Analyses of Return on Investments in Estonian eGovernment Development Projects. Expectations, Needs and Shortcomings.

Master's Thesis

Author: Kairit Kulm

Supervisor: Enn Õunapuu

Co-supervisor: Janek Rozov

Tallinn 2015

Author's declaration

I confirm that I have constructed this Master's thesis individually and that the current paper has not been presented by anyone before. All resources, viewpoints, citations, and other materials from other authors that have been used in this thesis have been referred to.

---   --
                        (*date*)   (*signature*)

Annotation

The aim of the thesis in hand is to analyse the current state of the assessment of the return on investments (RoI) in Estonian central eGovernment solutions based on researching three different case studies of e-service development culture.

The main problems dealt with include what are best practices and requirements of assessing RoI, how assessment is currently done and how to improve the current system so that it would achieve its aim.

The results of the research showed that the development of Estonian eGovernment in silos has led to a state where the goals of the agencies, practices of preparation of projects and methods for evaluating RoI vary a lot between and within the agencies. The assessment methods used do not ensure a thought through preparation of projects as the results of the developments and the profitability are highly inaccurate compared to the initial analyses.

The thesis is in English and contains 82 pages of text, 4 chapters, 6 figures, 4 tables.

Abbreviations and concepts

RoI   *return on investments*

MEA&C   *Ministry of Economic Affairs and Communications*

RIA   *State Information System Authority*

RMIT   *IT Centre of the Ministry of Finance*

ARIB   *Agricultural Registers and Information Board,*

MoJ   *Ministry of Justice*

EMTA   *Estonian Tax and Customs Board*

RIK   *Centre of Registers and Information Systems*

Service in silos   *The decentralized approach towards public service provision*

Central eGovernment   *The electronic services and solutions provided in the level of ministries excluding the local government e-services and solutions..*

List of tables

List of figures

Table of Contents

1. Introduction and motivation

World, society and state are constantly changing objects. Change is a norm in an organisations' or government's work, processes and information systems [38, pg. 21]. Thus all the mediums through which the state executes its legislative and executive power are in a constant change and re-development. The mediums include state offered services that are provided through the means of information technology.

Estonia is known to be a tech-savvy country and its eGovernment solutions are often praised for their innovativeness and ease of use. When the development of Estonian e-solutions began in the 90s, the main aim was to solve problems using ICT means quickly, efficiently and with minimum cost. [23, 33, 34] While this was an excellent strategy for the time being, the current situation shows that the older eGovernment solutions are beginning to lack behind in their interoperability solutions and platforms. There is a growing need for bettering old e-services and creating new ones. As nowadays there is greater amplitude of financing, mainly through European Union monetary support, there is also a greater possibility to develop services for the sake of developing and thus forgetting the benefits that should arise from a new service or re-development of a system.

In the period of 2014-2020 Estonia can receive over 180 million euros from European Structural funds for funding different public e-service development projects and enhancing its information society [43]. From 2021 the European monetary support will decrease rapidly, thus the Estonian state budget will be approximately 20% smaller. This means that the e-service development field will lose its current main funding. Therefore the decisions and projects made in the next five years have to be well implemented and sustainable.

While the state's aim is not to be financially profit-oriented, it should still make reasonable decisions so the investments made for implementing new developments, enhancements and services would return the impact intended. Analysing the possible return on investments (from here on RoI) is necessary to foresee and prevent negative externalities, to resolve problems ahead of time and to evaluate whether the new development will be beneficial relative to the investments made. While there are various ways to evaluate RoI, the main idea followed is that the benefits gained for the users, service owners or the society should be equal or higher to the investments made. [15]

The thesis at hand will view the current state of analysing return on investments in eGovernment solutions and services with the aim of creating an understanding of how different projects are implemented and evaluated as well as if and how the current state of RoI assessments of software and hardware developments in Estonian central eGovernment level should be improved.

1.1 Research questions

The research will focus on mapping the existing state of the return on investments in Estonian central government level e-government projects with the aim of conducting thorough enough research to evaluate its possible weaknesses and provide remedies for the weaknesses.

The research questions of the thesis in hand are:

1. How are the return on investment analysis conducted in Estonian central eGovernment projects?
   1.1. How the current analyses support the wider goals of the state, stakeholders and the service itself?
   1.2. How are return on investment assessments conducted over time?
2. If and how the current system could/should be improved?

As Estonian central eGovernment development is done in silos there is no concrete practice or commonly recognized metrics for evaluating a projects costs and benefits. As there are different possible places to receive funding, the analyses might vary according to the aim they are written for. The hypothesis of the thesis state that:

1) The metrics used are inconsistent and described so that the projects result would always be positive;

2) The analyses do not take into account the costs of future development and enhancements;

3) The value added to the users and society are undervalued in the metrics.

1.2 Research methodology

The research is qualitative using primary and secondary sources.

For understanding the current state, main directions and strategies of the Estonian eGovernment development necessary strategies and documents will be covered in the chapter on the theoretical background. In order to establish the best practices of assessing RoI as well as the needs and requirements of the assessments, the chapter will also cover most common RoI evaluation methodology assessing their strengths and weaknesses and thus trying to find the best methodologies to support the Estonian context.

The practical part of the thesis is built on the case study method. As the only central coordination is done through dividing Structural Funds, 11 applications for funding from recent years will be analysed and compared to establish the current state and possible weaknesses in the evaluation.

For understanding how RoI analyses, costs and benefits change in time two information systems that have been running for long time will be viewed. This includes studying documentation on chosen projects, the statutes of the agencies and systems as well as interviewing necessary stakeholders.

The interviews will be conducted with the stakeholders of two central eGovernment service providers. The questions of the interviews derive from the theoretical part of the work and base on the best practices of RoI assessment and the Estonian eGovernment concepts. The questions range from describing the current state and practice of RoI assessment in the agency to correspondence of the projects with the national strategies. The interviews were carried out face-to-face with the approximate length being one hour.

1.3 Literature overview

There are several surveys and benchmarks on how services should be developed, how to improve user-centricity and what approaches should a state take. Most of the aforementioned literature state that service development is lacking in user-centricity and the general development culture could be improved.

The European Commission made a benchmark in 2012 about public e-services. 28 000 EU citizens from 32 European countries were involved in the survey which looked at different scenarios and life events when e-services are and should be helpful for the citizen. [30]

According to the survey a shift towards user needs is a new way of thinking in eGovernment services, but according to user satisfaction the shift is not fully embraced in European countries. Another thing pointed out in the survey is that when not embracing the customer satisfaction aspect of providing e-services, governments are also not saving as much as they could when implementing these services [30, pg. 60-61]. According to Krogstie (2012) real end-users should be involved in the development process as stakeholders in order to ensure that the system will in fact be usable and beneficial to the users [38, pg. 32-34].

Key reasons for using eGovernment services are saving time, flexibility and saving money. The press release of the aforementioned survey stated that: "Respondents from the 32 participating countries indicated that the barriers to adopting eGovernment services were difficulties in usage (24%), and lack of awareness (21%). "[8, pg. 1]

According to the survey most popular e-services include declaring taxes, changing addresses and enrolling in higher education/applying for grants. Least popular services include reporting a crime, starting a new job and the procedure of getting disability allowance. [8, pg. 2]

What can be seen from the results of this benchmark is that the users tend to use more of the services that have a direct impact on their life. For example declaring taxes and applying for grants are directly related to if and how fast the citizen gets refunds or additional funds. Therefore the user is more motivated towards using the developed e-services. Judicial systems tend to have a less direct impact to citizens life which might be one of the reasons why the users don't see them as beneficial as some of the other services.

A similar study to the European Commissions` was made about Estonian e-services by the Institute of Baltic Studies together with Praxis Centre of Policy Studies in 2013. This study analysed the impact of Estonian e-services on citizens, service providers and ICT enterprises.

Users found that the e-services analysed had had a positive impact on them. Out of the 15 services analysed, users found that establishing a company and submitting VAT or income and social tax returns to the Tax and Customs Board saved them the most time. What is interesting but not very surprising is the fact that improving existing systems has not been very beneficial in terms of time saving: "In general, users have saved the most time with e-services whose use means that they no longer have to visit various government agencies or obtain information from previously separate information systems." Other aspects of e-services valued by the users included the ease and accessibility of using public services, which were both considered

generally really well. What was recommended by the authors of the survey, was simplifying the services furthermore as some of the less IT skilled users found them not accessible enough. [36, pg. 17-18]

The service providers generally saw the use and development of e-services cost and time efficient. What was found by the authors was that the service providers have not analysed the amount of time and resources actually spent on developing and maintaining these e-services. "As the dynamics of the number of persons who use services that are provided electronically or in offices and the details of IT investments and maintenance costs are often unavailable for specific types of transactions, the possible margin of error in the assessment of the increased efficiency (time and money saved) achieved in an organisation via the implementation of e-services is rather high. This makes any cost-benefit analysis as well as estimates of the time and money saved by all users highly inaccurate." [36, pg. 10]

Cresswell et al. (2006) researched return on investments in government IT based on some comparative case studies. They based their research and suggestions on user centricity and public value proposition. They found three significant shortcomings in the existing models of evaluating RoI in government IT:

1. The analysis of public value is incomplete thus the offered services do not offer best possible value;
2. Lack of attention on how the services can create value to the public;
3. Lack of know-how and skills of specifying context when applying general evaluation models to a concrete field. [17]

What Cresswell et al. (2006) also noted was the fact that current assessment of RoI is very technology development and implementation centric whereas the stakeholder's risks and benefits are secondary [17]. The aim of the research was to compare different assessment methods and provide decision makers with a framework to use when assessing RoI of government IT projects. What the actual outcome was a combination of different frameworks and assessment methods as well as some suggestions on how to present the outcome. A working system of comparing qualitative and quantitative impacts is still left for the decision-makers.

2. Theoretical background

The chapter in hand will first have a look on the Estonian eGovernment concepts and frameworks to understand the direction and aim of Estonian e-services. The second part of the chapter will assess the most relevant and often used RoI assessment methods and best practices for establishing the best methods for assessing RoI.

2.1. The Estonian eGovernment concepts and frameworks

Estonia has developed its e-services for over 20 years very successfully. The main idea for development of ICT in the 90s was decentralization. Every state agency and ministry was responsible for the development of ICT in their administrative field. At first this meant that each ministry put together an IT department but as the number of e-services grew, most of these departments in the central governmental level grew into separate agencies themselves. What this decentralization has led to, is a concept called service in silos. According to Krogstie (2012) this is a common world-wide phenomenon which has resulted in outsourcing a lot of the developments thus creating several organisations and partners with different direction and aim towards the system [38, pg. 35]. The service in silos effect has led to a state where different ministries, state agencies and authorities have their own aim, direction and methods of achieving this resulting in inconsistencies in the implementation.

As the re-development and enhancement of services requires interoperability and communication between different service providers, the main approach suggested by the government is enhancing interoperability, standardizing the services and providing central solutions such as x-road to enhance security measures of service delivery while still maintaining the decentralized provision of eGovernment services. There are many frameworks and concepts provided in order to better the interoperability issues and direct the service providers into working for similar goals while not taking away the freedom that the service in silos offers to the service providers. Some of the more important ones include the concept of information society and state information system but some other relevant frameworks, guidelines and methods that provide the direction for service providers will be viewed as well.

2.1.1. Information society concept and development plan

It has long been stated that ICT is a growing pillar for innovation, revenue and society as a whole both in the governmental and private sector level. Estonian government has been introducing the concept of information society since 1998. The main idea behind it is the fact

that the means of ICT are known for bettering businesses and making transactions easier and thus need to be further enhanced and strengthened.

The current information society development plan runs until 2020. The bigger goals that are aimed to achieve for that year are:

- Creation of fast internet infrastructure;
- Enhancement of cross-border cooperation in the use and development of Estonian ICT base-infrastructure (such as the x-road, digital signature etc.);
- Giving the data subjects more control over the use of their data;
- Reforming the existing public e-services and the technologies that support them through the creation of legacy principle. Meaning that no important Estonian e-service or technological platform can be older than 13 years;
- Enhancing the use of digital signature across European Union to 20%;
- Creating virtual data embassies by storing the back-ups of critical information systems in other countries;
- Starting the e-residency project and thus allowing foreign citizens to use Estonian e-services;
- Enhancing the capability of using existing data for better analysis in the public sector;
- Creating a worldwide think-thank to Estonia on the subject of information society;
- Raising the employment level in public ICT field by half. [42, pg. 1-2]

Several points stated in this development plan have direct impact on the development of e-services and information systems. For example the e-residency project requires all public e-service offers' to make modifications in their systems so that the e-resident would be authenticated, recognised and service provision would act the same as to an Estonian citizen. The legacy concept means that service owners who have systems that are older than 13 years have to change the platform and modify the process of the service even if they have updated the platform and business process annually throughout the years. [42] Thus the concept acts as a general guideline for the ICT development while stating some very concrete problems that the agencies and service providers must solve as well.

2.1.2. State information system interoperability framework

One of the concepts developed is based on the creation state information system. This means that the state information systems should transform from agency centricity towards service and

user centric approach. One of the main pillars of creating a state information system is the interoperability of different agencies and information systems. [45]

The interoperability framework consists of 12 pillars:

1. Subsidiarity and proportionality;
2. User-centricity;
3. Involvement and availability;
4. Security and privacy;
5. Multilingualism;
6. Simplification of management processes;
7. Transparency;
8. Storing information;
9. Openness;
10. Reusability;
11. Technological neutrality;
12. Efficiency and efficacy. [44]

The subsidiarity and proportionality principle states that decisions on IT development and maintenance coordination on central level should be minimum. The second pillar of subsidiarity and proportionality is that the information systems should be decentralized and connected to each other through services. Thirdly if a decision is made to join information systems that support the actions of authorities with different purposes, analyses of risks and return on investments must be conducted. [44, pg. 7]

The user-centricity principle lies in developing from institution centric approach towards user centric approach. This is done through providing many services through many channels by creating network of portals which are also approachable through the state portal. The services must be secure, personable, flexible and respecting of privacy. [44, pg. 7-8]

All eGovernment services must be available through various means and the user has to have the opportunity to choose the most appropriate way to receive the service. The e-services have to be usable on common software and operation systems. The citizens must have the opportunity to be involved in decisions and processes that concern themselves or the society through electronic channels. All of the channels, portals and services should be usable for elderly and people with special needs. [44, pg. 8]

Security and privacy principle states that all solutions used in the state information system must be secure and ensure the confidentiality, authenticity and availability of data and services. The citizens must have the opportunity to control and correct the data that the public sector holds about them as well as whom and to what purposes has accessed their data. [44, pg. 8-9]

The multilingualism principle states that services created for Estonian habitats need to be in Estonian by default. The interfaces of the systems must comply to the Web Content Accessibility Guidelines which ensure the use of these with speech synthesizers. International systems must be in addition to Estonian also in English and all relevant languages. The architecture, data structures and software of information systems should allow it to be easily realized in other languages. [44, pg. 9]

Simplification of management processes state that information should be collected only once and the services are provided without any unnecessary red tape or technical difficulties to the users [44, pg. 9-10].

