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TRUST TOWARDS SERVICES OF E-GOVERNMENT

Master's thesis

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Author's declaration of originality

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

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16.05.2016

signed digitally

Abstract

Trust is an important aspect in any human interaction. E-services are one medium of providing public services the citizens. The research wants to validate the assumption that Estonian e-services are used because they are trusted. The aim of the thesis is to study two different points of views: on one hand what is considered trustworthy from the citizen's point of view (from outside in) and on the contrary what is being done on the institutional level to build trust (from inside out).The author will examine different measures of building trust in Estonian public sector and view different theoretical backgrounds to conduct empirical research using qualitative and quantitative research methodologies.

This thesis is written in English and is 105 pages long, including 4 chapters, 11 figures and 8 tables.

List of abbreviations and terms

B2B	Business to business
B2G	Business to government
CERT	Computer emergency response team
EC	European Commission
eID	Electronic identification
eIDAS	Regulation (EU) N°910/2014
EU	European Union
G2G	Government to government
ICT	Information and communication technology
IS	Information system
ISKE	Three-level IT baseline security system
IT	Information Technology Department of Information Society Services Development
ITAO	in MKM
ITIL	Information technology infrastructure library Information Technology Centre of the Ministry of the
KEMIT	Environment
MKM	Ministry of Economic Affairs
MS	Microsoft
OECD	Organisation for Economic Co-operation and Development
OS	Operating system
PKI	Public Key Infrastructure
PPA	Police and Border Guard
RIA	State Information System Authority
RIHA	Catalogue for the state's information system
RIK	Centre of Registers and Information Systems Information Technology Centre of the Ministry of the
RMIT	Finance
SiM	Ministry of Interior
SLA	Service Level Agreement Information Technology Centre of the Ministry of the
SMIT	Interior
TJA	Technical Regulatory Authority
UN	United Nations
UNDP	United Nations Department of Public Administration

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1 Introduction and field of research

Trust has interested researchers during the history in many different disciplines from psychology to economics, politics, and sociology. Various frameworks in a different context have presented diverse outcomes; however, there is a universal opinion across fields: trust is a critical component in any form of interaction. Technology is taking noticeable effect in our daily lives by providing a novel, quicker and smarter ways to connect; therefore trust becomes a point of interest in information and communication technology (ICT) field as well. As a consequence interactions between people and information technology are becoming more prominent in the context of state governance as well.

Many governments are focusing on merging public services and information and communication technologies to foster a higher level of general well-being. The service-oriented approach is being implemented across the world, European Union (EU) and Estonia as well. Estonia is considered a piloting country and society in implementing electronic services (e-services), therefore, is often brought as an example of e-state success-story.

The aim of the thesis is to study two different points of views: on one hand what is being done on the institutional level to build trust and on the contrary what is considered trustworthy from the citizen's point of view. Current thesis focuses on studying trust in relation to government e-services, although trust might be affected by numerous aspects.

In regard to connecting state governance, public services, and ICT it is important to have in mind that state must always be trustworthy in its actions, reliable and provide security to its population. Therefore, a rather often used phrase in the context of e-services and information systems (IS) comes to mind: "Security by design" – which means that the systems built ought to be secure by default, nevertheless the discussion about what exactly is a secure design remains the topic of many debates. So far as there is no reliable artificial intelligence established, computers, IS, databases, e-services are

created by humans who are prone to make various errors – therefore the risk of miscalculation in coding or logic might occur in the technological outcome as well.

Nonetheless, humankind is evolving through its curiosity and knowledge learned along the experiments. Estonian society has had a varied historical background, but in the current century, Estonia is viewed and presented as an experimental environment where implementation of public e-services has been rapid and fruitful.

The first chapter will make an introduction to general definitions, relevance and Estonian context in greater details. The second chapter will focus on the Estonian institutional requirements and measures in building trust in people for using ICT in the public sector. In the third chapter the author will describe the theoretical backgrounds on how trust, e-services, and e-government have been previously studied; based on the research done proposes a model for conducting a field research with two focus groups: experts and end users. The fourth chapter will present the empirical research on trust using Estonian state e-services, describe the methodologies and sample descriptions, results of analysis and implications.

1.1 Definitions

To talk about e-services and trust aspects, the Estonian context, different governmental measures to build trust and theoretical background the main definitions must be explained. Therefore, from the thesis perspective, relevant explanations are listed and explained below.

Trust is in the focus of the current thesis from the e-service perspective. As trust has been studied across many fields, there are many different definitions as well. For example, Lynne G. Zucker states the following: “From a sociological perspective, trust is defined as a set of expectations shared by all those involved in exchange.” (G.Zucker, 1.05.2016) Piotr Sztompka suggests in his book that Trust consists of belief and commitment components, therefore, is closely related to risk, because believing something will happen does not necessarily mean it will, therefore belief is a gamble (Sztompka, 1999). Edward Lorenz states from the economic viewpoint that trust can be defined as the judgement one makes by one's past interactions with others that they will pursue to act in ways that favour one's interests, rather than hurt them, in conditions that persist to be defined. Trusting conclusions certainly remain tentative, rather than certain,

since they are based on a limited knowledge of others rather than a precise calculation of their interests (Lorenz, 1999). Or an organizational perspective by which trust is “the willingness of a party to be exposed to the activities of another party based on the belief that the other will perform a particular action important to the trustor (F. David Schoorman, 2007).

