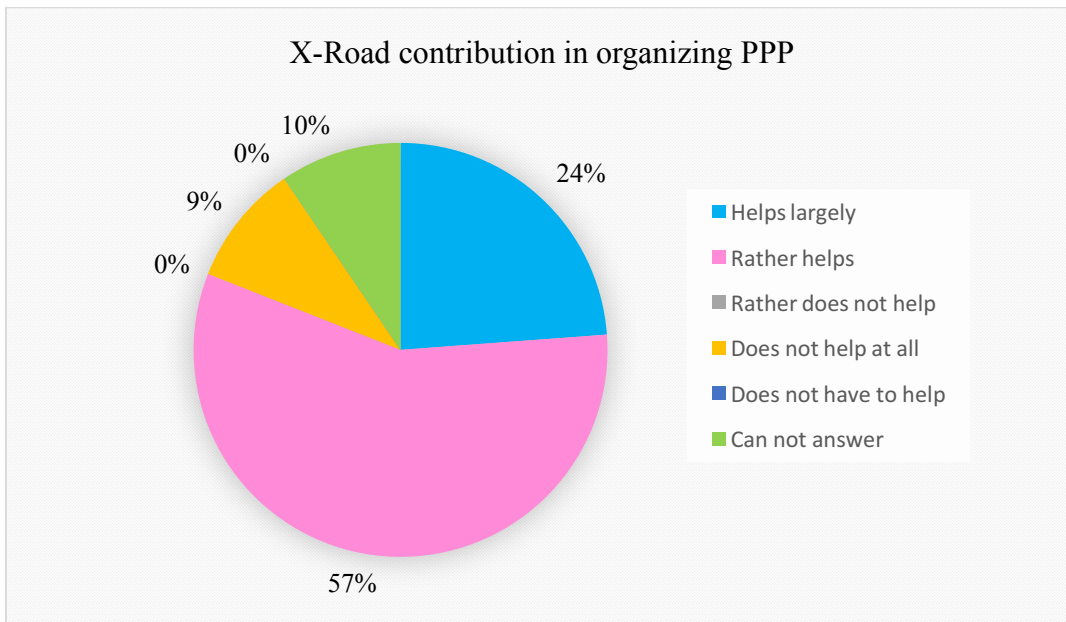


Figure 10. X-Road contribution in organizing PPP.

Comparing questionnaire findings with interviews, it can be said that X-Road is considered as a platform to promote Public-Private Partnerships and none of the participants thought that the platform is not supposed to support intersectoral collaboration. In conclusion, it can be said that there is a large PPP potential and by solving all previously mentioned problem areas, the collaboration between sectors only leads to a stronger interaction and collaboration between sectors and organizations.

5.2 Recommendations

Based on the foregoing analysis, the number of problem areas emerged. Therefore, the author has combined the various suggestions and possible solutions that were pointed out during the interviews and from the online questionnaire, in order to achieve future improvement of the platform.

This subchapter also summarizes sixth and seventh stage of SSM, where the author first, is supposed to define desirable and feasible solutions to the problematic situation and second, needs to express actions what should be done in order to improve the situation. The correlation table for problems and suggestions is illustrated in Table 4.

Table 4. The correlation table for problems and suggestions.

This table represents five problem areas, pointed out during the research and recommendations, which correspond to the brought out problem areas.	Raising awareness	Single point of contact	Information seminars/hackatons	Instructional materials	Specific examples reflect the profitability	different membership packages (Price according to the package)	Different sectoral approach	Reducing bureaucracy	Information dissemination
	Problem/Solution								
X-Road usage as well as accession process is complex		X	X	X			X	X	
Too many parties involved in the process		X					X	X	
Platform accompanies high expenditures					X	X			
A little awareness	X				X				X
A little understanding of profitability	X				X				X

The author placed problematic areas, emerged from the interview analysis, on the left of the correlation table, possible solutions and interviewees' recommendations on the top of the correlation table in a discretionary order. Problem areas were dealt with as follows: (1) the complexity of the process, (2) abundance of different stakeholders, (3) a number of costs, (4) a little awareness and (5) a little understanding of profitability. In order to show, how these mentioned recommendations will actually help to solve problems, author adjusted problematic areas with concrete recommendations and these relationships are illustrated with the "X" markings in the table.