The activities of the public sector must be transparent to the citizens and businesses. The users must have information about the state and time frame of processes and procedures that involve them. The public sector should create mechanisms for receiving user feedback to every service. The results on the quality of services are made public. [44, pg. 10]

eGovernment service providers are responsible for archiving digital documents that are created through their activities. For every information system the archiving rules and mechanisms should be described in its architecture documentation. [44, pg. 10]

Estonian public sector should base on the principle of Open Government as well as when possible use open source software development methods and standards. All architectural developments and software procurements must base on the principles of openness. [44, pg. 10]

The reusability principle bases on the fact that public sector authorities collect information only for the purpose of fulfilling their tasks. Using the information for any other purpose is considered reutilisation and should not be limited. If limits are set they cannot discriminate anyone or restrict competition. Re-utilisable information should be available for all potential market players and creators of additional value. Further on the reutilisation of experience, software and semantics by the public sector is recommended. [44, pg. 11]

Technological neutrality principle lies on the fact that when creation information systems, the public sector must mainly focus on the functionality and make the technological decisions as late as possible while still being transparent, reasonable and using resources sustainably. When outsourcing software development it is recommended to also purchase the necessary infrastructural changes. All interfaces must be created in a technologically neutral way using open standards. [44, pg. 11]

Public sector should make the most productive and efficient choices when developing information systems to ensure best solutions. When choosing the best solution the agencies must consider return on investments, costs of changes in infrastructure and organisation, total cost, increase in flexibility, ease of procedures, bettering of work environment and other aspects. When developing software the public sector must also consider other aspects of effectiveness and efficacy. [44, pg. 11]

What can be understood from all of this is that on one hand the state has a rather clear vision on how and what should be developed as well as how to evaluate RoI but at the same time the development and maintenance must stay decentralised so that the agency responsible for an information system will be responsible for it throughout the lifespan of the system.

2.1.3. Other relevant frameworks, guidelines and methods

While the information society and state information system concepts are the two big pillar frameworks for eGovernment development, there are several other relevant and more detailed guidelines and methods that support the bigger goals but at the same time aim to solve more specific issues on a more concrete level. Some of the frameworks that are relevant in RoI assessments will be viewed in this paragraph.

2.1.3.1. Portfolio management

The Government Office of Estonia conducted a research in 2014 to understand the current state of e-service management and to encourage and enhance the portfolio management of e-services [31].

The main reasons for using portfolio management are:

- The need for managing all services in a unified way and using best practices;

- The need to develop e-services in a way that they achieve the aim that was set for the service as well as measuring if and to what extent the results match the initial assessments;
- The need to develop provision of public services in various channels [31, pg. 2].

The development of the e-service portfolio management would make it easier to enhance interoperability between different agencies and services as the basic infrastructure would be similar to all. Unification of basis would also make it easier to evaluate return on investments as different services could be assessed on the same basis using same methods.

The portfolio management is done on two levels. Firstly all of the states web services and information systems must be registered in the states information system management system RIHA. The information in RIHA must include the description of web services in WSDL format, the policies of providing the service and the quality control metrics of the service [44, pg. 17]. The second level of portfolio management is done on the level of agencies. This means that all authorities who own or provide public services should map their services, metrics for evaluating these services and unified process for creating the services [31, pg. 6-7].

2.1.3.2. The metrics system for evaluating usability

In 2014 the Ministry of Economic Affairs and Communications (from here on MEA&C) launched another guideline regarding usability metrics system for public sector software. The system was created by Trinidad Consulting with the aim of creating a system for measuring quantitatively the usability of software in order to have a clear overview of the goals and the timeline of achieving the goals of the software. [57, pg. 5]

The system bases on the presumption that the usability of the system is 100%. With every problem faced or metrics undefined these aspects must be subtracted from the 100%. For creating the metrics users must be interviewed. Other usability goals are learnability, avoiding mistakes, effectiveness, memorability and satisfaction. All of the found goals and metrics are put into formulas which can be used to evaluate the usability of a service. [57, pg. 7, 38]

The methodology concentrates on evaluating existing services in order to provide understanding on how to better the service. What can be said regarding the methodology is that the concrete system might be complex and time consuming to use for the service providers.

2.1.3.3. Handbook for designing e-services

The handbook for designing e-services was published in 2014 with the aim to guide the public sector agencies in designing and creating better e-services.

The handbook addressed many aspects of designing e-services such as (Ziraff 2014):

- Creation of analyses, the initial task and other several documentation which are the basis of creating quality e-services;
- Organisational presumptions for creating e-services (such as sufficient budget base etc.);
- Roles and responsibilities of people involved in the development;
- The process of designing the service from creating the strategy for the service to development and implementation;
- Possible risks of the process;
- Methods for evaluating the impacts of the service design;
- Methods for evaluating the costs of the project;
- Work processes and rules necessary for the implementation of the service.

When measuring impacts of an e-service the guideline stated that the metrics have to be [56, pg. 90]:

- specific – clearly defined and relevant;
- measurable – pre agreed measures;
- accepted – by the stakeholders;
- realistic – the outcome can be measured using the metrics;
- time based – the metrics are time based and a deadline for achieving the impacts has been set.

The metrics set can be both qualitative and quantitative and their accuracy depends on the input for the metric. Even further the handbook states that the development of a project is approximately ten times more expensive than creation of the preliminary or business analysis but the result is highly dependent on the quality of the preliminary analysis. Thus extra effort should be put into the analysis of the project. [56, pg. 95-99]

The guideline stressed that basis of all of the aforementioned is that the goals of the organisation and users must be clearly defined and in balance [56, pg. 9].

2.2. Best practices of analysing the return on investments

There are several theories on analysing the return on investments. In general the RoI assessment must take into consideration all costs and all benefits whether the nature is social, economic or monetary. The following paragraph will assess some of the most common RoI assessment methodologies to understand their strengths and bottlenecks. Maximum RoI can be achieved only through providing quality services and as it has been brought out in the concepts of Estonian eGovernment they need to be measurable, thus relevant literature on the topic will be viewed. Finally a concept of balanced scorecard will be viewed to understand if this method could encompass all the strengths and needs of the best practices.

2.2.1. Most common return on investment assessment methods

Assessing return on investments in public sector IT projects is a complicated task. As the projects can range from enhancing a process in a system to completely transforming an information system the returns as well can stem in saving time in a process to improving the trust, transparency and legitimacy of the whole government [17, pg.1].

"(…) assessment is an iterative, continuing process, where integrated insights from the scientific and stakeholder community are communicated to the decision making community, and experiences and learning effects from decision makers constitute inputs for scientific and social assessment." [28].

The main question to be answered when assessing the possible returns of the investment is if the benefits and returns are equal or bigger to the investments made. The question is daunting as it is very hard to compare monetary investments to public values such as improved transparency or trust. There are several theories on how to evaluate return on investments. Most widely used of them in government sector are the cost-benefit analysis, public value proposition and impact analysis.

This chapter will try to analyse the best aspects of the three common RoI analysis theories in a way that the best of all worlds would cover the bottlenecks and weaknesses of others.

2.2.1.1. Cost-benefit analysis

"Cost-benefit analysis (CBA) is the most comprehensive and theoretically sound form of economic evaluation and it has been used as an aid to decision making in many different areas of economic and social policy in the public sector during the last 50 years." [55, pg. 924].

The European Commission has conducted a guide for evaluating costs and benefits. According to the European Commission (2008) every CBA conducted before starting a project should comprise of the following six steps:

1) Socio-economic context and objectives –the wider aim and correspondence to policies and strategies;
2) Identification of the project –the description of the project as a whole, beneficiaries and stakeholders;
3) Feasibility study and alternatives –why the project is the best choice and how it will be sustainable in the long run;
4) Financial analysis –all development and maintenance costs of present and future (the discount rate of the change of monetary value in time must be taken into account);
5) Economic analysis –calculating the net impact on economic welfare through various steps;
6) Risk assessment –possible risks and their mitigation through sensitivity analysis. [29, pg. 15-17)

Calculating costs and benefits in the public sector is a big challenge as the long-term benefits are often tangible whereas the short-term costs can be easily evaluated. Other problems that the government sector face is that the short-term costs often appear relatively high and as the long-term benefits are not as clear, the change might not seem beneficial. The challenge here is to evaluate all the necessary risks and true costs. The costs are not only economical but also societal just as the benefits can be in increasing efficiency, effectiveness and democracy. [38, pg. 22-23]

The main criticism for CBA is the fact that it puts the emphasis on measurable quantitative gains and costs. Krogstie (2012) points out that the development of IT is not a goal in itself. The main aim of development of information systems lies in the value that they create. This value can lie in ensuring economic, personal, organisational or/and societal gain [38, pg. 21-22}.

What can be learned from the theory of costs-benefit analysis is that in order to grasp whether a project is beneficial to be implemented, all of its costs need to be valued. In order to get the true value and costs of an investment, the methodology should not only cover the area of development and usage but also operations and maintenance [38, pg. 25]. These aspects are often neglected when evaluating RoI, as the maintenance costs of the service tend to make the

costs higher. In reality a properly maintained system with sufficient user assistance can also enhance the value of the service.

Other important aspect that the cost-benefit analysis encompass are risk assessment and the fact that monetary value changes in time. Thus the maintenance costs today will not be the same in five years' time.

2.2.1.2. Public value proposition

Public value proposition describes how public value can be created through government IT developments. Thus proposing a way on how to classify possible value created and providing value-based arguments on making the go/no-go decision when planning a new projects.

According to Cresswell et al. (2006) the proposition is based on six kinds of impacts a service can have on the users and society. The impacts are categorised as financial, political, social, strategic, ideological and stewardship impact. [17, pg. 17] When all impacts are categorised, the value creating mechanisms for the impacts need to be put in place. These include:

- Increases in efficiency –gaining the same benefits with less resources or gaining more benefits with same resources;
- Increases in effectiveness –gaining in quality or quantity of the desired output or benefit;
- Enablement –reducing the risk of undesirable outcomes or enhancing the possibility of hardly achievable goals;
- Intrinsic enhancements –enhancing the environment or circumstances of a stakeholders to increase value for the stakeholders themselves.

While there are several concepts and metrics to be considered when defining public value, the core parts that need to be viewed are the investment, the stakeholders and the affected programs and operations of the public sector. Another crucial thing in understanding the complexity of public value, is the fact that value itself and the amplitude of it differs for affected people as well as the fact that values may change in time.

Chatfield & AlHujran (2007) state that stakeholders of public service range from citizens to businesses to public sector agencies and employees themselves and user-centricity is what helps to create public value [13]. What Cresswell et al. (2006) bring out is that there are three types of service impacts for the stakeholders:

    1. Direct service impacts

Direct service impacts occur when IT is directly related to the service offering [17, pg. 11]. There are several different examples of direct service impact but the main idea behind it is the fact that the government process is offered through the IT means. The impact to the stakeholder lies in the difference between the value provided by the means of old service and the value created by the new value. (As seen from figure one, the impact = value 2 – value 1.)
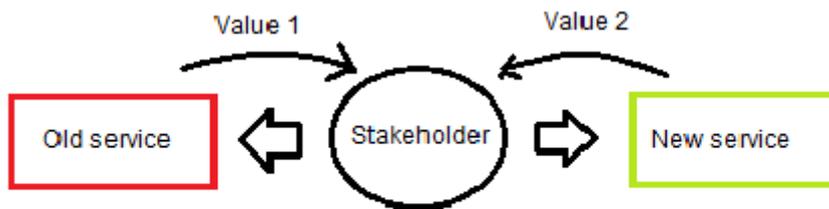
Figure 1 Direct service impact

2. Indirect service impact

Indirect service impacts occur when the created value lies in the use of new IT infrastructure or investments that are not in direct contact with the stakeholder [17, pg. 11]. An example of how an indirect impact may occur is when creating one-stop-shop solutions, where the stakeholder can access multiple services across different agencies while directly turning to only one service. The IT infrastructure and interoperability of services is what creates the extended value. The impact created can be measured as the subtraction of new value and old value (as can be seen on Figure 2: impact = Value 2 – Value 1).

Figure 2 Indirect service impact

3. Mixed impact

Mixed impact occurs when there is direct impact to the stakeholder or the environment which carries indirect value to people not in direct contact with the service (see Figure 3). A rough example of this kind of impact is creation of open data, which in some cases releases the data controller of the archiving and publishing costs (direct value) and gives all interested parties

access to the data and thus creating an indirect value for example for researches. The value created through mixed impacts equals in the sum of indirect and direct values.
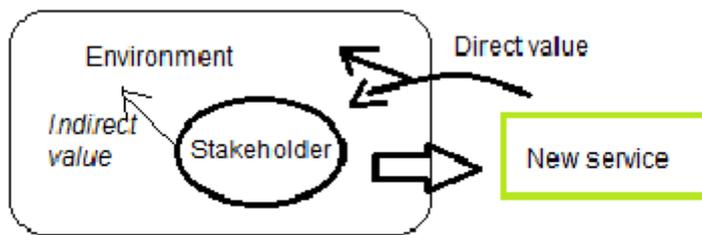
The main problem with the public value proposition is that while the direct value is relatively easy to describe, defining the indirect value is a lot more complex. Thus while the system itself is quite clear and easy to follow, the sum of the value created might not reflect reality due to the difficulty of defining and calculating. Even further Krogstie (2012) states that the real value to the stakeholder or user can be done if they are the co-creator of the value, thus users need to be involved in the development and their experience or perception of the service is crucial [38, pg. 12]. Even when involving the stakeholders throughout the whole process, evaluating the possible value created to them by the user experience of the service can be very difficult.

Another problem with the public value proposition is that it concentrates on the value provided for the public whereas the value provided within the government sector, between and within agencies is not assessed.

2.2.1.3. Socio-economic impact assessment

Impact assessment is another widespread tool to assess the return on investments and aid decision makers in making the go/no-go decisions when taking on a new project. It comprises of aspects from both the cost-benefit analysis as well as the public value proposition.

"Impacts are described in qualitative, quantitative, and in monetary terms when reliable estimates are possible. Expressing all impacts in monetary terms makes it easier to compare different impacts, because everything is then expressed in the same units. However, not all impacts can be quantified in monetary terms, and the main effort should go into describing and quantifying impacts in their own terms." [28, pg. 8]

The classical socio-economic analysis consists of both cost-benefit analysis as well as social value assessment together with risk analysis. Where there are several impacts of qualitative, quantitative and monetary sorts as well as a high level of uncertainty, a multi-criteria approach is suggested to use [28, pg. 17]. This approach bases on establishing criteria for comparing options and evaluating the impacts a project can offer. When using this method in a scale of 1-10 the stakeholders and policy makers have to evaluate the importance of gained value as well as financial and economic costs according to the criteria set beforehand. Thus allowing to quantitatively compare qualitative data.

The main issue with this methodology is that the results depend on which stakeholders to consult with. The people responsible for maintenance will evaluate the technical platform a lot higher whereas the user will most likely give the highest grade to the speed and ease of usability. Krogstie (2012) states that the product owner should be responsible for conducting RoI [38, pg. 29], thus the owner is responsible for creating a comprehensive criteria and involving all the right stakeholders so that the results would be in fact true. As the final results will be indicated correctly only if the abovementioned things are considered, this method is prone to human error as the preparations and basis of the results rely on the product owner.

2.2.2. Evaluating the quality of service

The costs, values, impacts and benefits are all very important when assessing RoI but in order to achieve the goals stated, the state has to offer a quality service. This thus is another aspect to view when analysing whether a project should be launched or not.

Krogstie (2012) points out some of the characteristics that need to be evaluated in order to achieve quality service. These characteristics are:

- Functionality –does the software support the functions?
- Reliability –is the software reliable?
- Efficiency –does the software perform efficiently?
- Usability –is the software easy to use?
- Portability –is the software transportable to another technical environment?
- Maintainability –is the software easily modifiable? [38, pg. 205]

While the abovementioned points refer to a more detailed preliminary analysis and thus do not need to be fully answered in the go/no-go decision making in detail. Nevertheless these aspects

need to be addressed to some extent to understand the costs of development and the overall goal of the project so that the software would indeed assist in reaching the goal.