Trustworthiness – something or someone deserving trust or confidence; being dependable; reliable (Dictionary.com, 28.02.2016).

Trust service definition according to eIDAS article 3 paragraphs 16 in an electronic service normally provided for remuneration which consists of one of the following:

- 1) the creation, verification, and validation of electronic signatures, electronic seals or electronic time stamps, electronic registered delivery services and certificates related to these services, or
- 2) the creation, verification and validation of certificates for website authentication; or
- 3) the preservation of electronic signatures, seals or certificates related to those services; (Official Journal of the European Union, 1.05.2016)

Integrity by definition of Oxford dictionary is the quality of being honest and having strong moral principles, also the state of being whole and undivided (Oxford University, 2005). According to OECD integrity refers to the application of values, principles and norms in the daily operations of public sector organisations (OECD, 1.05.2016).

Security – activities to protect someone or something (Oxford University, 2005). Therefore, cyber security is the protection of hardware, software, information from misuse and disruption.

The institution is a large, prestigious organization that has a particular purpose (Oxford University, 2005).

Agent defined by Oxford Dictionary as a person or a thing that does an action or has a substantial effect on the situation (Oxford University, 2005).

An end user is a person who is using information system or information received from information system (e-teatmik, 9.04.2016).

Expert(s) in the current thesis are the individuals or representatives from the organizations that are the owners, developers of Estonian public e-services.

The government is a system or a group of persons with the authority to regulate, govern and control a state (Oxford University, 2005).

Governance is about societies developing ways of making decisions regarding common problems, thereby creating norms, rules, and institutions states Marc Hufty (Hufty, 9.04.2016).

E-government – OECD e-government project team defines as the use of information and communication technologies, and particularly the Internet, as a tool to achieve better government (OECD, 9.04.2016). The reasons to use information and communication technology (ICT) in government are to improve the efficiency of government outcome(s), service quality and improve the overall trust relationship. E-government improves information flows and encourages active participation by citizens. Therefore, it is increasingly seen as a valuable tool for building trust between governments and citizens.

E-democracy viewed by e-Governance Academy is e-voting, e-participation, and exchange of e-democracy experiences on an international level (EGA, 8.04.2016).

E-services defined in Handbook for e-service design is Internet environment, where the user is identified and provided with services in electronic environment, for example, see or forward data (MKM ITAO, RIA, Road Administration, 9.04.2016). E-teatmik specifies that e-services are provided through websites and different appliances with microchips (TV, smartphone, car dashboard, etc.), whereas the person or software must initiate some services, others work in the background without human interference (e-teatmik, 9.04.2016). The focus of the current thesis is Estonian state e-service(s), therefore, **e-service(s) in the present thesis are public services provided electronically** (e.g. through www.eesti.ee) **and where the end user authenticates oneself** (with ID-card, mobile-ID, digi-ID, residence permit or e-resident's Digi-ID).

State e-service or **government e-service** in the current paper are used as synonyms and carry the meaning of e-services which are provided by the public sector, or government and usage require electronic identification using ID-card, mobile-ID, digi-ID, e-residency card or residence permit.

Commercial e-service in the current paper is used to refer to e-service provided by the private sector companies or organizations.

In current paper **trust in e-government** is equal to **trust in state e-services**, because e-government is executed through state e-services and state e-self-services.

E-self-service or web self-service is defined as a type of electronic support that allows employees and customers to access information perform routine tasks over the Internet without the need for any interaction with a representative of an enterprise

(SearchCRM.com, 9.04.2016). In the context of the current thesis, the author uses this term to refer to governmental e-self-service platforms such as www.eesti.ee, www.mnt.ee, www.emta.ee or other, through which citizen can access and use state e-services.

1.2 Relevance

Living in the 21st century, we have witnessed a mighty change of the world we live in. By this, I consider from industrial revolution about a century ago, when Henry Ford introduced assembly line production, to everything going digital. Let me bring just a few examples that have already changed our daily lives in a way modern person would miss out on the personal, professional, social and political level. The following list is to give a general estimation, therefore, listed not in order of importance: Internet, Google, Skype, 3D printer and everything being smart including phones, cars, houses and the list goes on. We live in the society where we are dependent on technological artefacts.