Recommendations are pointed out with the aim to provide a practical tool for EISA in order to possibly make changes at the platform and to provide an additional help and guidance, in the form of information seminars, materials or otherwise, as pointed out during the research.

6 Summary and Conclusions

6.1 Research method

As the main research methodology of this research, the author chose Soft Systems Methodology, that takes a real-life problematic situation, and based on the comparison of an idealistic conceptual model with the real life experiences, provides suggestions for future change and improvement.

Author find SSM as the most suitable methodology for current research, because the problematic situation under an analysis, Public-Private Partnerships based on the Estonian X-Road example, can only be analyzed in detail, if taking into account different real-life experiences with the approach, that will arise from qualitative interviews. Idealistic theory, how PPP should work, is provided in the various literature, but in order to make suggestions for an actual PPP platform improvements, experiences should be analyzed and compared with an idealistic model.

Differently, from the traditional SSM approach, the author did not provide a new idealistic model for the system, opposite, the author examined already existing model, that has been considered idealistic based on past experiences. The author finds that, because current thesis main focus is on public services, and in Estonia, the pattern, how public services are delivered and consumed over X-Road is quite similar, it is a reasonable decision to use an existing model, in order to compare it with the actual situation.

6.2 Answering research questions

At the beginning of the research, the author wanted to map possible ways, how intersectoral collaboration can be organized and why it is beneficial. As pointed out in the analysis, there are at least five different approaches for Public-Private partnerships, that are also adjusted according to the needs and nature of the procurement and of the country, so there is still no such thing as a unified definition for Public-Private Partnerships. PPP was considered as a management reform, a risk scattering, a power sharing and also a reformation of public services. Analysis showed, that there are those

countries who has been successful, in connection with the organization of collaboration between sectors and also those who has no or little relationship with it. At the end, organizing collaboration between public sector agencies and private entities is different and should be taken case-by-case, in order to achieve objectives, set for the specific collaboration project.

Second, the author conducted a practical research, of how to design a unified platform for both public as well as private sector and wanted to know what are the obstacles that can emerge. The research was made, based on the Estonian example, X-Road, as a tool for collaboration. As research result showed, there are several problem areas arose from private sector entities' experiences and these problem areas are the main reason, why the private sector is not interested in becoming an X-Road member. As obstacles, following problem areas were pointed out: the complexity of the process, the abundance of different stakeholders, a number of costs, a little awareness and a little understanding of profitability. In order to be able to overcome these obstacles in the future, the author provided various recommendations that could help to make the platform more attractive for private sector entities.

6.3 Future directions

In the current research, the author has pointed out five different problem areas, that emerged from the analysis and based on these provided different possible solutions and also recommendations for EISA, in order to direct X-Road future development activities towards dealing with these bottlenecks.

As future developments, the author sees that state should focus first, on raising awareness and making the X-Road platform more visible among private sector entities. In addition to information seminars, materials, and roundtables, the author sees that it should be considered to make a competence center under EISA, that could help to raise awareness and to get closer to the private sector with the issues concerning a unified platform developments. It is clear, that one-time educating is not enough, in order to reach every single company in Estonia, so author finds that a separate competency center can make raising awareness as a running process and can also help EISA in X-Road value sales, that is a quite actual process, towards which EISA is moving today. The author also see that the competence center could be the single point of contact for private sector, in order

to guide them through the process of becoming an X-Road member and through the difficulties, concerning use and can hold private sector on the leash, in a good way, that after a single difficulty, X-Road is not going to lose members, but they get support.