The main challenge with RoI is trying to put all of its aspects into metrics so that the intended goals could later be analysed and assessed. The metrics do differ in every project depending on the aim, software, users, stakeholders etc. and thus need to be tailor made to the project. Krogstie (2012) recommends seven characteristics for creating a measurement system to evaluate whether a new development is better than the status quo:

1. The measurement has to be accurate;
2. The measurement has to be objective (the results should be the same no matter who does the measurement);
3. The measurement has to use more than one dimensions e.g. time (using more than one dimensions gives the opportunity to evaluate the value against different criteria);
4. The measurement has to have a specific target (measuring a specific target such as improving speed 50% is a lot easier than measuring a general goal);
5. The goals have to be in balance (when having the goal of low cost and high quality, then it is often not possible to achieve them both fully as high quality usually costs more);
6. The goals and measures have to be clear to all;
7. The goals and measures should be in compliance with the organisations strategy. [38, pg. 283-284]

The suggested measurement system guidance does compliment the suggested positive aspects of the RoI theories as well as specifies the measurement metrics suggested in the Estonian eGovernment concept and thus will assist the stakeholders and decision makers in RoI assessment as well as ease the process of ex-post analysis.

2.2.3. Balanced Scorecard

What has been recommended by Krogstie (2012) for achieving quality software, is first eliminating the solution from the aim. Thus first creating what we want to achieve and then later on how to achieve it [38, pg. 207]. Many of the aforementioned theories as well as Estonian eGovernment concepts emphasise the need for balance between costs and benefits, views of the organisation and users etc. One of the widely used methods that supports this concept is the Balanced Scorecard.

Since its adoption Balanced Scorecard has been mostly used in the private sector and even further half of the most successful companies in the world have stated to use the Balanced Scorecard. But nowadays more and more governments and their authorities are practicing using the Balanced Scorecard. [3]

The main aim of the creation of Balanced Scorecard lies in adding strategic non-financial metrics to traditional financial metrics of performance measurement. This is done by dividing the organisation, service, project or whatever unit under observation in to four perspectives: financial-, internal business process-, customer- and learning perspective. [7]

According to Ahmad (2012) the four perspectives should be viewed as followed:

1. Financial Perspective should cover the cost of the viewed entity as well as providing best possible value to customers and stakeholders. The main questions that should be answered are if the costs can be further minimized and if the current policies are the most efficient.

2. Customer Perspective should put the focus on meeting the customers need in the best possible way so that it is efficient and effective. In this perspective the customers and stakeholders should be defined as well as the question if their needs are satisfied should be answered.

3. Internal Business Processes focus on the performance side of the service. This means all the software, hardware and human resources that need to be available to implement maximum performance. The questions asked here are how to add value to the service provide as well as which of the processes add value.

4. Learning and Innovation perspective contains the organisations ability and structure that is needed to achieve its goals. The questions at focus in this section are if the personnel has all the relevant tools and is the technological platform sufficient for the aim. [3, pg. 7]

The aim of the Balanced Scorecard is that all of these four elements need to be balanced to each other and in correspondence with the agencies goals (see Figure 4 Balanced Scorecard below).

The Balanced Scorecard can and should be tailored to each agencies needs and services. The beauty of it lies in its simplicity as well as in the fact that this model can be used for describing all bigger and smaller entities in an organisation starting with the organisation in general all the way to describing specific services and projects. Another positive of it is that all of the best practices of RoI analysis discussed previously fit in this model perfectly as through the model describing the costs, impacts, benefits, risks and values can all be tied together. Even further

every perspective assessed in the balanced scorecard has to measurable and the quality evaluation method can easily be used in defining the measures and targets of all helping. Thus the scorecard can provide sufficient assistance the service owners make decisions of whether the new project is beneficial or not.
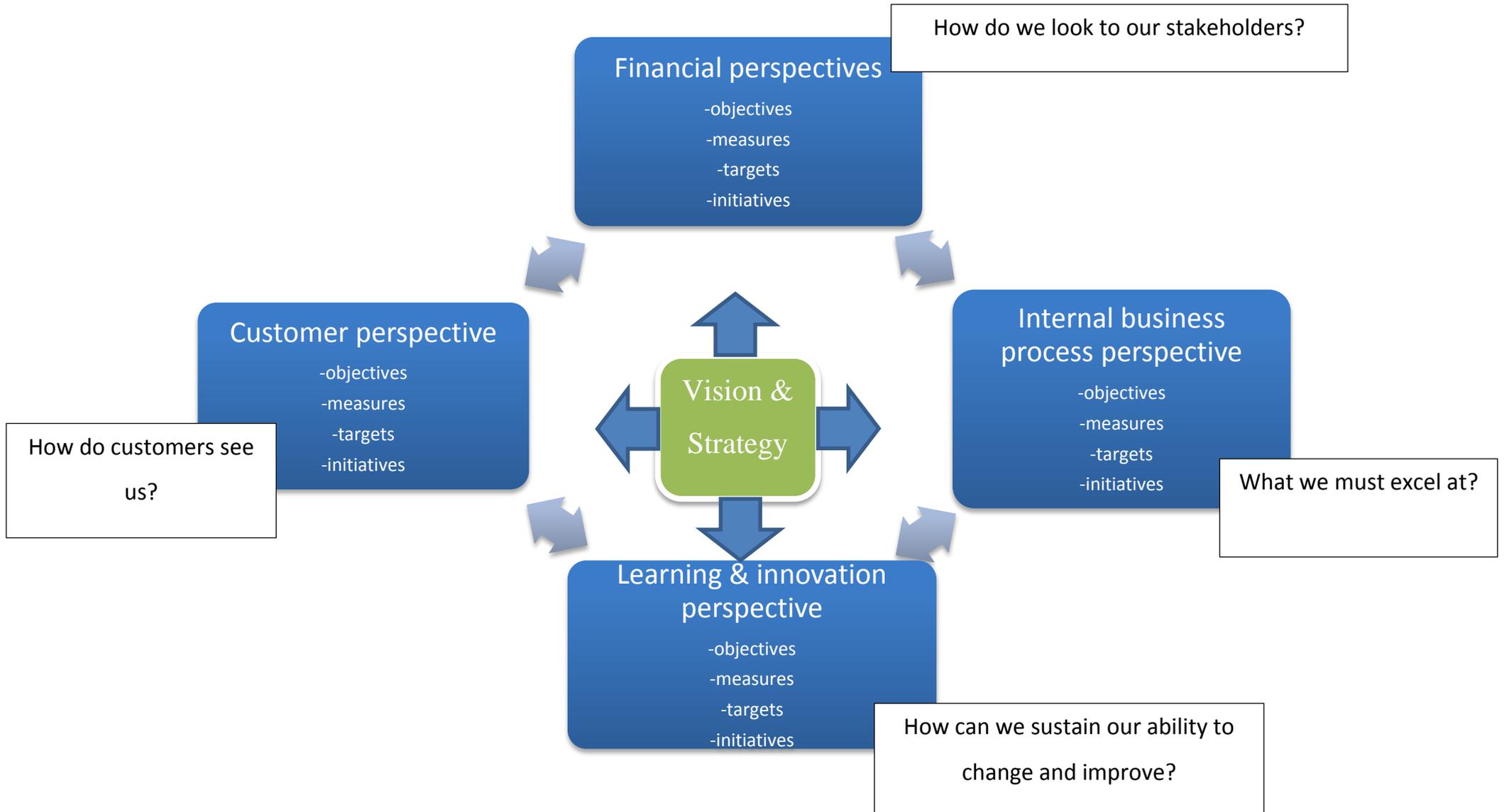
Figure 4 Balanced Scorecard

3. Evaluating RoI in Estonian central eGovernment projects

The previous paragraphs described the main strategies and policies of Estonian eGovernment as well as the best practices of providing profitable, efficient and balanced quality service. The following chapters will concentrate on the practice of RoI assessment in Estonian central level eGovernment services.

The central policies of information society are shaped and coordinated by the Ministry of Economic Affairs and Communications [43]. The Information System Authority (RIA) is the subdivision of MEA&C which is responsible for coordinating, monitoring and advising the providers of public services. Other responsibilities of RIA include handling cyber security incidents and implementing the division of European Union structural assistance funding in Estonia. [19]

Even though there are central coordination authorities, the methods for coordination are mainly through strategies and guidelines. The development of Estonian eGovernment in general is based on decentralization and done in silos. Each entity from a ministry to a local government is responsible for all e-services and IT solutions in their field of management themselves.

Thus the coordination of RoI can be done through handbooks and guidelines but the most direct way for RIA to coordinate the development of quality services is through the allocation of structural funding. RIA together with MEA&C can shape the application forms and decide on which of the applications would indeed provide beneficial services.

Thus the chapter in hand will focus on analysing three case studies in order to understand the as-is situation of evaluating return on investments on Estonian central level eGovernment projects.

The first case study will concentrate on analysing the current state of RoI by analysing 11 applications for Structural funding which have been allocated the money and implemented in the recent years. The aim of the case study is to understand how RoI is evaluated and if it corresponds to the best practices of evaluating RoI as well as the states strategies and goals.

In order to understand how the costs and values in RoI analysis change over time, two case studies of long-term services from Estonian central eGovernment will be looked at in more depth. The second case study concentrates on how Estonian Tax and Customs Board (EMTA) evaluate the return on investments based on the example of e-tax and customs system. The third

case study will have a look at a central database for all judicial proceedings called the e-file that is under the Ministry of Justice.

3.1.   Case study 1: Structural fund projects

As it was already discussed in one of the previous paragraphs, the Estonian eGovernment developments are done in silos. Thus the way projects are written, analysed and evaluated differ in every agency. All central coordination is done under the Ministry of Economic Affairs and Communications (MEA&C) in the State Information System Authority (RIA). While RIA has authority to conduct audits, supervision and ex-post analyses, the only way to direct the course of the development of e-Government projects is through the allocation of Structural Funds.

The investment funding will be allocated to information systems with real and relevant impact and to systems that secure state information system. The call for proposals is open only for government entities with relevant capabilities and opportunities and are generally opened once a year. The entities who may apply have been picked out by the MEA&C. Funding is allocated to projects which either create new information systems, improve existing systems, enhance state's information systems security or help the state information system to become more wholesome. [20] What projects receive funding is decided by a committee consisting of members from the both aforementioned authorities based on subjective opinions and objective arguments.

In years 2008-2013 RIA allocated 27 342 167 euros of Structural Funding to different e-Government projects. The application for funding in that period consisted of 8 topics [22]:

- The description of the goal of the project or description of the problem that needs to be solved;
- Description of the anticipated end result of the project;
- Description of changes in work processes or proceedings as a result of the project;
- Description of actions taken to implement the project. These need to include activities done from own finances (contribution);
- The costs of implementation (shown distribution by activities with calculations and explanations);
- Description of social or economic benefits that arise as a result of the project;
- The range of usability of the project's result and the amount of potential users;

- The planned amount and description of public procurements needed for the implementation of the project.

RIA has conducted several recommendations for writing and implementing a successful project. These include [19]:

- The involvement of different stakeholders in the project planning phase (business-, ICT- and judicial representatives as well as the end-user and supervisor of the project);
- Setting a clear goal as to why the project is necessary and what public sector goal does the project aim to achieve;
- Setting metrics for the project to understand how can be the success of the project measured;
- Assessing all of the risks of the projects failure and creating means to minimize these risks;
- Evaluating the novelty of the project, possible future prospects and technological solutions;
- Assessing the direct and indirect benefits of the project to the service provider, user and society as a whole;
- Thinking of the best practices of software development to assess whether to implement the project in-house, develop it together with another authority or to procure it from private sector;
- Analysing the target group of users;
- Analysing the changes in processes and evaluating if the processes can be eased even further;
- Analysing the existing and possible integration of the solution with other e-Government means;
- Making sure that the cooperation with other authorities or parties and information is exchanged clearly, on a daily bases and is understandable to all parties;
- Analysing the possibility of creating the environment on other technical means besides the computer (digital TV, only internet, mobiles etc.);
- Assessing if the solution will take into account the target groups of people with special needs, people from other language groups and internationality of the solution;
- Analysing the user support and training aspects of the solution;

- Analysing the sustainability of the project (are there possible new developments needed in the future? Are the maintenance and operations costs planned? Does the project take into account possible unseen costs?). [19]

While the recommendations are detailed and cover all the main problems that need to be addressed in the planning phase of the project, the application form is a lot more general. In order to understand how the application is understood by different authorities, what qualities are valued and how are the costs analysed the following chapters will take a look at 11 project application that have received funding from the Structural Funds in the period of 2009-2013.

The project applications were chosen from projects that have been completed. The sample applications were chosen at random from the central level eGovernment projects to ensure widest possible variety of different projects, authorities and practices. The projects were chosen from 74 completed projects so that the amount of applications analysed would cover approximately 15 percent. The 11 applications were chosen in a way that it would cover correspondingly different implementation authorities as well as various levels of development (new system, enhancements and re-developments).

3.1.1. Development of the new Public Announcements information system for bettering data reusability

Public Announcements is the official web publication of the republic of Estonia. The publications made in the system include public announcements and notices which publications are regulated by legislation. [4, § 1)]

According to the application the existing Public Announcement system was dated. Due to the old platform further developments were complicated but the aim was to make the announcements machine readable so that they could be reused. Another problem that was faced was that the announcements had human errors and typos in them. This too was planned to be fixed with the adaptation of machine readable forms. [5.1]

To fix the aforementioned problems Centre of Registers and Information systems (RIK) launched the project in 2013. The main target group of the application were citizens and entrepreneurs, whom would have the benefits of easier using, downloading and processing the data. Some of the other positive impacts mentioned were [5.1]:

- Possibility to use the data for the state's open data project

- Bettering the quality of the service as well as state's services as a whole
- User-friendly system with high quality and available services
- Higher security
- Sustainable platform [5.1]

All of the impacts listed are of social nature and show the necessity of the project rather comprehensively in the frames given. While the application covered many of the aspects of RoI emphasised in the best practices and frameworks discussed previously, none of the goals were provided in a measurable or quantitative way. The costs of the project were estimated at 200 000 euros and the going live phase within 18 months of the developments. In reality the project went live 2 years after its initiation [12].

3.1.2. Electronic Land Cadastre

Estonian Land Board is responsible for processing and up keeping of Estonian Land Cadastre. The aim of the Land Cadastre is to collecting, storing and issuing information regarding the value, condition and usage of the land. [18]

The main problems with the existing Land Cadastre were that it was developed on paper-based interactions, the platform was outdated and not supported, there were no possibilities for using ID card, mobile-ID or digital signature thus the creation of e-services was not possible. Other problems faced were high maintenance costs and information exchange with the Land Register was not applicable to the security demands. [5.2]

To eliminate these issues as well as to create fully electronic Land Cadastre, the Estonian Land Board launched the project in 2012. The economic benefits seen to be achieved with the project were 30% lower maintenance costs as well as no need for additional employees due to paperless processes and functions. [5.2]

The main concentration of this application was on the economic benefits. Meanwhile that social impacts were not discussed. What can be assumed when analysing the application is the fact that there is a great emphasis on the project's compliance with national strategies whereas the interests of users and stakeholders are hardly evident. [5.2]

The project cost was evaluated at 470 000 euros [5.2]. What must be mentioned is that the Estonian Land Board applied for funding with two applications that both were implemented together. The second application had the additional cost of 200 000 euros [19]. The duration of

the project was planned at 14 months, ending at 31.12.2013. The exact end of the project is unknown but it is known that the system didn't go live at December 2013 but exceeded it to some extent [14] showing that the initial planning and evaluation of the project was incorrect.

3.1.3. Modernization of e-police devices

E-police was a project launched in 2005 which aimed to equip all police cars with computers so that the police officers could to integrated queries over x-road to several state databases so that the police can have operational information regarding the vehicle as well as the driver's former offences. [21]

In 2011 there was a change in the traffic legislation, which stated that drivers no longer have to carry documents regarding identification or driving rights with them. The only way for police officers to operatively check personal information is thus via the e-police system. The main problem why the project applied for funding was that the hardware and software acquired in 2004-2008 had amortized and didn't allow the police to operate effectively in fieldwork. [5.3]

The aim of the project thus was to develop new preconditions and prototype for the transition to new hardware. The project was aimed as a pilot project to develop the system and test the system as well as new hardware before obtaining the new equipment and launching the new system as a whole. The project consisted of the development of the prototype and buying two mobile devices for testing. [5.3]

The impacts of the project were ought to be faster and more efficient procedures, better optimized resources of the Police and Border Guard, higher quality and security. All of the impacts mentioned in the application refer to benefits that will be achieved after full adoption of the new software and hardware thus the direct impacts of this project are not evident. [5.3]

The estimated costs of the project were 209 520 and the project was ought to be carried out within 12 months in 2013 [5.3]. Even though the exact finishing date is unknown, RIA states that the project is concluded [19].