The quote from the Independent on 5th of May 2015 (McRae, 9.04.2016) on Facebook, Airbnb, Uber, and the unstoppable rise of the content non-generators: *“The world’s largest taxi firm, Uber, owns no cars. The world’s most popular media company, Facebook, creates no content. The world’s most valuable retailer, Alibaba, carries no stock. And the world’s largest accommodation provider, Airbnb, owns no property. Something big is going on.”* And ends with a final thought: *“is this not much more important than the little matter of who forms our next government?”*

Indeed, debates are held on the topic, which should constitute next government. However, I find it is much more important to ask how the formed governments around the world deal with technological and digital changes and how governments continue to create value for their citizens in the changed world of digitally networked world? To follow up on this question I focus on Estonian experience and take a closer look at how Estonian government has made decisions to use technology as an opportunity in state governance and how citizens have adopted the changes. Without a doubt – trust – has been an important component in these changes. Different researchers argue that the society we live in today can be described as a volatile, unpredictable and rapidly changing environment. Therefore, the important question arises: how to maintain sustainability of the society and collaboration between individuals in this vague

situation, where data is considered the oil of our age; networks might be more valuable than the enterprises; or where artificial intelligence might be the biggest breakthrough of society and at the same time the greatest threat to humankind.

The topic is relevant because Estonia has the experience of using e-services for last 20 years. A notable example is “Riigi Teataja”, which publishes consolidated Estonian legislation on The Internet from 1997 and in 2010 the paper print was terminated. Therefore, Internet environment State Gazette (www.riigiteataja.ee) is the primary source for valid Estonian law. This is just one example of Estonian favorable result to use e-service.

Many countries have tried to implement e-government services, but they have not been taken into such an extensive usage as in Estonia. Therefore, elaborating the idea if e-services are highly used they should be trusted regarding security as well. As a result, the question is raised, do Estonians trust their state e-services and why? What are the fundamental components for building confidence in an e-state? To the knowledge of the author of current thesis such research has never been carried out in Estonia. Also trust is vital for any governmental service because this is a core component of society to take any service into daily usage especially e-services.

The primary goal of this thesis is to understand why Estonians trust e-services, what affects trust and how trust towards e-services can be increased. To answer the central question the following sub-questions are raised that the author of the thesis aims to solve and analyse:

- First is to validate the assumption: Are e-services incorporated into daily life and highly used, therefore, trusted by end users?
- Second, investigate what measures are considered trustworthy from the perspective of the end user and how are they implemented on an institutional level to build trust?

The central problem with the topic is to list the security measures (technical, procedural, organizational, communicative, etc.) on the corporate level and how are they perceived on the end user level. Which corporate requirements and measures contribute in the best way to increase trust towards e-services? Also, is there one or few individual elements that have stronger importance in building trust; or trust is formed as a result of a set of measures occurring simultaneously.

For research purposes, the thesis has two focus groups: experts and end users. The panel of experts is used to gain the understanding of what type of measures and activities are undertaken to build trust in e-services, whereas end users group is used to understand what aspects are important from the non-tech user perspective. **The aim of the thesis is to study two different points of views: on one hand what is considered trustworthy from the citizen's point of view (from outside in) and on the contrary what is being done on the institutional level to build trust (from inside out).**

From theoretical approaches, the thesis will use the perspective of previously developed sociological research among e-government service and security experts in the form of an interview and online survey among end users. Research methodology to study trust is based on Information system success model and Theoretical research model.

1.3 Estonian context

The following paragraph will give an outline of Estonia's development into a digital society. Furthermore, the author will introduce the scope and usage of public e-services and relation to trust. Trust is important in any format of interaction, the more in the context of computers, tablets and smartphones where the end user rarely comprehends the background of the ICT working principles.

Estonia is being referred to as e-society, Internet titan (Kingsley, 23.04.2016), and success story of e-government implementation in worldwide media. In fact, Estonia is used as a showcase example of successful implementation of e-solutions in the world. Furthermore, e-Government Benchmark Report 2015 states Estonia has 94% for the online availability, is a top performer in government operation transparency and cross-border online public services (European Commission, 2015 (23.04.2016)). UN E-Government Survey provides consistent information on E-Government Development which states that in 2004 Estonia was ranked 20th, whereas in 2014 leaped to 15 in ranking. These surveys provide proof of the continuous progress of Estonia in the e-government implementation (United Nations, 23.04.2016). In Global Information Technology Report 2015 the overall ranking of Estonia in the Networked Readiness Index is 22nd, 7th in Government success in ICT promotion, 5th in ICT use and government efficiency, and 1st in the category of laws relating to ICTs (World

Economic Forum, 4.04.2016). In order to reach these high rankings having trust is important on both institutional and end-user level.

Daniel Vaarik lists Estonian first landmarks in White Paper on Estonia's Digital Ideology (MKM, 23.04.2016): paperless e-cabinet sessions from 2000, followed by the launch of secure data exchange layer X-Road in 2001, beginning of issuing mandatory Estonian ID-card in 2002 as a required identification document (SK, 1.05.2016). Moreover, in 2005 world's first Internet voting took place in official elections which have been widely accepted in society because in last Parliamentary Elections in 2015 reliable 30% of the voters gave their vote online (Vabariigi Valmiskomisjon). To make Internet voting possible requires strong political will and trust in technology expert to provide a trustworthy and transparent system, whereas a great leap of faith from end users who lack the knowledge to understand all the technical aspects involved in the complex and sensitive government-citizen interaction format which are elections.