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Appendix 1 – Interview questions

- 1) What do You think is the most important function of the X-Road?
- 2) When was Your first contact to X-Road, and in relation to which?
- 3) What was the reason why You decided to become an X-Road member? (What was the reason You opted out of the use of X-Road?)
- 4) What do You think is the most difficult in the process of becoming an X-Road member? Why?
- 5) What do You think is the easiest in the process of becoming an X-Road member? Why?
- 6) What changes/expenditure Your company had to make in order to prepare for X-Road membership?
- 7) What do You think is the greatest advantage of the X-road members compared to those who do not use X-Road? (What is the advantage of the system currently in use in Your company compared to the X-Road? Why is it more convenient for you?)
- 8) What resources and in what extent X-Road has helped your company to save/reduce?
- 9) How big is your need for cooperation with public sector agencies?
- 10) How do you assess the role of X-Road in organizing Public Private Partnerships? Whether and how the X-Road has changed your company's communication and information exchange with public sector agencies?
- 11) How would/could the process of becoming an X-Road member can be changed, in order to attract more private entities? Why is it important?

- 12) How do you evaluate the safety of X-Road? What do You think are the security risks that the system hides?
- 13) Do you think that the X-Road queries semantic side is understandable and easily combinable with your company's own system.

Appendix 2 – X-Road Community questionnaire

- 1) Sector, where You currently work
 - Private sector
 - Public sector
 - Third sector (Non-profit sector)

RESOURCES

- 2) Do You evaluate costs, accompanied with the X-Road usage, reasonable?
 - Yes
 - Rather yes
 - Rather no
 - No
 - Can not answer
- 3) What are Your expectations for X-Road usage, which added value the platform should create?
- 4) What are currently your organization costs on trust services? *(Here, OCSP /CRL and/or time stamping service-related costs are meant)*
 - Do not know
 - Do not use
 - Use, but do not know the cost
 - Use and do know the cost
- 5) In case You chose “Use and do know the cost” in the previous question, name cost sources and their approximate sizes.
- 6) Do You think that X-Road use, will help businesses reduce resources?
 - Helps largely
 - Rather helps
 - Rather does not help
 - Does not help at all
 - Can not answer

7) Which resources X-Road helps to reduce?

- Investments
- Running costs
- Time
- Workforce
- Other

BECOMING AN X-ROAD MEMBER/ X-ROAD USE

8) How would You rate the awareness of the possibilities of becoming an X-Road member and of the X-Road use?

- Very low
- Rather low
- Rather high
- Very high
- Can not answer

9) What would help to raise awareness of businesses?

10) How do you evaluate the complexity of the X-Road process?

- Very complicated
- Rather complicated
- Rather simple
- Very simple
- Can not answer

11) Which factors make becoming an X-Road member a complicated process?

- Process itself is complicated
- Instructions are complicated
- The amount of parties (RIHA, SK etc.)
- Communication with service providers
- Registration in RIHA is complicated
- Security server installation is complicated
- The implementation of the requirement of security measures

PUBLIC-PRIVATE PARTNERSHIPS

12) Do You think that X-Road will contribute in organizing public-private partnerships (including data exchange)?

- Helps largely
- Rather helps
- Rather does not help
- Does not help at all
- Does not have to help
- Can not answer

13) How can Public-Private Partnerships and data exchange should be supported by the X-Road platform? *(If you answered the previous question anything other than "does not have to help", please explain)*

14) Do You think the state should support companies in becoming an X-Road member?

- Yes
- No
- Can not answer

15) Which support state should provide?

- Financial support
- Know-how
- Different information seminars/ hackathons
- Instructional materials
- Other

16) Do You think that X-Road accession process should be sector specific? *(Do You expect that all X-Road members meet uniform requirements or requirements specifications are justified between public and private sector?)*

- Yes
- No

17) Specifications, suggestions