3.1.4. Developing the framework and services of e-PRIA

"e-PRIA is the client portal of the Agricultural Registers and Information Board, through which clients can submit documents to ARIB and check their details in ARIB's registers. The portal represents a convenient way for our clients to exchange information online." [1]

The e-PRIA follow-up project was launched in 2010 with the aim of updating the existing client portal. The main problem with the existing portal was found as a result of customer research that showed that the users of the portal wanted more services in electronic format. The initial e-PRIA development contained only a few services. The main aim of the follow-up project was to make the interactions completely electronic as well as to develop possibilities for authentication and signing documents using mobile-ID. Another problem that the existing system faced was its performance and ease of use. [5.4]

The application showed thorough analysis of the projects costs as well as the economic and social impacts. With the cost of 7 836 800 euros it aimed to achieve benefits for the users, stakeholders, the state and environment by various improvements. The project launched in 2010 and was aimed to be finished with 20 months. [5.4]

As one of the services aimed to be created with the funding was the development of new web map of agriculture lands, it can be assumed from PRIA's newsletter that the complete launch of the project was in 2014. [2] Thus being yet another project that exceeded its initial timeline.

3.1.5. Second development stage of the Court Information System (KIS)

Court information system is a judicial system for court officials to electronically create, manage and publish proceedings, documents and information [37, § 2]. As the existing information system was dated, Centre of Registers and Information systems (RIK) applied for funding of over 500 000 euros from the structural funds. During the harmonization process of the detailed analysis with the board of courts, it was evident that the court's needs were greater than those aimed to achieve with the received funding. Thus in 2011 RIK launched the second stage of the development of the new Court Information System with the additional 511 293 euros of funding. [5.5]

The main additions to the existing developments included interfacing KIS with population registry, tax- and customs board registry, health insurance fund registry, traffic registry, banks etc. Some other changes included creation of additional forms, changing the algorithm for distribution of court work and creating additional functionalities so that the Supreme Court of Estonia would be able to be included to the user base of the system. [5.5]

The application showed that the result of the project were tied directly to the aims wanted to achieve with this concrete call for proposals. The main results would be reduction in workload and time through the usage of interfaces, the whole court system of Estonia would be using the

same information system and the interaction with courts would be easier and faster for the citizens. The economic impact of the system was ought to be achieved through the raise in effectiveness of courts as well as reduction of paper-based proceedings. The social impact of the project was found to be from the citizens' side as the court proceedings would become easier and more transparent. [5.5]

While in general the application promises a lot on paper, it does raise the question on how well the initial project was prepared when over half a million euros worth of developments were discovered mid analysis.

3.1.6. The development of data exchange between Citizenship & Migration office information system and the Population Register

The Citizenship and Migration office is responsible for documenting Estonian habitats, prevention of illegal immigration and managing asylum issues [49]. The information system of the Citizenship and Migration office (KMAIS) is responsible for the maintenance and issuing of all Estonian identification documents. KMAIS and the Population Register are highly dependent on each other's data. [5.6]

The situation described in the proposal showed that the information exchange between the two databases is done by exchanging files or using other information exchange channels but none of the information is provided over the x-road. Another problem was that a lot of important information was not exchanged at all due to the lack of technical ability thus the proceeding processes for citizens and the state to the KMAIS was very time consuming. Some of the processes that were lacking were ordering personal ID codes, fixation of the citizenship of new-borns, annulment of the documents of the deceased as well as the general security of the data. [5.6]

The main impacts aimed to be achieved were time saved on procedural acts thus money saved, less time spent on routine procedures and better data quality. The project clearly aimed to achieve greater quality and to improve the comfort of its users. The project launched in 2010 and was aimed to be concluded by 1.07.2010. [5.6] According to RIHA, KMAIS joined the x-road on 06.10.2014 [52] thus showing some clear overestimating of development abilities.

3.1.7. Creation of Traffic Surveillance information system

The aim of the Traffic Surveillance information system is to store and exchange information collected through the surveillance of traffic and the work and rest time of drivers. As the existing

system was completely paper-based and it didn't allow the surveillance officers to properly present periodical reports to the European Parliament, the project was launched in 2009. Some of the other perks of the system were data exchange with Road Administration regarding the technical condition and surveillance results of vehicles. The information system was aimed to be created so that it would later allow it to be interfaced with international systems to exchange information regarding crimes committed in other countries. [5.7]

The main impacts to be achieved with the system were listed as improved safety in traffic, faster proceedings and analysis processes, less clerical work resolving in less costs. The user base and impact on official was also evaluated as great in amplitude. The projects costs were estimated at 110 439 and as a positive addition the annual maintenance costs of the system were also brought out. [5.7]

3.1.8. Developing the Traffic register in the field of right to drive and creating the basis for developing new e-services

The Estonian Traffic register contains of data regarding all vehicles, small vessels, driving rights and licences, taximeters and drivers occupational trainings [40]. The first data collected in the Traffic register of Estonia date back to 1994 [53]. The main aim of the project launched at 2009 was to create a fully digital Traffic register in the field of driving rights and licences. Thus the citizen would have the opportunity to perform all interactions regarding the right to drive online. With the project several notifications would also be created (e.g. notice of the completion of the licence or the notice of the end of the validity period of the licence). [5.8]

The main impacts achieved with the project were described as time saved (29,5 million hours for citizens per year), rise in the usage of the Traffic registers e-services, the rise of maintenance ability, trustworthiness and sustainability of Estonian Road Administration as well as improvements in Estonian image as an IT country. While some of the impact assessments and corresponding strategies seemed not thoroughly analysed rather than just hype, the application showed a lot of promise. [5.8] As the project was launched in time and has received many positive feedbacks in the media with its follow-up developments it seems to be a successful project [59].

3.1.9. Updating the Succession register

The Succession register is a national register maintained by the Chamber of Notaries. The main aim of the register is to ease the processing of different succession proceedings as well as maintaining and storing all the relevant documents. [47]

The main aim of the succession register project was to lessen the problems with data quality in the registry. As many successions are paper-based and these haven't been digitized to the register, the database was not wholesome nor trustworthy. As many of the successions are paper-based and archived, the queries to the system from notaries could not be made without the assistance of the employees of the succession register. [5.9]

Thus the project concentrated on digitizing the register's paper archives and enhancing the existing search engine, so that it would be more intuitive to the user. The impact analysis of the application showed the importance of user centricity and involvement of stakeholders to the project's success. There were also mentions of some of the state's goals that will be achieved. Topics regarding maintenance, operations, facilities aim and vision as well as the sustainability of the project were not discussed. [5.9]

The project was launched in 2010 with the aim of completing it within 18 months. In reality the improved Succession register became available to users in 2013 [11]. Costs of software development and hardware were estimated at 499 968 and described with the utmost attention to detail when compared with other projects. [5.9]

3.1.10. Creation of mobile state portal eesti.ee and raising the security and availability of the document exchange centre (DEC)

Estonian state portal eesti.ee is the central web portal for doing different processes with the state. The portal has over 100 e-services, various forms and contact information. All the information shared via eesti.ee is connected directly to different registries and information systems through x-road. [23]

Estonian Information System Authority (RIA) launched the project in 2012 for providing the state portal on mobile devices as well as improving the technical aspects of the existing document exchange system so that state authorities could exchange documents with each other as well as with the citizens via DEC. [5.10]

The social impact analysis of the application stated that from implementing the project the users will save time and the usability will improve, the DEC will be more reliable, the document exchange between authorities and citizens will become faster, more comfortable and easier to follow. [5.10]

Thus it can be said that the user centricity is very well covered in this application. Even though the funding has been received for two different developments, it seems as if the development of DEC is the primary aim of the project. As DEC should one day be connected with all document management systems of the state the application is lacking in stating how the stakeholders' needs and expectations will be covered. [5.10] As it has been previously stated analyses of RoI should also cover the aspects of maintenance and the sustainability of the project, in this application these fields are lacking. On the positive side the applicant has clearly and understandably stated how the project would be in correspondence with RIA's and the states goals and strategies.

3.1.11. Labour inspectorate information system (eTI)

The labour inspectorate is responsible for implementing work environment related policies as well as for the supervision occupational safety, health and labour relations [58].

According to regulations, a doctor must inform labour inspectorate in case of work related accidents or occupational sickness with patients. The employer is then obligated to send the inspectorate different reports and information. The aim of the project was to create an e-service environment to the existing labour inspectorate information system, so that employers and doctors could authenticate themselves with an ID-card and send information to the labour inspectorate in digital format thus automating the existing system. The system would be integrated with Business register, EMTA database and Estonian Health Insurance fund. [5.11]

According to the application for structural funding the results of the project are [5.11]:

- Less time spent for employers, inspectorate employees and medical facilities for filing forms, reporting and correcting the data
- Employees will have a concentrated overview of their work related operations. [5.11]

The application of the project mostly concentrates on the reduction of paper based work as well as reduction in workload and incorrect data. While the application shows how the services will ease the workload of different stakeholders via automated notifications and digital information

exchange, it doesn't put a lot of emphasis on user centricity, later maintenance costs, sustainability nor the compliance of the project with different strategies. [5.11]

The project was launched in 2010 wit the total costs of the project planned at 2 million Kroon's which is approximately 127 823 euros [5.11]. It is not precisely known when the solution was completed but an article from 2011 states that the project is almost completed [39]. Thus the presumable launch was at the end of 2011 or in the beginning of 2012.

3.1.12. Comparison of the applications

When looking at the 11 project applications described and analysed previously, it is clearly evident that the thought process and ex ante analyses vary in different agencies and throughout the projects.

When looking at some of the elements that should be considered in the project planning phase according to RIA and most common RoI analyses, it is evident that most of the e-Government projects are aimed to improve existing systems (Table 1 Project planning indicators). This shows that the sustainability and long term goals are either not considered or not evident in planning phases of the creation of new information systems. Even further, these applications show that only 27% of the projects mentioned issues regarding sustainability in any way. These included numeral or percentage mentioning or just by stating in the application that the new platform is more sustainable then the existing. Another element showing the thought process regarding the future is the maintenance and operations of the project. This was covered in some form or way only in 45% of the projects.

Another concern raised by comparing the applications is that out of the eleven projects 5 projects exceeded the planned development time. With four projects the exact time of project launch and finish are unknown so the projects might have exceeded the deadline but the possible exceeding period is not more than a couple of months. With only two projects it is clearly stated that the projects were concluded and made available to the users in the estimated time frame. User centricity was covered in all of the applications whereas three applications didn't cover the interests of stakeholders in any way or form. While the coverage of the projects compliance to strategies, missions and visions was generally good, there was clear difference between covering the states goals and the organizations goals. 72% of application mentioned some sort of compliance with national strategies meanwhile only 64% of the applications stated some connection of the project with the organizations or information systems goals and strategies. Table 1 shows the results of the comparison mentioned above.

Table 1 Project planning indicators

"N" new system; "E" replacing existing system; "I" improving existing system; "+" is mentioned; "-" is not mentioned; "*" is not mentioned directly	New system, replacing existing system or improvement (N/E/I)	User centricity	Stakeholders interests	Compliance with agencies strategy	Compliance with national strategies	Maintenance & operations	Sustainability	Project launch	Duration of the project (months)	Launch of the system
1.Public announcements	E	+	+	+	+	-	+	2013	18	2015
2.Electronic land cadastre	E	+*	-	+	+	+	-	2012	14	2014*
3. e-police	E	-	-	+*	+	-	-	2013	12	-
4. e-PRIA	I	+	+	+	+	+	-	2010	20	2014*
5. Court IS	I	+	+	+	-	-	-	2011	18	2013
6. Citizenship & Migration office systems	I	+	+	-	-	-	-	2010	6	2014
7.Traffic Surveillance IS	N	+	+	+	+	+	+	2009	12	2010
8.Traffic register	I	+	+	-	+	+	+*	2009	7	2010
9.Succession register	I	+	+	-	+	-	-	2010	18	2013
10. eesti.ee & DEC	I	+	-	+	+	-	-	2012	17	2013/2014
11.Labour Inspectorate IS	I	+*	+	-	-	+*	-	2010	12	2011/2012

As return of investment is based on evaluating the relation of costs to benefits, the assessment of these elements is of great importance to ensure the success of a project. As the Structural Fund application suggests the benefits and costs to be analysed as social and economic impacts and the costs of the project to be viewed separately, Table 2 Benefits and costs concentrates on these values.

In 91% of the cases some sort of economic and/or social impacts have been brought out. Only 9% of the applications had some sort of detailed description for social impacts and 18% of economic impacts showed detailed and/or quantitative evaluation. This shows that the level of detail in analysis behind evaluating these impacts is very low.

The allocation of costs was evident in 91% of the applications. Even though in the application it is demanded to show not only the allocation of the project costs but also the calculations behind these numbers, only 45% of the applications have brought out how the calculations were made.

Another important aspect for evaluating RoI has been brought out to be the possible future costs and developments. Mentioning of the costs of maintenance and operations was evident in only one of the application making 9% of the total.

The costs of the project range from 110 000 euros to 511 000 euros. What must be noted here is that as 91% of the projects are either improvement projects or replacement projects, the actual costs of development through-out the projects' development have been a lot higher. Even further, two projects from the selection showed that even in the current development process, the cost shown in the application is only partial. For example the case of the Court information system showed, that the project had already been granted 500 000 in the previous funding period. Just as in the case of Electronic Land Cadastre it was pointed out that the project sent in two applications and the aims wanted to be achieved can only be done if both of the project proposals are implemented.

Table 2 Benefits and costs

	Social impacts mentioned	Detailed social impact (D) or mentioning of the impact (M)	Economic impacts mentioned	Detailed/quantitative economic impact (D) or mentioning of the impact (M)	Cost of development	Allocation of costs are shown	Calculation of costs are shown	Possible future costs have been mentioned
1.Public announcements	+	M	+	M	200 000	+	-	-
2.Electronic land cadastre	-	-	+	D	470 000	-	+*	-
3. e-police	+	M	+	M	209 520	+	-	-
4. e-PRIA	+	M	+	M	500 862	+	+	-
5. Court IS	+	M	+	M	511 293	-	+	-
6. Citizenship & Migration office systems	+	M	+	M	121 432	+	-	-
7.Traffic Surveillance IS	+	M	+	M	110 439	+	+	+
8.Traffic register	+	D	+	D	511 037	+	-	-
9.Succession register	+	M	+	M	499 968	+	+	-
10. eesti.ee & DEC	+	M	+*	M	417 825	+	-	-
11.Labour Inspectorate IS	+	M	-	-	127 823	+	-	-

What the proposals and end-results of the Structural Funds show is that the ex-ante analyses vary a lot throughout the different projects and authorities. The main issues risen are that the sustainability and future costs have not been well thought out, the planned timeframes are often exceeded, the interests of stakeholders and compliance to strategies could be more thought through and the impacts of the project assessed with more detail.