All the previously listed accomplishments have taken place thanks to several coincidences in Estonian history. For one, the regaining of independence in 1991 must be accounted as a starting point of many changes in Estonian daily life from politics to economics to society. The young state with young leaders had a difficult situation to tackle as rebuilding and managing a sovereign state was a costly endeavour. The opportunities to maintain the state were limited due to the size and economic situation in Estonia after the collapse of Soviet Union; therefore, the processes had to be optimized, and automated were possible. The technology was seen as the solution to many problems young state was facing. It was understood that for the changes to take place state must create a supporting legal environment. In short, Estonia had the political will to take the advantage of technological possibilities on a governmental level.

Jumping ahead in history two years before Estonia became a member of EU; in 2002, Estonia enforced EU Directive 1999/93/EC with Digital Signatures Act (Riigi teataja, 1.05.2016), which set the legal framework for mutual recognition between EU states for mutual recognition of digital signatures. According to EU Benchmark 2015, the key enabler of e-government was the successful (100%) implementation of Electronic Identity (European Commission, 2015 (23.04.2016)).

From this section, author of the thesis concludes that the Estonian citizens use the e-services. Therefore, the first hypothesis can be proposed below:

Hypothesis 1: Estonian state e-services are used because they are trusted.

2 Building trust and security in Estonia

2.1 Requirements and measures

Estonia has fostered significant developments in e-governance, and the outcome is that public e-services are widely used. It means both public and private sector see great value in e-services – the first being time and money saved on bureaucratic procedures as e-service are mostly accessible at any time and from any location provided that there are a computer and the Internet connection. The e-services are adopted due to the reason that they are accessible in a secure manner, meaning that e-services use safe and reliable authentication methods. The key in Estonian ICT policy has been the systematic development of the state information system and ensuring its security (MKM, 1.05.2016).

In the light of ICT development, Estonian Ministry of Economic Affairs (MKM) has conducted a national strategic document Digital Agenda 2020. It focuses on creating an environment that facilitates the use of ICT and the development of smart solutions in Estonia in general, whereas the ultimate goal is the well-being of people, increasing the economic competitiveness, and the efficiency of public administration. E-governance is being built around ICT tools which means operating in an ecosystem which is in a constant fast development. This ecosystem consists of a variety of actors starting from standardization organizations to hardware manufactories and software development facilities. To bring few examples of type changing factors in e-government are: standards evolve over years sometimes decades, new operating systems are launched yearly, new hardware gadgets are launched on a daily basis, software updates are done on the monthly or weekly basis. All these circumstances pose significant challenges to the state to keep up and running e-services in these changing environments (MKM, 1.05.2016).

To manage the world of ICT state must develop a set of requirements and measures to guarantee the citizens continued access to e-services. Estonia has built up and followed following principles of information policy:

- distributed service-oriented architecture,
- appropriate security of data and data exchange,

- web-based solutions,
- orientation towards e-services,
- use of secure authentication tools.

It is important to point out that the basic infrastructure of Estonian state information system: X-road, public key infrastructure and eID, document exchange centre and state portal eesti.ee – have provided that the improvement of public e-services is flexible and fast. However, the state must continue development and renew components to provide the security of usage to its citizen (MKM, 1.05.2016).

United Nations Department of Public Administration (UNDP) proposes two closely related meanings for public administration (UN, 2006 (1.05.2016)):

- (a) The aggregate machinery (policies, rules, procedures, systems, organizational structures, personnel and so forth) funded by the State budget and in charge of the management and direction of the affairs of the executive government, and its interaction with other stakeholders in the state, society, and external environment;
- (b) The management and implementation of the whole set of government activities dealing with the implementation of laws, regulations and decisions of the government and the management related to the provision of public services.

The essence of these meanings is executive government interactions with its stakeholder and management of implementations of its activities. In general stakeholders of the state can be divided into two: citizens and organizations. Looking at it more precisely it means government to employees, entrepreneurs, government officials or in the case of organizations to companies, non-governmental organisations or agencies. Therefore, in the current chapter interactions of different stakeholders will be examined in the paragraph of administration measures. The other side is the management of state activities which will be viewed under the section of organization criteria. Nonetheless, the medium of contact with stakeholders is important to examine as well because any interaction takes place in some format of communication. Therefore, it will be briefly studied in the last paragraph of the communication measures. Figure 1 below illustrates the interaction between the stakeholder(s) and state which must generate reciprocal trust.