What can be concluded from all of this is that the project planning part is lacking in many aspects. This results in issues such as the Court information system needing twice the funding to achieve the users' needs and the Citizenship and Migration office information system joining the x-road three years after the planned time. RIA and MEA&C have come to the same conclusion as they have annually improved the application form. The latest form consists of 21 points that cover many of the points lacking in the assessed applications [6]:

1) Correspondence to the aim of the call of proposals;
2) Correspondence to the agencies goals;
3) Objectives of the project;
4) Range of the project;
5) Description of the project;
6) The as-is situation and necessity of the project;
7) Result of the project;
8) Impact of the project;
9) Description of the regulations and legislations related to the project;
10) The beneficiaries of the project and the target group;
11) Third parties of the project and their costs;
12) Innovativeness of the project;
13) Preconditions of the project;
14) Current status of project preparations;
15) Description of the project teams and allocation of roles;
16) Description of project activities;;
17) Budget of the implementation of the project with calculations and justifications;
18) Amount and description of public procurements necessary for the implementation;
19) Possible risks and their mitigation;
20) Description of the deployment process of the project;
21) Sustainability of the project. [6]

3.2. Case study 2: Estonian Tax and Customs Board

The Estonian Tax and Customs Board (EMTA) was the first state agency in Estonia to provide e-services [36, pg. 73]. The board provides several e-services for citizens, enterprises and other state agencies. One of the biggest systems under EMTA and Estonia as a whole is the e-tax and –customs system. E-tax is an electronic tax filing system of Estonia that was first introduced in 2000 [25].

Over the 15 years of its existence the system has been developed annually and has made a massive leap in technological development and user experience:

- Initially the system provided the declaration of turnovers, income taxes, social security taxes etc. for legal persons [36, pg. 73].
- By 2002 the system had developed to the stage were tax declarations became automated through pre-filled forms [25].
- In 2003-2007 the functionality of the system was improved with additional declarations and the introduction and implementation of prefilled forms was enhanced [36, pg. 73].
- In 2004 a contact centre for assisting the users of e-services was created, in 2005 x-road was taken into usage and by 2006 the system provided toll declarations [36, pg. 73].
- By 2007 the e-tax/e-customs system had had a makeover as the system was outdated both functionally and visually. The new form of the system provided the opportunity to start distinguishing users by roles [36, pg. 73].
- Since 2007 using e-tax system for declarations is obligatory to all businesses [25].
- In 2009 the accounting system was changed in EMTA thus enabling the state to have a better overview of tax revenue inflow as well as made the tax system more understandable for citizens and businesses [25].
- In 2010-2012 payment links were added to the declarations and electronic mandate system was created [25].

The system has achieved very high usability through automating the process even further. It takes just a couple of minutes to file ones taxes which has resulted in 95% of all taxpayers using the e-tax system. [25]

With the impressive achievements that the developments have shown, the e-services of EMTA are definitely the flagship of Estonian eGovernment and due to the long experience in offering e-services the board is notably of great interest when researching the RoI assessment in Estonia.

The following case study is based on an interview carried out with stakeholders from EMTA on 6.04.2015 and publications and relevant information on the internet.

3.2.1. The aim of the agency and the system

EMTA is a governmental agency under the Ministry of Finance. EMTA has administrative functions and supervision authority. [41, § 1] The main tasks of EMTA are managing state revenues, implementing tax and customs policies and protecting economic activity of the society [41, §6].

The board has stated principle values and goals in to the authority's strategy that guides the aim the agency tries to achieve in a 3 year period. In 2013-2016 EMTA bases its activities on the values of trustworthiness, cooperation, rationality and innovativeness. The goals to be achieved by 2017 are collecting state's tax revenue, reduce the amount of dishonest economic activities and the creation of an organisation culture that supports development and productivity. [24]

The basis of all e-services related to taxes including the portal of e-tax and e-customs is the Register of Taxable Persons. The register was created in 1999 and holds all data regarding tax and customs proceedings as regulated by the law. [41] The purpose of the register is gathering data for implementing tasks regulated by legislation, keeping count of the accuracy of tax payment as well as for determining and collecting taxes [54].

With the developed e-services EMTA acts as a stakeholder and system owner describing the needs, initial tasks and coordinating the implementation of development. Since 2011 the IT Centre of the Ministry of Finance (from here on RMIT) is responsible for maintenance of the solutions as well as conducting the IT procurements [50].

3.2.2. The development and problems of RoI assessment in the Estonian Tax and Customs Board

The developments of IT services in EMTA started at the turn of the century. The first developments were done *ad hoc* and were developed without any additional resources. The IT manager of the board developed the first versions of the solutions of e-tax as a hobby project and brought them in on floppy discs. There were presumptions that the capacity will increase and volumes of doing things on paper will reduce but none of these were documented or assessed. [32]

According to the interviewees [32] there were very little costs, no partners of cooperation and only a few customers. The first role models for developing e-services were internet banks but other Estonian or international authorities had not implemented anything of such sort yet. As there were no best practices or standards to meet no analysing of RoI was done. In retrospect the interviewees state that as a good thing, as the return on investments with the knowledge of the time and the customer base existing would have most definitely been negative.

The e-tax system was launched in 2000. In spring the first income tax declarations were made and by fall companies started to submit declarations and wage reports.

In the years of forming the first services EMTA received criticism for using human resources who are on the state's payroll on services that can be used on computers. At the time only a small proportion of citizens had computers and people didn't even dream that there would be a boom and e-solutions would be a widespread phenomenon. The user base in the beginning years was 3% and no one would have dared to imagine that it will be 95% within 15 years. But the interviewees state that the improvement on usage can only go so far as they don't see the system ever being 100% electronic as some users like the personal contact. [32]

One of the bigger changes to the e-tax system was made in 2006-2007 when the visual of the system changed. Even then no calculations of profitability were made. After that change some calculations started to occur, but not in the way it is done nowadays.

Today the board analyses RoI on all bigger developments, but the overall evaluation is not simple. The focus and goal is to provide simple services and good emotion, which cannot be evaluated in monetary terms. For example with the declaration of income taxes the profitability is more and more hard to calculate as 95% of users already do it electronically. With this example the RoI analyses are not done. The basis for development in this case is the knowledge of wanting to achieve the declaration process with one click, the speed of session and ensuring capacity. The development of the process from five clicks to one is not profitable in monetary terms, but the market requires better, faster and easier service. The evaluation on how much more money accrues to the state budget through the improvement as this cannot be done. The presumption is made that an easier system makes difference in tax behaviour and thus increases revenue for the state and lessens the need to control dishonesty. But this cannot be proven or measured. [32]

In the view of the stakeholders [32] cost-benefit analysis in its pure form can only be done with services that are made electronic from completely paper-based system. As soon as the focus shifts on improving the existing system in matters of ease of use and providing good emotions then the evaluation becomes a lot more complicated.

For evaluating RoI in case of improving existing services the estimated time consumption of processes before and after the development are done. The results can be multiplied with Estonian medium salary but the result does not give the clarity as to whether the investment is profitable. In many cases the time consumption of the boards own employees is done but when calculating the cost for the users the results are arbitrary. It definitely shows some truth but the connection to RoI is questionable. [32]

In EMTA the profitability period of 4-5 years is a very good result but in many cases this cannot be taken as the basis for go/no-go decision. An example was brought from a customs project where the costs are tens of millions of euros and the profitability period is in 25 years. With this project the RoI aspect cannot be used as a basis for go/no-go decision as the change is compulsory for all members of European Union. [32]

3.2.3. Involvement and user-centricity

The projects in EMTA are domain specific. There are 12 domains or fields in the board and each of them is responsible for developing their services. The development department of the board is responsible for coordination. As it has been stated previously the board acts as system owner and the coordinator where the development and maintenance is done at RMIT. [32]

With all projects there is always the involvement of representatives from other fields inside the agency. With bigger developments interested parties, stakeholders and enterprises are involved. For involvement of the stakeholders and the users the board organizes information meetings and seminars where they have the opportunity to give ideas for further developments as well as feedback on existing solutions. With bigger projects some facilities and user segments are used for testing throughout the development phase. [32]

The board places high value on the user centricity and need, thus all of the provided e-services have a feedback form. The interviewed stakeholders value this as a great way to have the most adequate feedback on what to fix or improve. [32]

What was brought out by the interviewees is that the current practice of development is very cost and time centric and thus doesn't always allow to provide the best possible services. The

current practice states the exact costs, the initial task with specific development stages and the end date of the project. According to the representatives of EMTA it leaves no room for creativity or agility. [32]

The stages must be followed in order to stay in the time frame. Often this results in the fact where the time pressure does not leave room for emphasising ease of use. Another problem often faced with the current methods is that the initial task has to be very specific in detail of all the navigation buttons and warning messages. In reality needs for modification arise in the course of development which result in discussions with the developer as to whether the changes can be implemented within the cost range and whether the initial task allows changes. The deadlines given are also often unrealistic and need to be modified in the course of the project to achieve the goal set. [32]

According to the representatives of the board this results in situations where the time frame and the initial cost are exceeded or the project results do not correspond the real needs of the users. The main reason behind it is that when the initial task or preliminary analysis is written, it takes about a year of development in average until the service is usable. In a year the needs and expectations can change thus the product launched to the market is already outdated. [32]

The board would like the process to be more agile in the future where the end goal would be described and worked towards together with the project partners and developers. This practice is nowadays widely used in the private sector and the interviewees are hopeful that this is the direction where the public sector is moving towards. [32]

3.2.4. Monetary support and funding

The vast majority of funding for the IT developments of EMTA comes straight from the state budget. The base budget for developments is 1.2 million euros a year but for example for 2015 another 1.3 million was allocated as additional budget. [32]

In the period of 2007-2013 funding for 6 to 7 projects was received from the structural funds. In the period of 2014-2020 the board has already applied for two projects in the total amount of 600 000 euros and they are planning to apply for several more. In the coming years the wider aim is to renew the e-tax soft- and hardware completely. The estimated cost for these actions in total is 17 million euros which is aimed to be financed with the assistance of structural funds by 2025. [32]

As far as the application for structural funds go the stakeholders of the board agree that it is very general. In the opinion of the stakeholders the aim of the application is to understand if the owner of the system understands for what purposes a service is needed. The outcome is not measurable or possible to be evaluated later on. Thus the board calculates the RoI for these projects as usual and in the application they describe the general impacts that the board does not assess in the RoI analysis. These include time savings, better service, better assessment and analysis of risks etc. [32]

The profitability aspect is unclear to the stakeholders as it raises the question of what is going to be done with the return on investments or the profit. When taken an example where a project should pay off in 3 years then what will be done with the left over money on the fourth year? Should it go back to the state's budget? And if the benefit is created to the user then the return will never be evident for the state. But these are the questions that aren't measured or of interest to anyone. According to the stakeholders interviewed the application requires remarkable psychic abilities in regards to what the outcome of the project will be but at the end this information is relevant only to the owner of the system. It raises the question why does the profitability aspect need to be evaluated as maybe the agency does not want the profit at all.

In the view of the interviewees the application should concentrate more on the creation of additional value but the existing system is very cost-centric. [32]

3.2.5. Compliance to strategies

It has been established that user-centricity is a big pillar of EMTA strategy as well as that customer feedback is considered the basis for new developments. For understanding how EMTA implement national strategies the interviewees reflected their actions towards some of the bigger national projects described in the information society strategy 2020. [32]

One of the goals of the state is enhancing cross-border cooperation and this aspect is very valued in the board as well. This is especially important in questions regarding customs where cooperation and exchange of best practices is done on a daily basis. The board is active in European workgroups which develop most of the standards and requirements used in questions regarding customs. Other forms of cooperation include the standardization of data exchange with other countries bordering the Baltic Sea, exchange of best practices and new ideas with nearby countries as well as cooperation within Estonia. The national cooperation is very frequent with the Road Administration and cooperation regarding developing strategies and exchanging experience with MEA&C The board sees national cooperation as something that is

beneficial for all involved parties as for example time put into research made by MEA&C will improve the board's image and thus gives them a greater chance to receive additional funding from the structural funds. [32]

Another important concept of the information society is the legacy principle which lies in reforming the existing public e-services and the technologies so that no important Estonian e-service or technological platform can be older than 13 years. The board admits that they have several applications and databases from the turn of the century that are still up and running. Only a few legacy systems have been able to be put on a shelf. The interviewees stated that they don't base their decisions on exchanging technologies on the 13 years principle as the main question for them is performance –if the legacy system allows new developments, is not overly difficult to maintain and has necessary capacity then the change is not rushed. [32]

Currently the board is planning to exchange the older platforms as for example the e-tax solution requires annual purchases of memory capacity to keep the performance up which definitely is not a sustainable solution. The main problem with these systems in EMTA is that there have been new developments and applications that have been built on the legacy system that are all interconnected and thus the exchange of development is not easy. As mentioned previously the changes in legacy systems planned in the years to come are estimated at 17 million euros. The interviewees admit that one of the problems with exchanging legacy systems is the return on these investments as for the users the process doesn't necessarily change. The only way to calculate RoI in these cases is to assess the risks of the legacy system stopping completely due to the technical limits. In this case the cost of everything being paper-based again is the possible cost faced, but the interviewees admit that this is extremely arbitrary way of evaluating RoI. Another aspect brought out by the stakeholders that the solutions of the future are not necessarily cheaper than the old ones. An example was brought of the digital archives the creation of which is definitely not cheaper than renting 1400 square metres of archive space and keeping three archivists on the payroll. But it is definitely more comfortable and needs to be done. [32]

EMTA has been involved in the e-residency project from the beginning as they conducted a risk analysis to the MEA&C. The main questions that the board has risen regarding the project is safety as for surveillance purposes it is necessary to know who is the person using the e-services but currently the e-residents are anonymous to Estonian authorities as to where they live and who they are. Thus some processes are restricted by the board. In general the e-services

of EMTA are usable for e-residents but the interviewees don't see these users using the services as the obligation to pay taxes is tied to the place of economic activity. So if for example and Australian produces something in Australia but is e-resident in Estonia then the tax obligation is still to the Australian government. Thus the interviewees were sceptical as to whether the project can achieve the aim it was set. [32]

Another project supported in the information society concept is the publication of open data. As of 20.04.2015 there are 11 different sets of data published in the Estonian open data portal [48], one of them is provided by EMTA. The interviewees state that if there is demand for the information then it is most certainly provided but when discussing providing further data the stakeholders were sceptical. Reasoning behind it lied on one hand in the fact that much of the data held by the board includes delicate information but on the other hand the stakeholders do not see the full purpose of the project. [32]

The interviewees stated that MEA&C stated that the main aim of the project is for small enterprises to create services based on the open data, but the stakeholders find it unclear which services could be created based on their data. It was stated that if there was interest towards their data these would most certainly be provided but until then the resources for developing open data would not be spent. The stakeholders stated that the open data concept is only halfway as for example the Swedes have already made a step forwards and are providing open services. The open services concept lies in the fact that the source code of public services is given out to private sector based on contracts and the private sector can provide the public services themselves. For example with the tax declarations a private enterprise could provide a service where in addition to the tax declaration itself some consultancy would be offered. The interviewees state that this is just an example on how to improve upon the open data concept.

With the concepts of creating virtual data embassies and giving the data subjects more control over their data the board is not as involved with as with the above mentioned. For data protection issues the main emphasis is on ISKE and citizens can make queries regarding their data. Automated services for data provision or planned activities regarding data embassies are not implemented. [32]

What can be seen from the implementation of strategies is that the approach from EMTA is rational ad sceptical meaning that even with national goals the implementation will not be rushed if the reasoning and necessity is unclear.

3.2.6. Return on the Tax and Customs Board investments

Several problems regarding RoI raised by the interviewees have been brought out in the previous paragraphs. In order to fully grasp how the assessment is done, the current state of RoI analysing in EMTA is viewed.

The assessment of RoI in EMTA was created on an example of the Road Administration and is now used in the whole administrative field of the Ministry of Finance [32]. The form is based on cost-benefit analysis and aims to compare the as-is situation to the to-be situation. The measurable entities vary according to the projects but the basis of the application are the same.

The calculation process includes of annual costs of different variables. These variables include:

1. Number of documents in the process
   - Both on paper and in electronic form
2. Calculation of the time unit of employees involved in the process
   - Includes the calculations of annual salary funds, management costs and fixed costs
3. Calculation of factor costs
   - Such as the material cost of a document multiplied by the amount of documents in the process
4. The costs of management of soft- and hardware
5. Time spent of the user
   - Includes the time spent for getting to the service provider (based on a result of an audit made by the National Audit Office of Estonia), queue time at the office and time of proceeding the document
6. The calculation of the users total time costs
   - Time spent is multiplied with the average salary in Estonia [32]

The calculations are done for a period of years (for example from 2016 to 2020) for both the as-is and to-be process. All costs (such as the average salary of the citizen, average salary of the employee from EMTA and RMIT and the average maintenance cost of a system) are based on calculations on the current situation and are re-calculated annually. [32]

After the as-is and to-be situation have been described the investment and profitability side will be analysed. This is also shown over the pre-defined period of years and comprises of aspects such as [32]:

1. Development costs
   - This includes both the costs of the specific project as well as the possible follow-up projects implemented in the years analysed.
2. Changes in costs
   - This paragraph show the total annual costs, the difference of as-is and to-be costs for EMTA, RMIT and to the customer as well as the total sum of costs.
3. The return on investments
   - This is shown as the difference between the investment costs and the change in costs (revenue, lessened costs). The comparison is done over the years in order to understand when the return is bigger than the sum of investments and change in costs.

The general understanding in the board is that if the return on investments will be achieved within 5 years then the project will be implemented. The interviewees stated that the providing good emotion or simple service is not taken into account in these calculations. The analysis is based on the assumption that time equals money. As it has been stated in the previous paragraphs this method of calculation is used whenever possible but with some projects the qualitative values such as ease of use are valued over the monetary gain and thus the analysis is not conducted. [32]

While the assessments are usually done before the implementation in some cases the ex-post assessments have been conducted as well. For example with the project aimed to send documents from the records management system straight to e-tax portal to the citizen cost 23 000 euros. 6 months after the implementation calculations were made that the documents sent electronically in that period would have cost exactly 23 000 euros to be sent on paper. Thus the analysis stated that the development paid off in 6 months. This development saved the working time of 4 people and thus 4 persons were discharged. What the interviewees stated is that while in many times the return on investments should come in the account of employee time savings, these employees are often relocated to other fields and thus the profit is not physically evident. [32]

The costs of software development of EMTA were provided for the years 2004-2014 (Table 3) [32]. The costs show all software developments made for the board and thus cannot be used for assessing whether the RoI assessment of the past viewed correct metrics.

Table 3 Costs of software development in the Tax and Customs Board

Year	Development costs
2004	1 818 343
2005	1 509 319
2006	882 350
2007	2 260 356
2008	3 269 704
2009	2 351 455
2010	2 466 889
2011	1 522 553
2012	1 444 236
2013	1 861 351
2014	2 278 727
Total	21 665 283

When assessing the methodology of analysing RoI it cannot be classified as the cost-benefit analysis in its pure form, as this is only financial analysis without any feasibility studies, risk assessments or analysing possible alternatives. As far as for justification of a go/no-go decision this method can definitely be used if the results can be quantitatively measured. The weaknesses of the system lie in the fact that it doesn't take into account the discount rate of changes in monetary value over time. Thus the real return on investments period is probably longer than the one estimated in the assessment.

As the stakeholders stated themselves when it comes to improving existing e-solutions or exchanging technical platform the assessment is not done due to the fact that these developments are not beneficial in quantitative terms. Qualitative assessments are not conducted.

As the history of conducting assessments in EMTA is relatively recent, costs provided to the author are not differed across projects and all the e-services, information systems and portals

are interconnected the case study does not provide sufficient grounds for quantitative assessment on how the projects have paid off in real life. What the case study clearly shows is that quantitative assessment is not sufficient in an already existing eGovernment environment and as also stated by the interviewees the calculation of time savings does not really provide the necessary clarity on where does the return come from and for what purposes it will be used.

3.3.   Case study 3: Ministry of Justice (E-file)

The Ministry of Justice (from here on MoJ) is responsible for creating and implementing legislation as well as the coordination of the development of registries and information systems in its administrative field. This includes services that are provided for the citizen such as the e-business register, e-land register, services that are provided to the public such as the public announcements and Riigi Teataja as well as the procedural systems for prisons, courts, notaries, prosecutors etc. [46]. The development and maintenance of the IT systems and services is done in the Centre of Registers and Information Systems (from here on RIK) which is a state agency in the administrative field of MoJ [51].

One of the biggest and longest IT projects under MoJ is the e-File. The e-File is central database with a public user interface which allows procedural parties to electronically submit procedural documents to courts and to observe the progress of the proceedings related to them [10]. The database links all the procedural data from police to prosecutor and from court to prison. Thus creating one judicial database that holds all the necessary information regarding a persons' judicial proceedings.

The e-File was launched in 2008 [27] and fully implemented in 2010. In the beginning the e-File system exchanged data with the police information system, the register of criminal proceedings, court information system and the e-File public interface. Over the course of time systems such as the register of prisoners and probationers, register of enforcement proceedings, punishment records and many others have also started to use e-File services through x-road making the data integrity even more wholesome.

As MoJ is one of the biggest e-service providers of the Estonian eGovernment and the E-File is one of the biggest central databases and the pillar of electronic justice proceedings it is notably of great interest when researching the RoI assessment in Estonia. The following case study is based on an interview carried out with the director of the Information Systems and Work Procedures Division of MoJ on 21.04.2015 as well as information received from different

employees of MoJ and RIK via e-mail and other publications and relevant information on the internet.

3.3.1. The aim of the agency and the e-file

MoJ is responsible for planning and implementing the state's legal and criminal policy, coordination of law-making, matters of courts, prosecutors, prisons, court forensics, notaries, civil enforcements, sworn translators, proceedings of bankruptcy, legal aid and data protection and other tasks [35]. As the Centre of Registers and Information systems is responsible for the provision of all electronic means that assist the implementation of these tasks as well as for the creation of registers and information systems for all judicial proceedings the mission of RIK will be viewed in depth.

RIK has stated its vision to be the most valued developer and administrator of state's IT services with the mission of being knowledgeable and flexible partner for the public sector, providing quality IT services from concept to implementation. The values on which RIK with its 200 IT specialists pillars on are flexibility, competence, cooperation and security. [9] While RIK was established in 2007 in its current form it has developed and maintained the IT solutions of MoJ as a department of the ministry for far longer.

In its activities RIK bases on the regulation of information technology planning, management and administration regulation of MoJ. The regulation states the aim and direction of IT management; financing; the roles, obligations and other relevant information on planning, developing, managing and controlling of software developments. [34]

The developments of MoJ IT solutions are implemented by the private sector through IT procurements or with bigger and longer projects within RIK. The ministry is responsible for coordination and controlling and acts as a system owner together with the stakeholders of the service and RIK is responsible for the development, procurements and maintenance of the services.

3.3.2. The development and problems of RoI assessment in the Ministry of Justice

MoJ is divided into 5 big fields with the corresponding departments and divisions. Each field is responsible for both legislative changes in the field and all the necessary software developments. The practice for some years have been that each field determines the system owner who is responsible for conducting the preliminary materials of development projects with all its different aspects as well as for coordination of the development process itself.

According to the regulation of information technology planning, management and administration all system owners should conduct a profitability analysis together with the Information Systems and Work Procedures Division. All initial tasks and assessments must be approved by the aforementioned division. [33]

Nevertheless the director of the division noted that the practice of conducting the assessment is very uneven through the projects and is highly dependent of the system owner. Meaning that the practice of conducting RoI is not very long but it has been implemented over the last 10 years for the bigger projects. In many cases RoI might not be assessed at all as the necessity of the project comes straight from the minister and is thus of political nature. In these cases the funding of development is found within the ministry but the maintenance and operations costs must be found within RIK. These examples are not monetarily thought through but must be implemented nevertheless. [33]

Since 2015 the IT council of MoJ was recreated. The council is led by the chancellor and the members of the council are all the vice-chancellors of the ministry as well as the director of RIK. The council is changing the rules and regulations of IT management significantly. While the new IT management regulation is not yet signed the changes are already implemented. Through this change the Information Systems and Work Procedures Division will lose its regulative role in RoI assessment and the accountability is further divided between the specific fields. The reasoning behind the change lies in the change of financing IT projects. The funding is allocated to each field and the chancellor or the vice-chancellor of the field is responsible for the division of funding in the field. The fields are for e.g. the field of courts, the field of prisons etc. Every field is responsible for if and how the profitability is evaluated. Notably the division will still give advice to the system owners but whether the advice is taken and which methods are used for evaluating RoI cannot be regulated by the division. [33]

3.3.3. Involvement and user-centricity

As it has been mentioned before the developments in MoJ are domain specific. When planning a new development it is up to the system owner to involve necessary stakeholders and ask for user feedback. The stakeholders are involved throughout the development process and representatives of users or stakeholders are included to the steering group of the project. [33]

As far as getting user feedback goes there is no obligation for developing feedback forms or other relevant developments. In some projects the feedback is asked directly from the users and stakeholders but it is domain specific and not compulsory. Communication with the

stakeholders or users in the administrative field is continuous whereas with citizens the feed-back and communication flow is uneven. [33]

When RoI is assessed the ease of use and customer satisfaction are two of the three compulsory qualitative criteria's that must be evaluated. The so called "soft values" are the ones that usually bring the additional value to the users. But these are very hard to evaluate. The method currently suggested in the administrative field of MoJ does allow the qualitative values to be evaluated but as the solution does not always allow the full assessment of qualitative aspects of existing e-services they are very open to advancing their methods. [33]

3.3.4. Monetary support and funding

According to the interviewee in recent years the new developments of information systems and registers have not been funded from the state budget as the budget has been allocated for the maintenance and operations. What must be noted is that in case of some of the bigger systems such as the e-File and the Public e-File the developments are done within RIK and the salaries of the project team are allocated from the state budget. [33]

With the developments of smaller systems that are not related to other systems to that extent the funding is found within the specific field. With completely new projects the bigger developments have been implemented from European Commission programmes. The latest of these include the register of prisoners, the punishment records and the register of enforcement proceedings. [33]

While the European Commission funding is mostly over million euros per project, related to that amount the smaller projects have been done from the Structural Funds. The amounts there are around half a million euros. Some projects have been funded from very specific programmes of Norway or Switzerland. [33]

The director of the division states that the main problems with the development projects lies in the project management triangle where money, time and goals are the tips of the tringle and only two of these can be fulfilled 100% (please see Figure 5). The problem with the triangle is very evident in projects that have received funding from the European Commission or Structural Funds as the amount of funding and deadline are very strict, the goals often have to be compromised to some extent. [33]
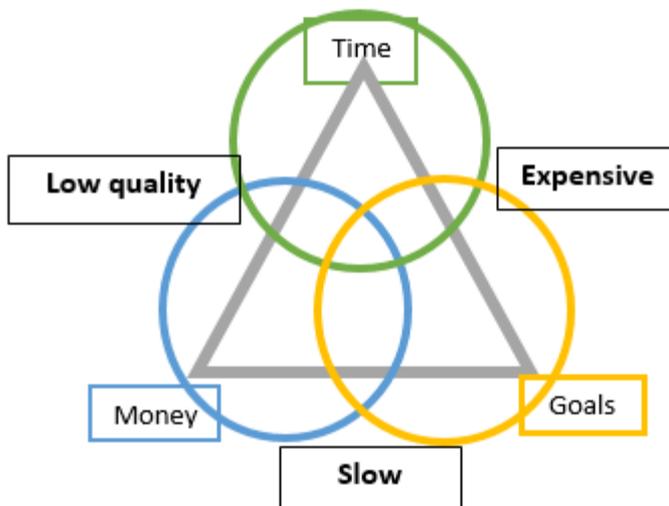
Figure 5 Project Management Triangle

As far as the applying for structural funds go the interviewee that it is evident that the authorities have different goals. According to the interviewee MEA&C established the application requirements last year and MoJ applied funding for 3 to 4 projects which all were declined as the profitability was not convincing. The interviewee adds that the problem wasn't only with MoJ projects but it was nation-wide. The issue was addressed in the nation-wide IT managers' council that is led by the MEA&C. According to the interviewee in the council several parties asked for standards or criteria's on which to base on when writing the application for funding as it would also make the assessment of the applications easier for the State Information System Authority. [33]

In the beginning of this year an example of one of the best applications was brought. The example was the case of the Road Administration Board which covered a whole life cycle of one process from both the citizens and officials point of view. The application did indeed cover all possible costs in the process. The problem with the example according to the interviewee is that it's an example not a method. The life-cycle described there is very specific and thus cannot really be used for evaluating the processes in the administrative field of MoJ. Another problem with the example is that the case shown there describes a paper-based service that is planned to be developed into an e-service. Understandably the return on investment is far easier to evaluate in this case then when improving already existing e-services. As there isn't a standard or methodology for evaluating the applications the interviewee states that the allocation of funding seems subjective. [33]

The interviewee states that the emphasis in MoJ projects is more and more on the preparation of the preliminary task and now the owners don't run after the amount of money or a specific time of call for proposals. Thus the projects are much more elaborately thought out as to why and to whom the developments are made. If a project really is needed and does give significant additional value, then finding funding for it is not as complicated and the quality of the solution is far better. [33]

3.3.5. Compliance to strategies

In order to understand how MoJ implement national strategies in the software development projects, the interviewee reflected their actions towards some of the bigger national projects described in the information society strategy 2020.