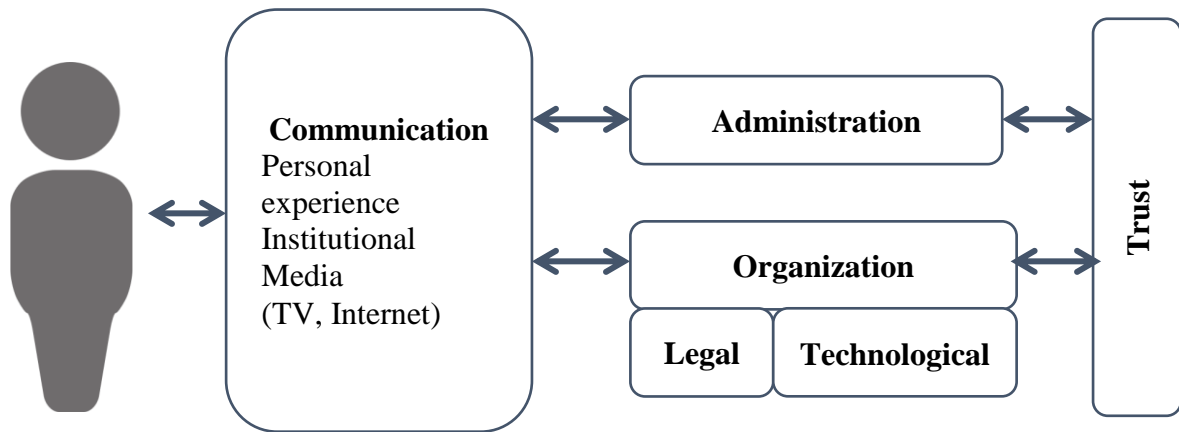


Figure 1 Government interaction with the stakeholder by the author.

Communication between the citizen and the state must entail some medium for interaction for example TV, The Internet, education or other to make the public aware of the public e-services provided. However, provided e-services can be addressed as a final product (or service). Which is given by the state and the government must give the management to provide these end goods and services to the general public, citizens and organizations for which purposes the state must organize the administration and the organization of provision likewise of and other public good artefact. In the following paragraphs administration, communication, organizational including legal and technological measures will be examined in greater details.

2.1.1 Administration measures

In the current section, the author will focus on state interactions with its different interest groups or stakeholders, such as other governmental agencies, citizens and businesses. The author of the thesis has presented different interest groups in the following Table 1.

Table 1 Government and stakeholders by Anna Mõtlik

Abbreviation	Government interaction	Examples of e-services or components of IS infrastructure
G2G	government to government	eID, X-Road, RIHA, different registries and databases. E-services between state information systems.
G2C	government to citizen	Tiger leap, Digital Agenda 2020
G2B	government to business	Electronic bills (E-arved), electronic tax declaration, Estonian and European e-

		business registries, e-Residency.
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2.1.1.1 G2G – government to government

The extended use of ICT in governmental agencies became more evident in 1990 which for Estonia was an important turning point as well due to the collapse of the Soviet Union and regaining of independence for the Republic of Estonian. For example, United States of America launched in 1993 the Clinton-Gore Administration's initiative to create an administration that "works better, costs less, and gets results Americans care about". Over the 5-year period, it had remarkable accomplishments such as federal civilian workforce cuts by 351,000, recommended \$177 billion in savings and most importantly, public trust in the federal government is finally increasing after a 30-year decline (Kamensky, 1999).

In the early nineties, the state faced significant challenges to managing governmental activities because it was in deficit of financial resources. However, the state was governed by young politicians who saw an opportunity in technology which leads to ambitious goals. One example is a paperless government which was implemented in 2000 and means that government meetings are held with electronic information system – the idea came from former Prime Minister of Estonia Mart Laar. This system provided more efficient meetings instead of 2 hours now the meetings take 30 minutes on average. Or another example is a statewide Internet accessibility which meant all public libraries even small municipalities were equipped with computers and the Internet. At the same time, ICT was implemented in various fields of governmental agencies by restructuring and automatization. As a consequence, some departments became obsolescent whereas, new sub-agencies were established such as RIA, RIK, KEMIT, RMIT, SMIT, etc. which deal with development and management of state information systems.

The Estonian Information System Authority (from now on RIA) coordinates the development and administration of the national information system, such as X-road, eID, RIHA, eesti.ee and CERT (RIA, 1.05.2016), the listed components will be viewed in greater details under the technology paragraph. However, it is important to note RIHA's function. RIHA is an administration system for the state information system which means that it has two primary purposes. First is to serve as a catalogue of the

state information system, databases, information collected, services connected to x-road lists the reusable components. And secondly, RIHA records the use of information systems and databases, register services, connectivity with x-road and administer the reusable components such as XML assets, classifications, dictionaries and ontologies (RIA, 24.04.2016).

The Centre of Registers and Information Systems (from now on RIK) develops and administrates many information systems. The list is following: the e-Business Register, the e-Notary system, the e-Land Register, the information system of courts, the Probation Supervision Register, the Prisoners Register, the Criminal Records Database, the e-File, the electronic State Gazette, etc. (RIK, 24.04.2016). The Information Technology Centre of the Ministry of the Environment (from now on KEMIT) administrates and develops information and communication systems of the Ministry of the Environment (KEMIT, 24.04.2016). The Information Technology Centre of the Ministry of the Finance (from now on RMIT) administrates and develops Information and communication systems of the Ministry of the Finance (RMIT, 1.05.2016). The Information Technology Centre of the Ministry of the Interior (from now on SMIT) administrates and develops information and communication systems of the Ministry of the Interior (SMIT, 1.05.2016).