MoJ has a big role in the failure or success of the e-residency project and deals with the issues of the project on a daily basis. While MoJ was not part of the planning od this project, it has a significant role in the implementation. The main aspect where MoJ has a crucial role is in implementing the necessary changes in legislation. As the aim of the project is to grow the economy, the business register needs to be able to provide the necessary for e-residents. The legislation and register are interconnected as the data that needs to be provided for the register is stated in legislation but the e-residents don't need to submit all of the legally binding data. One of the examples of this is the fact that according to legislation, the enterprise or the entrepreneur must have an Estonian address as through the business activities some conflicts might occur that need to be addressed in court and thus the owner of the business must be accessible. This is a rather simple requirement to protect the possible sufferer but under the current frame of the e-residency project this criteria cannot be filled in the case of e-resident. This poses many problems on the legal part as to solve the problem in a way that the local citizens and entrepreneurs wouldn't be of a disadvantage and how to ensure the availability of the e-resident when in need which are all currently analysed and assessed. There have been some more simple necessities with the project such as translating the business register to English. [33]

MoJ provides open data services from 3 information systems and is planning to add to more services. The services will be added to the open data webpage by the beginning of July this year. According to the interviewee the project required in depth analysis as to what data can be published from the data protection and security perspectives and through the analysis many struggles with the differences on outlook between the Ministry of Justice and Ministry of

Economic Affairs and Communications have arisen. As the name of MEA&C state, the emphasis of the ministry is on bettering the economic sphere with the general outlook being more private sector like as the interviewee put it, whereas MoJ puts a lot of emphasis on data protection. This had resulted in discussions on where one ministry emphasised the necessity of availability and openness and the other ministry stated that the openness can only go so far in order to ensure the protection of the data subjects. As MoJ has some public services that are available for a state fee according to legislation (e.g. the business register and land register) the strategy was controversial towards the data provided by these services. The rationing behind providing services for fees lies in the costs of developments that these systems require to offer quality services, thus the services are self-supporting and publishing the data for free would undermine the services. Through the discussions exceptions were made in the strategy for services that are not free of charge. [33]

The Riigi Teataja (Electronic State Gazette) was one of the two first webpages that were hosted in a cloud based technology for piloting the virtual data embassies project. The aim of the pilot was to establish the technical capabilities and based on the results decide on the services that are to be hosted in the cloud. The pilot was successful but the interviewee did not hold information on the further plans or actions regarding the project. Depending on the services selected for the project MoJ will most likely be part of the implementation. [33]

As it has been stated previously MoJ places great emphasis on data protection issues. As it has been stated in the strategy the data subject should have the ability to control who, when and for what purposes has accessed his or her data. With some information systems the e-services have been developed that allow the data subject to acquire the aforementioned information. One example being the Punishment Records. The main problem with implementing these e-services on all the information systems lies in the system of transaction logs with the older services. RIK has launched a project that maps the log problems in all the information systems as with some of the services the transactions of administrators and other technical support is not properly logged thus the information about the accessing of data might be incomplete. Other problems include the re-use of the logs as they are often not in a machine readable format. The mapping of the current situation is the basis for changing the transaction log system where necessary and then creating the e-services regarding the logs for data subjects. [33]

Another important aspect of the Information Society concept is the legacy principle. This is something that MoJ aims to follow as much as possible. The funding of changing legacy

technology after 13 years is the biggest issue at hand. As MoJ has provided services for over 15 years many of the older systems are considered under the legacy principle and thus need to be exchanged but the necessary developments and newer platforms are not cheap thus the state budget does not provide funding for these projects. One of the possible places for funding are the Structural Funds but even though the legacy principle and allocation of funding are both coordinated by the same ministry the legacy principle on its own is not sufficient reason for getting the necessary funding. According to the interviewee MEA&C require a clear profitability and bettering in processes but in some cases MoJ can't see the possibility to better the service at the same time frame. An example was brought of the Land Register which by its age falls under the legacy principle and for ensuring future developments needs to be renewed but as the system has been developed throughout the years very thoughtfully and user-centric, the process cannot be directly improved. The interviewee states that with technology 13 years is a very long time and the information systems will collapse at one time if they are not renewed but additional economic value cannot always be created and in these cases should not be the basis of the allocation of funding. This cannot mean that the projects can be carelessly stated as a Legacy and then renewed, the necessity and preparation for the project must be thorough nevertheless. [33]

As far as the international cooperation and exchange of best practices goes MoJ active on several fields. First of all there are international development projects such as e-justice, ecris, e-codex and e-sens where MoJ and RIK are project partners. Networking and exchanging of best practices is done one a daily basis in all different fields. The last field where MoJ and RIK are actively participating is the provision of development cooperation. The project is run by the Ministry of Foreign Affairs. Examples where RIK has assisted and advised countries under the development cooperation include introducing business register and court information system to Ukraine and advising Georgia in building their e-solutions. MoJ has expanded the advising on e-solutions to all interested countries thus RIK is involved in developments in Kurdistan, Oman and other countries. [33]

What can be concluded is that MoJ is very open to different strategies and involvement of state projects but holds a firm position regarding data protection and security issues that these might bring along.

3.3.6. Return on the Ministry of Justice's investments

The previous paragraphs have stated several problems that the interviewee states with the current state of the RoI assessment. As it has been stated the assessment through projects is very uneven but to get the general aim on how the RoI assessment stands the test of time the initial profitability analysis of e-File from 2006 will be viewed and compared to the costs of the project. For understanding the current methods of analysing RoI the current suggested assessment method will be analysed.

3.3.6.1. RoI of e-File

The e-File project was implemented in 2010 but the developments begun two years before. At the time it was considered a very big and innovative project as it concentrated several authorities, information systems and services into one central system. The interviewee stated that the e-File has also received criticism and has probably not yet achieved its full potential.

The preliminary assessment of RoI of the creation of the central database e-File and the public user interface for citizens named Public e-File was done in 2006. The methodology of the assessment was a take on the cost-benefit analysis that calculated the direct monetary savings of related authorities, brought out possible risks and further assessment needs. The assessment described the possible alternatives and so called "soft values" but didn't assess the cost of these. [26]

The possible alternatives were set aside based on possible costliness and time of realization. After viewing the possible alternatives, specific components of profitability were taken a look at. According to the assessment the project concentrates services and information for seven different authorities and saving of resources in all of these facilities were viewed separately. The components taken into account in this analysis were:

1) Reduction of workload;
2) Savings on economic costs related to staff;
3) Time saved on procedures between different authorities;
4) Time saved on making requests to different information systems;
5) Time saved on answering to requests from different authorities;
6) Savings on postal fees and making copies;
7) Possible raise in paper costs as the possibility of printing out different forms will grow;

8) Temporarily there is a possibility of growth in workload due to adapting the new system;

9) Some "soft" components were discussed but not taken into account in numeral comparison of cost and benefit. [26]

The time savings at the time were estimated at 14 million Kroon's (approximately 895 000 euros) per year. None of the possible costs neither development, hardware nor maintenance costs of the project were viewed. Thus the analysis can be considered a benefit analysis rather than cost-benefit or RoI but it was emphasised that the assessment was initial [26].

When looking into the costs of the e-File and its components (the public interface, hardware and maintenance costs and payment order functions) it is evident that the annual developments are costly (please see Table 4) [16]. Furthermore out of the seven authorities listed in the preliminary RoI assessment two authorities are not fully using the e-File system. Nevertheless the necessity of the e-File is not questioned by the users, several other information systems that were not initially covered have started to use the services combining the central e-File to a pillar of the judicial system. The development has provided the basis for new innovative solutions currently under development such as a completely digital court case and provision of digital evidence through all proceedings.

Table 4 Costs of e-File 2008-2014

Year	Public e-File	e-File database	Payment order functions	Total
2008	250 293 (EUR)	1 284 073 (EUR)	No info	1 534 366 (EUR)
2009	383 534 (EUR)	646 028 (EUR)	63 912 (EUR)	1 093 474 (EUR)
2010	249 595 (EUR)	306 962 (EUR)	No info	556 557 (EUR)
2011	303 564 (EUR)	367 923 (EUR)	38 100 (EUR)	709 587 (EUR)
2012	234 328 (EUR)	349 755 (EUR)	182 000 (EUR)	766 083 (EUR)
2013	472 151 (EUR)	460 018 (EUR)	No info	932 169 (EUR)
2014	351 412 (EUR)	510 423 (EUR)	55 273 (EUR)	917 108 (EUR)
Total	2 244 877 (EUR)	3 925 182 (EUR)	339 285 (EUR)	**6 509 344 (EUR)**

Thus any ex-post evaluations would provide arbitrary results as the focus and importance of the project has shifted. When assessing the numbers without the content it may be assumed that the

profitability has not been reached but as stated the content behind the numbers has shifted so most likely the metrics of profitability have as well.

3.3.6.2. Current method for assessing RoI

As the e-File assessment showed the ex-post assessments are often not relevant nor measurable and thus don't show the accurate situation. The e-File was created upon a paper-based system and thus the quantitative benefits were relatively easy to assess whereas today the situation is much more complex. MoJ recommends the system owners of the administrative field to use Saaty method when evaluating RoI. Saaty method bases on five big steps and the sub-tasks of these [33]. The general methodology is following:

1) Stating the goal;
2) Stating the alternatives;
   - These must include but are not limited to doing nothing, bettering the existing solution, the new solution;
3) Stating the criteria;
   - The criteria are divided into two: general criteria and specific criteria;
   - General criteria is the same for all projects and must include all cost of investments, cost of maintenance, profit, risks, amount of users, customer satisfaction, user friendliness and sustainability of the solution;
   - The specific criteria is related to the aim of the project and must be created specifically for every project;
4) Comparison of the criteria;
   - This is done in a software that compares all the criteria to each other and all the alternatives towards the criteria to understand the scales of the every solution;
   - All alternatives are compared to every criteria on the scale of 1 to 9 where 1 states that the alternatives are of equal importance to a criteria and 9 shows extreme superiority of one solution to the other;
   - As a result the software calculates the final score of each alternative with the total amount of points of all alternatives being 1000. The alternative with the most points is the best choice;
5) Choosing the best solution [34]

The method provides a very good quantitative comparison method of qualitative and quantitative metrics. The possible weaknesses of the system are that it is solely based on the

judgement of the person assessing the alternatives and as it the method is not widely used in the administrative field of MoJ it might be assumed that the ease of use or clarity of the method is not sufficient. As the interviewee stated the method is easier to use on smaller projects where as the assessment of larger and more complex systems might later turn out to be arbitrary and inessential. Overall the method does seems to be comprehensive on all the necessary components stated in the Best Practices paragraph of the research in hand.

3.4.   Conclusion of the case studies

All three case studies showed that the assessment of RoI varies within and between agencies a lot. Both the Ministry of Justice and the Estonian Tax and Customs Board admitted that while there are methods developed for evaluating the return on investments it is used in practice only when the profitability can be measured. In the projects that are implemented on the basis of a political decision it is often seen that the profitability is not evident and thus RoI is not assessed at all.

The case study of the structural funds showed that most of the assessed projects concentrated on improving the existing systems. Furthermore the case study showed that almost half of the projects exceeded the planned implementation time showing that the current preliminary assessment is rather highly inaccurate and sustainability and future of the projects is undervalued.

It is evident that all authorities have different perspectives towards developments and thus the methods of evaluation differ as well resulting in the fact where the level of detail in the structural fund applications varies a lot. As it was established in the case studies of EMTA and MoJ the current application form is not clear towards what is the methodology behind it and how to best describe the outcome of the project. Furthermore as the current system separates the costs from the impacts the return on investment cannot be concluded on the basis of the application form but as the interviewees stated the unclear profitability is often the stumbling block as to why a project does not receive funding.

4. Conclusions

The thesis in hand analysed the concept and policies of Estonian eGovernment as well as the best practices of evaluating return on investment in eGovernment projects. For understanding the current status of RoI assessment three case studies were conducted.

The theoretical background stated that the Information Society concept, that provides the frameworks and projects that the state agencies implement, is supported by the framework of state information system and other relevant guidelines and frameworks. The general mind set of the direction of Estonian eGovernment development bases on the 12 pillars of the interoperability framework, which are:

1. Subsidiarity and proportionality;
2. User-centricity;
3. Involvement and availability;
4. Security and privacy;
5. Multilingualism;
6. Simplification of management processes;
7. Transparency;
8. Storing information;
9. Openness;
10. Reusability;
11. Technological neutrality;
12. Efficiency and efficacy.

The basis of any specific eGovernment project is the preliminary analysis together with the assessment of RoI. As it was stated in the theoretical framework of RoI assessment there are several widespread theories on the assessment of RoI which assist the service owner in making the go/no-go decision.

When looking at a development of a completely new information system or service, the possible benefits are rather easy to detect whereas when looking at the re-development of legacy systems, the benefits are harder to define. This is the case especially when the processes of the service remain similar to the previous system and cannot be improved. While this is clear and understandable reason for IT specialists, it is not seen as the best sales argument by the management and ministries.

The best practices of RoI assessment provide remedy for the problem as they encompass the measuring of the key performance indicators of the solution, the overall strategic planning and aim of the project as well as the costs and benefits of the system thus allowing the re-development of existing systems to be better analysed. The keyword brought out in the Estonian concept as well as in the best practices in balance between strategies, financial aspects and the goal of the service.

The following chapters will conclude the research on the RoI of Estonian central eGovernment projects providing answers to the two main research questions:

1) How the RoI assessments are conducted –what are the main bottlenecks and issues?
2) How can the current system be improved?

4.1. How are the return on investment analysis conducted in Estonian central eGovernment projects?

The practical case studies from 11 Structural Fund applications, the Estonian Tax and Customs Board and the Ministry of Justice proved that the methodology and practice of assessing RoI differs within the agencies and throughout the whole Estonian central eGovernment development. What can be seen is that the RoI assessment is mostly seen as a justification for costs rather than a mean of strategic planning and service oriented approach and thus only implemented if the return on investments is measurably positive.

The main problems shown in the case studies are that the projects preliminary assessment are inaccurate as far as the future costs and the timeline goes. The aspects emphasised in the strategies and frameworks are unevenly covered and implemented. It is evident that the service in silos has led to a state where every state agency has a specific goal and acts accordingly. For example with the structural fund applications it became evident through the case studies that MEA&C values the growth of economic sphere and monetary profitability whereas EMTA assume that user-centricity provides better tax paying and MoJ concentrates on the protection and security issues of the citizens. The difference is clear across the RoI assessment techniques as well as in the implementation of state's strategies and eGovernment projects.

Thus the RoI assessments often do not correspond the wider goals of the state and the service itself. The involvement of soft values such as the interests of stakeholders and users as well as the sustainability is very uneven across the preliminary assessments. Furthermore even when the RoI assessments are conducted then the ex-post assessments throughout the projects

lifecycle and at the end of the profitability period are scarce. Thus there is no clear evidence that the projects implemented have truly been the best alternatives RoI wise.

Hypothesises of the research were following:

1) The metrics used are inconsistent and described so that the projects result would always be positive;

2) The analyses do not take into account the costs of future development and enhancements;

3) The value added to the users and society are undervalued in the metrics.

What the research has proven is that:

1) The metrics are consistent within the administrative field of an agency but they vary a lot across the central agencies. The metrics are described fairly but the assessments are not made if the end result is not positive and even further the metrics are not always unambiguously measurable;

2) Only 9% of the cases in the structural fund case studies corresponded any future costs whereas with the case studies of EMTA and MoJ showed that future costs of maintenance are taken into account. Thus the inclusion of future costs regarding maintenance and operations differs across the projects whereas future development costs are in most cases not viewed at all;

3) While all of the case studies showed that the so called "soft values" are taken into account, this mostly lies in mentioning user-centricity and social impacts in the preliminary assessments. Opposed to, as suggested in best practices, taking them into account as a metric when analysing RoI or involving users in the development of new projects to truly enhance the user-centricity.

Thus it can be concluded that the current state of RoI assessment in Estonia needs to be improved to understand the true value of the investments whether positive or negative in sum.

4.2.   If and how the current system could/should be improved?

It is evident that while the service owners are starting to assess the return on investments more and more over the recent years, the current assessment method is still lacking on several levels. As it has been brought out beforehand, the only central coordination across the agencies in the field can be done through the application form for allocation of structural funds.

While RIA and MEA&C have constantly improved on their applications and have stated that the reasoning and assessment have bettered, the inconsistencies and deficiencies are still significant.

The main deficiencies that have been brought out in the research that are not clearly addressed in the application of structural funds include:

1) Correspondence to the strategies and objectives of the state and the service itself;
2) Costs of maintenance and operations;
3) Any foreseeable costs of future developments;
4) The level of detail behind the cost calculations;
5) The impacts and results should ensure the quality of a service and thus key performance indicators or other measurable targets should be set.

The abovementioned criteria together with the requirements set in the structural fund application should ensure the necessary level of general preliminary assessment for a new eGovernment projects regardless the place of funding. As it has been brought out beforehand there is constant search for balance between different stakeholders and criteria's of RoI assessment. Furthermore the case studies showed that the ministries and agencies all have their different unique perspective towards developing e-services which all have valid reasoning. Once again a balance between the different approaches should be found to ensure that the government works towards its goals in a unified manner rather than in domain specific silos. For ensuring that the project meets the abovementioned criteria as well as the existing requirements of the structural fund, an adaptation of the balanced scorecard could be used to cover all the necessary aspects providing a logical and structural form (please see Figure 6) meanwhile not needing an extensive allocation of time to assess the criteria.

As eGovernment solutions should provoke innovation, the perspective of first stating the goal or aim and then considering the solution has been proven to be the best practice. After all when looking at some of the innovations of the past it is evident that the solution initially intended has not always been nearly as wide as the end result. Take the development of cars for example which were initially seen as a product for the wealthy whereas nowadays they have transformed the transportation domain. The balanced scorecard framework provides the methodology for ensuring that the service owner covers the strategic, financial, customer, internal and growth perspective by first stating the direction and aim of the project and then setting concrete assessment metrics and initiatives.