As the architecture of Estonian Information System is decentralized all the ministries administrate the development and management of their internal information systems which must be by the Estonian Interoperability Framework (MKM, 1.05.2016).

2.1.1.2 G2C – government to citizen

Estonia is often referred to as information society because all the transactions citizen needs to have with the state can be done electronically, with only a few exceptions: ownership property transactions (such as selling or buying) and getting married.

MKM is responsible for the overall development of public services, standardisation, the establishment of a user-friendly service environment, electronic communication, cyber security and increasing citizen's awareness about the opportunities and threats existing while using the Internet.

Their goal is to raise the awareness of people and officials of the services available and their satisfaction with such services. Connecting the electronic records management facility to the provision of services helps to develop automated handling and procedural processes fully, improve reporting, increase transparency and ensure the safekeeping of

materials, kept on any media, and their value as evidence, for a specified term in time (MKM, 1.05.2016).

Tiger Leap project which took off in 1996 is an important landmark in development because it began to prioritize Information Technology infrastructure, by connecting educational institutes to computers and Internet access. The efforts laid a seed of technology-savvy skills among Estonia's citizens. The project remains active until this day creating a sustainable and healthy lifecycle of IT industry. Meanwhile, the private sector driven by banks had introduced online services that were ahead of the rest of the world and entrepreneurs developed smart innovations like M-Parking and location-based services (e-Estonia.com, 1.05.2016).

According to the 2012 survey results on MKM webpage, 76% of entrepreneurs and 67% of regular citizens expressed their satisfaction with the e-services, stating that public e-services help them to save both time and money and, in general, persons are content with the public services (MKM, 1.05.2016). To mention the few most commonly used platforms for e-services are Estonian state portal eesti.ee, digilugu.ee that presents the medical history of the person. And www.mnt.ee self-service portal where citizens conduct transactions with their vehicles and driver's license related services; and of course electronic tax authority with electronic tax declaration service which was among the first Estonian public e-services whereas today above 90% of personal income taxes and 98% of the customs taxes are declared online (RIA, 1.05.2016).

2.1.1.3 G2B – government to business

Estonian authorities have put great emphasis to support the ICT environment to provide e-services to the private sector as well. It is facilitated with state strategic decisions, also previously mentioned Tiger Leap program, but also such organizations as Enterprise Estonia and e-Estonia showroom which encourage and support local businesses in exporting the ICT knowledge, products and services cross-border. Estonian tech-savviness has provided few internationally well-known start-ups such as Skype in 2003, Fortumo 2007, Guardtime 2007, ZeroTurnaround 2008, GrabCAD 2009 and Transferwise 2011 (MKM, 23.04.2016).

The Estonian government has had high goals in supporting entrepreneurial environment, for example, one can establish a company in about 20 minutes, without ever leaving home (MKM, 1.05.2016). Or another goal of Estonian Ministry of Finance is to have all

the invoices between private and public sector in an electronic format by the end of the 2016 (Ministry of Finance, 1.05.2016).

In regards to supporting private sector Estonian government launched E-Residency program on 1st of December 2014, which is often referred to as managed like a state start-up. The project's goal is to have 10 million e-residents by 2025 (err.ee, 1.05.2016) who are given digital identity to administer the business online location-independently. E-resident's Digi-ID does not provide Estonian citizenship. However, the card enables secure and convenient digital services that facilitate credibility and trust online as the card holder can digitally sign documents, verify and authenticate oneself, establish a company in Estonia and conduct bank transactions from anywhere in the world (e-Estonia.com, 1.05.2016). By May 2016, there are nearly 10 000 e-Residents and approximately 1 000 companies are owned or have e-resident's engagement in them (EAS, 1.05.2016), which is estimated to bring tax returns to the Estonian economy.

2.1.1.4 Best practices - ITIL

ITIL – stands for Information technology infrastructure library and it is a framework, a source of best practice in service management. It is a process and service-oriented framework, where the business processes are mapped; in every stage roles are designated with relevant responsibilities, e.g. process owner, process manager, process practitioner, service owner. Also, RACI model is used to define the roles and responsibilities, whereas RACI acronym stands for stating who is responsible, accountable, consulted and informed (ITIL, 2011).

ITIL describes processes, procedures, tasks, and checklists which are not organization-specific, but rather can be implemented by an organization for forming integration with the organization's strategy, delivering value, and maintaining a minimum level of competency. It allows the institution to establish a baseline from which it can plan, implement, and measure. It is used to demonstrate compliance and to measure improvement. ITIL enhances the many different aspects which will not be further discussed under current thesis (ITIL, 2011).

2.1.2 Organisational measures

Under organizational measures, two important sub-measures must be viewed in greater details. The legal and technological measures are studied in the Estonian context in the paragraphs below.

Organizational measures on the state level are used support the everyday life of citizens and business environment. However, Estonia has been ranked rather highly on international levels. Therefore, something that is done is done well. According to the United Nations E-Government Survey 2014 e-government development index, Estonia is ranked 15th which is considered very high, therefore among leaders in e-government. It is stated that despite challenging times Estonia has increased ICT investments which can be attributed to their support for e-government implementation as an essential strategic tool to achieve wider public governance goals that support economic recovery and serve citizens. (United Nations, 23.04.2016)

MKM has issued a Green Paper on the Organisation of Public Services which describes the problems in the respective field, introduces the fundamental and the most important policy options, and suggests a possible solution. Their goal is to improve service quality on a broader scale. The goals for 2020 are that users of public services would study all the services offered in Estonia as being available, simple, non-burdensome, comprehensible, and transparent; moreover, all public service institutions could offer the services in a secure, efficient, and cost-effective manner (MKM, 1.05.2016).

Estonian Interoperability Framework considers information society as a service-oriented organization, which means actions done by officials, entrepreneurs, citizens and information systems are considered as services (MKM, 1.05.2016). And as previously stated under the Requirements and measures paragraph Estonia has a distributed or decentralized architecture, which means that authorities have their databases and information systems which are interconnected. If the state collects public information about its citizens it should be accessible to other jurisdictions as well – meaning the person does not have to provide the same information to all the state authorities separately.

Estonian information system is built on the following pillars: Digital Identity, X-Road, and RIHA, which are administrated and developed by RIA.

- 1) **Digital identity** – this is where a person can authenticate themselves with ID-card, mobile-ID, residence permit, digi-ID or e-resident's Digi-ID. Estonia has a national Public Key Infrastructure (PKI). However, development and certification related services are bought from the private sector (SK¹). MKM coordinates the legislation and issuing the ID-cards is dealt with by Estonian Police and Boarder Guard (PPA) (RIA, 1.05.2016). ID-card is the mandatory national card which serves as the digital access Estonia's e-services. The chip on the card carries embedded files which use 2048-bit public key encryption and enable to use it as definitive proof of ID in an electronic environment (e-Estonia.com, 1.05.2016). By 1st of May 2016, there are 1 267 587 active ID-cards, 284 185 027 digital signatures given and 436 243 853 authentications (ID.ee, 1.05.2016).
- 2) **X-road** – this is a secure data exchange layer for information systems. It is a technological and organizational environment enabling a secure Internet-based data exchange amongst information systems (RIA, 1.05.2016). It connects state databases by allowing them to work together without creating a central database(s). All the Estonian e-solutions use multiple databases connected by X-Road. All outgoing data from the X-road is digitally signed and encrypted. All incoming data is authenticated and logged. It is designed with growth in mind, so it can scale up as new e-services emerge (e-Estonia.com, 1.05.2016).
- 3) **RIHA** is a catalogue for the state's information system and a procedural and administrative environment as mentioned previously under administrative measures.

2.1.2.1 Legislation measures

Under the current section, a broad overview will be given of legal actions which Estonia has undertaken to enforce e-governance. The relationship between trust and norm is often argued, whether it is “Trust based on Norms” or “Norms based on Trust.” Therefore, the legal measures are studied in the current thesis.

¹ Certification Centre with a legal name AS Sertifitseerimiskeskus (SK) is a private company founded and owned by Swedbank, SEB and Telia Eesti in 2001. SK issues certificates for authentication and digital signing to Estonian national identity documents (ID-card, Mobile-ID, Digi-ID, residence permit card and e-resident's Digi-ID). SK is listed in National Certification Register which creates a legal basis for the service it provides and for the implementation of digital signing in Estonia (SK, 1.05.2016).

The list has is gathered by investigating the websites of ministries and state agencies, but also as a result of browsing for electronic or digital reference from Estonian Official Journal Riigi Teataja. The legal acts and regulations listed are the ones who have the widest scope and impact of the Estonian e-government usage in electronic and digital means. The overview does not represent a complete list of legislation that governs e-government as it is not in the scope of current master's thesis. The ones listed are rather to give an overall understanding of how broad is the scope of implementing e-government in a decentralized manner. E-government measures are reflected in many legal acts due to the distributed information system. Therefore, ICT is considered as a tool to help the state enforce the state governance and provide the public good to the citizens.

Estonia has two main IS from legal perspective (Riigi Teataja, 1.05.2016):

- 1) Electronic Coordination System for Draft Legislation – which includes all the legislative drafts since 2003.
- 2) Estonian Official Journal Riigi Teataja – once an act becomes law it is published in the open legal library. Therefore, all Estonian laws are accessible from the www.riigiteataja.ee webpage.

The legal acts related to e-governance are represented in the following Table 2 List of relevant laws regarding e-government (Riigi teataja, 1.05.2016).