Figure 6 Balanced Scorecard based method

Strategic priorities	Objectives	Measures	Targets	Initiatives
Financial	(e.g. reduction of cost)	This row should cover all costs (development, maintenance, operations, future costs) and financial benefits	The measures column should set the Key Performance Indicators and the Targets column should show the corresponding measurable targets	This column should indicate through which means the aforementioned priorities and objectives will be achieved
Customer /stakeholder	This column should correspond the national, agencies and service's aim	(e.g. customer satisfaction) — This row should cover the user perspective and –centricity aspects		
Internal		(e.g. faster internal process)	(e.g. By 2017 two administrators can be allocated to another project) — This row should correspond how the internal processes are bettered and what are the agencies goals	
Learning & Growth	This column should clarify what are the objectives of the priorities	This row should concentrate both individual and corporal self-improvement of the agency		(e.g. the motivation of the maintenance team will be raised through conducting team events twice a year)

Thus the system owners after completing the balanced scorecard analysis of a specific project, an information system or e-service will have a wholesome understanding of what, why and to whom should be developed to achieve the goals set. And as the name of the method states, the perspectives have to be balanced therefore making it easier to assess RoI on already existing e-solutions which might not have as many direct financial impacts as the paper-based services might have.

What must be kept in mind that there aren't only costs and benefits, the impacts can be negative or indirect. As the case studies proved in many cases the developments are just not profitable and thus the RoI assessment is not done. These actions undermine the concept and necessity of assessing RoI as the analyses should be conducted even when the decision of implementing a project is of political kind. This enables the service owners to understand all four perspectives brought out in the balanced scorecard and thus assess the possible loss to the state. Thorough assessment can bring clarity as to whether there is a better alternative to implementing the political decision and perhaps the means of ICT do not provide the best solution. Based on the same concept the balanced scorecard based RoI assessment should be analysed continuously as the mind sets and goals may change in time. Thus the metrics and goals should be reconsidered and analysed on a constant basis.

As the current state of Estonian central eGovernment RoI assessment showed severe inconsistencies in depth and quality it raises the question as to why it is done in the first place. The current practice shows it to be as a bureaucratic activity not a mean to strategic planning. The interest for assessing RoI should come from the service owners, developers, ministries, service providers, maintainers and all relevant stakeholders as it shows the risks, benefits and costs of achieving the goals. The Estonian eGovernment as a whole should have a more balanced perspective as to what are the goals to be achieved whereas today it seems that every agency acts as a government within a government as a result of the strong decentralization and development of services in silos. This includes everything from developing and implementing the ICT related strategies together with all the stakeholder agencies to the e-services and all the way to the RoI assessments. As the service in silos concept stands the Estonian eGovernment should strive towards a more unified goal and conducting more thorough RoI assessments could be the first step.

Discussion

The research in hand concentrated on the issues of RoI assessment on the central government level whereas the e-services of local government and municipalities and their assessment can e even more complex. Thus further discussion on RoI assessment on the municipality level should be assessed.

The research provided the balanced scorecard as one of the possibilities for assessing RoI in the preliminary assessment. Further discussion on the applicability of balanced scorecard for different sized and contented projects could be conducted.

Finally strong decentralization has been brought out as one of the reasons in inconsistencies of eGovernment development and assessment. Further research should be conducted as to understand the holistic view on the reasons of these inconsistencies in order to provide suggestions for improving on the concept of service in silos to eliminate these issues.

Bibliography

[1] Agricultural Registers and Information Board "e-PRIA" [WWW]
   http://www.pria.ee/en/ePRIA (as of 10.04.2015)

[2] Agricultural Registers and Information Board "PRIA infokiri - september 2014"
   [WWW] http://pria.ee/uudiskiri/vaade/pria_infokiri___september_2014#uusveebikaart
   (as of   9.04.2015)

[3] Ahmad, A. (2012) "Improving Government Performance: Use of Balanced Scorecard
Nine   step model for e-Government Projects" [*Online*] Academia.edu

[4] Ametlike Teadaannete põhimäärus. *Riigiteataja I, 01.04.2015, 9*

[5] Applications of 11 projects funded from the European Structural funds (received from
Jaak   Liivik from RIA via e-mail on 27.11.14):

   1. "Ametlike Teadaannete uue infosüsteemi loomine andmete taaskasutamise
      parendamiseks"
   2. "E-politsei seadmete kaasajastamine"
   3. "Elektrooniline maakataster"
   4. "e-PRIA teenuste ja raamistiku arendamine"
   5. "Kohtute Infosüsteemi (KIS) II arendusetapp"
   6. "Kodakondsus- ja Migratsiooniameti andmekogude ja rahvastikuregistri
      andmevahetuse täiendamine ja üleviimine X-teele"
   7. "Liiklusjärelvalve Infosüsteemi loomine"
   8. "Liiklusregistri arendamine juhtimisõiguse valdkonnas ja eelduste loomine e-
      teenuste arendamiseks"
   9. "Pärimisregistri ajakohastamine"
   10. "Teabevärav eesti.ee mobiilse versiooni loomine ning eesti.ee ja
      dokumendivahetuskeskuse (DVK) käideldavuse ja turvalisuse tõstmine"
   11. "Tööinspektsiooni Infosüsteemi (ITI) e-teenuste väljaarendamine"

[6] Avalike teenuste pakkumise arendamiseks ja toetuste andmise tingimused ja kord. *Riigi
   Teataja I, 17.04.2015, 11*

[7] Balanced Scorecard Institute "Balanced Scorecard Basics" [WWW] http://balancedscorecard.org/Resources/About-the-Balanced-Scorecard (as of 13.04.2015)

[8] Capgemini press release (2013) "The European Commission eGovernment Benchmark: Further Uptake Required To Meet Growing Citizens' Expectations For Public Services" [*Online*] https://www.capgemini.com/news/the-european-commission-egovernment-benchmark-further-uptake-required-to-meet-growing-citizens (as of 4.05.2015)

[9] Centre of Registers and Information Systems "Asutusest" [WWW] http://www.rik.ee/et/asutusest (as of 18.03.2015)

[10] Centre of Registers and Information Systems "e-File" [WWW] http://www.rik.ee/en/e-file (as of 18.03.2015)

[11] Centre of Registers and Information Systems (1.11.2013) "Oktoobri lõpus valmis pärimisregistri ajakohastamise project" [WWW] http://www.rik.ee/et/news/oktoobri-lopus-valmis-parimisregistri-ajakohastamise-projekt (as of 11.04.2015)

[12] Centre of Registers and Information Systems (6.04.2015) "Tänasest on kasutusel uus Ametlike Teadaannete infosüsteem" [WWW] http://www.rik.ee/et/news/tanasest-kasutusel-uus-ametlike-teadaannete-infosusteem (as of 9.04.2015)

[13] Chatfield, A. T. & AlHujran, O. (2007). "E-government evaluation: a user-centric perspective for public value proposition." [*Online*] Research online

[14] City24 (27.12.2013) "Maa-ameti elektrooniline maakataster valmib tähtajaks" [WWW] http://www.city24.ee/newsContent?newsId=NEWS_1990&year=2013 (as of 9.04.2015)

[15] Cole, D. H. (2012) "Law, politics and cost-benefit analysis" [*Online*]

[16] Costs of e-File and Public e-File 2008-2014 (received from K. Reimo from RIK via e-mail on 28.04.2015)

[17] Cresswell, A. M., G. B. Burke & T. A. Pardo (2006) "Advancing Return on Investment Analysis for Government IT. A Public Value Framework." [*Online*] Center for Technology in Government University at Albany

[18] Estonian Land Board "Maakataster" [WWW] http://www.maaamet.ee/index.php?page_id=2 (as of 9.04.2015)

[19] Estonian State Information System Authority "Information System Authority" [WWW] https://www.ria.ee/about-estonian-information-system-authority (as of 2.04.2015)

[20] Estonian State Information System Authority "Investeeringute kava" [WWW] https://www.ria.ee/sf-investeeringute-kava/ (as of 11.04.2015)

[21] Estonian State Information System Authority "Kogu riigi infosüsteem ühes autos" [WWW] https://www.ria.ee/teejuht/eesti-it-edulood/kogu-riigi-infosusteem-uhes-autos (as of 9.04.2015)

[22] Estonian State Information System Authority "Projekti kirjeldus" [*Online*] https://www.ria.ee/public/SF/Projekti_kirjeldus.pdf (as of 4.05.2015)

[23] Estonian State Information System Authority "Riigiportaal eesti.ee" [WWW] https://www.ria.ee/teejuht/riigi-infosusteemi-olemus-ja-komponendid/riigiportaal-eesti-ee/ (as of 11.04.2015)

[24] Estonian Tax and Customs Board (2014) "Maksu- ja Tolliameti arengukava 2013-2016. Muudetud 2014. aastal perioodi 2014-2017 kajastavate täiendustega" [*Online*]

[25] E-Estonia.com "e-Tax" [WWW] https://e-estonia.com/component/e-tax/ (as of 5.04.2015)

[26] E-Toimiku rakendamise esmane tasuvusanalüüs (received via e-mail from RIK on 2.04.2015)

[27] E-toimiku süsteemi asutamine ja e-toimiku süsteemi pidamise põhimäärus. *Riigi Teataja I 2008, 31, 197*

[28] European Commission (2002) "Socio-economic tools for sustainability impact assessment. The contribution of EU research to sustainable development." [*Online*]

[29] European Commission (2008) "Guide to cost-benefit analysis" [*Online*]

[30] European Commissions eGovernment benchmark (2012) "Digital by Default or Detour?" [*Online*]

[31] Government office of Estonia (2014) "Summary: Integrated Portfolio Management of Public Services" [*Online*]

[32] Interview with Karuse-Veebel, K., K. Liik, K. Aleksandrov & R. Reitman. 6.04.2015 at Estonian Tax & Customs Board (later specification on costs of EMTA and calculation method of RoI via e-mail with K. Karuse-Veebel on 6.04.2015)

[33] Interview with Varik, H. 21.04.2015 at the Ministry of Justice (later specification on open data with B.Blös from MoJ via e-mail on 23.04.2015)

[34] Justiitsministeeriumi infotehnoloogia valdkonna planeerimise, juhtimise ja haldamise kord (received from Marit Karjus from MoJ via e-mail on 22.04.2015)

[35] Justiitsministeeriumi põhimääruse kinnitamine. *Riigi Teataja I, 13.01.2015, 22*

[36] Kalvet, T., M. Tiits H. Hinsberg (2013) "E-teenuste kasutamise tulemuslikkus ja mõju." *Tallinn: Balti Uuringute Instituut ja Poliitikauuringute Keskus Praxis.*

[37] Kohtute Infosüsteemi põhimäärus. *Riigi Teataja I, 14.10.2011, 11*

[38] Krogstie, J. (2012) "Model-Based Development and Evolution of Information Systems. A Quality Approach." *Springer-Verlag, London*

[39] Labour Inspectorate of Estonia "Newsletter no 15" [WWW] http://www.ti.ee/fileadmin/user_upload/failid/dokumendid/Meedia_ja_statistika/Teavitustegevus/Infokirjad/2011/infokiri_nr_15/oktoober2011_aktuaalne1.pdf (as of 8.04.2015)

[40] Liiklusregistri pidamise põhimäärus. *Riigi Teataja I, 17.04.2014, 3*

[41] Maksu- ja Tolliameti põhimäärus. *Riigi Teataja I, 19.08.2014, 11*

[42] Ministry of Economic Affairs and Communications "Eesti Infoühiskonna   Arengukava 2020"

[43] Ministry of Economic Affairs and Communications "Infoühiskond" [WWW] https://www.mkm.ee/et/tegevused-eesmargid/infouhiskond (as of 2.03.2015).

[44] Ministry of Economic Affairs and Communications of Estonia (2011) "Riigi Infosüsteemi koosvõime raamistik" [*Online*]

[45] Ministry of Economic Affairs and Communications of Estonia "State information system" [WWW] https://www.mkm.ee/en/objectives-activities/information-society/state-information-system (as of 15.04.2015)

[46] Ministry of Justice of Estonia "Eesmärgid ja tegevused" [WWW] http://www.just.ee/et (as of 22.04.2015)

[47] Ministry of Justice of Estonia "Pärimisregister" [WWW] http://www.just.ee/et/eesmargid-tegevused/kinnisvara-abieluvara-parimine/parimisregister (as of 11.04.2015)

[48] Open data portal of estonia [WWW] https://opendata.riik.ee/ (as of 4.04.2015)

[49] Police and Border Guard [WWW] "KMA ajalugu" https://www.politsei.ee/et/organisatsioon/politsei-ja-piirivalveamet/ajalugu/kma-ajalugu/ (as of 10.04.2015)

[50] Rahandusministeeriumi Infotehnoloogiakeskuse põhimäärus (2011) [WWW] http://www.rmit.ee/public/RMIT_pohimaarus_10112014_3.pdf (as of 10.04.2015)

[51] Registrite ja Infosüsteemide Keskuse põhimäärus. *Riigi Teataja I, 28.03.2015, 11*

[52] RIHA "Infosüsteem: Isikut tõendavate dokumentide andmekogu" [*Online*]

[53] RIHA "Infosüsteem: Liiklusregister" [*Online*]

[54] RIHA "Infosüsteem: Maksukohustuslaste register (MKR)" [*Online*]

[55] Robinson R. "Cost-benefit analysis." *BMJ : British Medical Journal. 1993*.

[56] Ziraff (2014) "Kasutajasõbralike e-teenuste disainimine Maanteeameti näitel. Käsiraamat avalikule sektorile" [*Online*]

[57] Trinidad Consulting (2014) "Kasutatavuse mõõdikute süsteem avaliku sektori tarkvarasüsteemidele" [*Online*]

[58] Tööinspektsiooni põhimäärus. *Riigi Teataja I, 16.01.2015, 4*

[59] Whatacar.ee (26.02.2015) "Esmase juhiloa vahetamine odavamalt – kasuta e-teenindust" [*Online*] *Forte, Delfi*

Appendices

Questions used as a guideline for interviews by the author

e-tax/e-file

1. When did the software developments of the project begin?
2. When was the project launched?
3. What were the estimated costs and revenues at the beginning of the project (if such estimations were made)?
4. Have you made estimations on the real costs, revenues and benefits of the system throughout the years?
5. Have there been ex-post evaluations or corrections to existing RoI analyses?

RoI in general

1. How are your development projects funded (from state budget/structural funds/European Commission/own revenue)?
2. Please describe how is the return on investment (both qualitative and quantitative aspects) evaluated for IT development projects and follow-up projects in your administrative field?
3. Do you conduct analyses for assessing RoI?
4. Does the process and form of analysing RoI depend on the source of funding?
5. If and who do you are involved/included when evaluating the possible return on investments of a project?
6. What components or metrics are viewed when evaluating RoI?
7. In your opinion how important are the following aspects and what are the relations between them:
   a. Ease of use for users/user-centricity
   b. Ease of use for your employees
   c. Costs of maintenance and operations
   d. Sustainability of the technological platform
   e. The compliance of the project with the strategies of the agency
   f. The compliance of the project with the strategies of the state
   g. Deadlines
8. What methods to you use for implementing RoI assessment?

9. Do the estimates include possible follow-up projects and developments as well as maintenance costs?

10. Do you execute RoI assessments during the development process? (…) during the maintenance period? (…) periodically?

11. How do you evaluate the validity of ex-ante assessments?

12. Have you had projects funded from the structural funds? How do you evaluate their application system and RoI evaluation compared to your agencies practices?

13. Have you had projects where the final result of the assessment is that the costs are higher than the benefits?

National strategies

1. Do you have any international cooperation projects?

2. If and how are the citizens included into the protection and usage of their data?

3. How is the update of technological platforms arranged in your administrative field?

4. How have you arranged data storage in your administrative field? Are you involved/aware of the project of data embassies?

5. Are any of your services or information systems involved with the e-residency project?

6. Are any of your services or information systems involved with the open-data project?