Table 2 List of relevant laws regarding e-government

Legal act	Passed	Notes
Identity Documents Act	1999	In force
Databases Act	2002	Repealed in 2006
Digital Signatures Act (DAS) based on EU Directive 1999/93/EC	2000	In force, but will be overruled by eIDAS Regulation.
Regulation (EU) N°910/2014 (eIDAS Regulation)	2014	In force, member states must fully implement by 2018.
Government of the Republic Regulation on Data exchange layer (X-Road)	2008	In force
Government Regulation on Administration	2008	In force

system for the state information system (RIHA)		
The Government Republic on Regulation on IT baseline security system ISKE	2004	In force
Public Information Act	2000	In force
Competition Act	2001	In force
Electronic Communications Act (ESS)	2004	In force
Personal Data Protection Act	2007	In force
Emergency Act	2009	currently revised in force until 30.06.2016
Government of the Republic Regulation on Procedure Rules of National Electoral Committee	2012	In force

2.1.2.1.1 eIDAS

The Regulation (EU) N°910/2014 also known as eIDAS Regulation is a legal act that regulates electronic identification and trust services for electronic transactions in the internal market of European Union. It was adopted on 23 July 2014 is considered as a landmark to provide a foreseeable regulatory environment to permit secure and seamless electronic exchanges between businesses, citizens, and public authorities. eIDAS ensures that people and businesses can use their national electronic identification schemes (eIDs) to enter public e-services in other EU countries where eIDs are offered, and creates a European internal market for electronic signatures, electronic seals, time stamp, electronic delivery service and website authentication (European Commission, 1.05.2016).

All member states must implement eIDAS by September 2018. Therefore, all Estonian public e-services must achieve in the time provided. Estonian digital signature is a qualified electronic signature; therefore, it has the same legal effect as a handwritten signature (European Parliament and of the Council, 1.05.2016).

2.1.2.2 Technology measures

Trust in using e-services can be affected by various factors; however this is the reason why it is important to study trust and the factors that influence building trust. In the following paragraph a general overview of the different aspects which must be considered while coordinating state IT. In modern society, we are surrendered by

different technological dimensions. Technical measures must be viewed together with organizational, legal and administrative measures.

Information and communication technology must be viewed on a wider scale than hardware and software. Which is because the measures in today's world could rather be referred as to a technological ecosystem as it consists of for example standards, legal and management frameworks, hardware manufacturers, software providers (e.g. OS, browsers, storage and platform providers, etc.) and service providers on different levels among the ones mentioned. This list is not the full scope of the ICT ecosystem, however, to provide a substantial overview of the general understanding to emphasise how wide the field is, the author has drawn the Figure number 2 below where most significant connections are drawn.

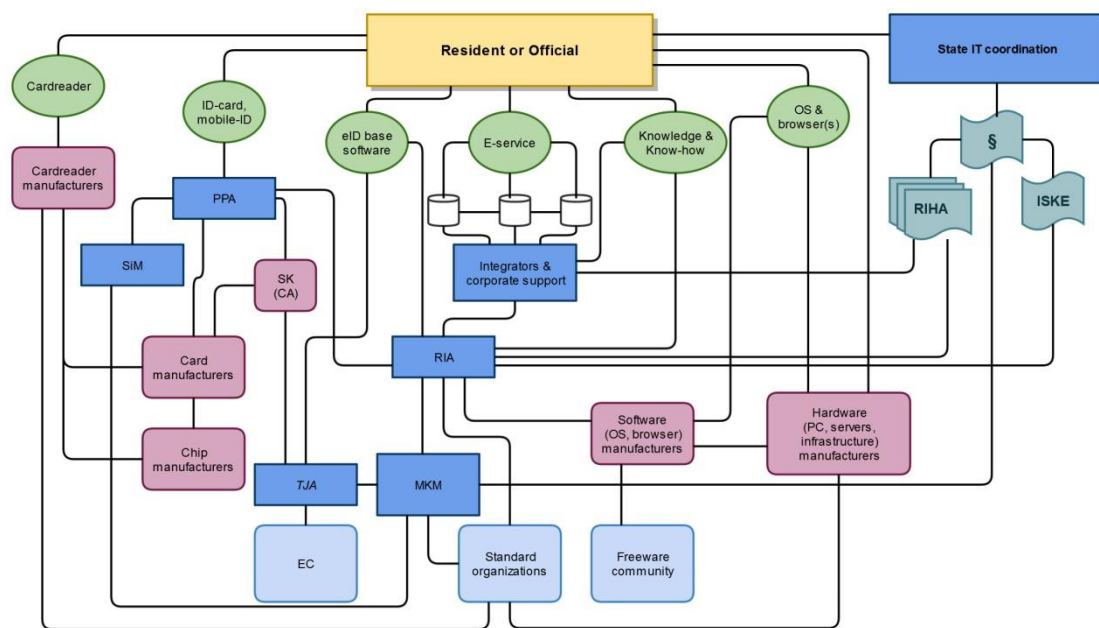


Figure 2 State IT eco-system by the author

The end user (as citizen or official) is represented in the yellow box, whereas the communication medium to interact with government is presented in green circles. Government bodies are represented with darker blue (ministries, authorities and state integrators or service providers) which are responsible for executing the legislation (described in grey). Light blue boxes are the international organizations or communities such as European Commission, organizations of different standards and freeware community. The private sector is represented in purple colour (different manufacturers and service providers).

2.1.2.2.1 ISKE

ISKE is a security standard, a three-level IT baseline security system which was developed based on German information security standard IT-Grundschutz. It is implemented to ensure a sufficient security level for the data processed in IT systems. The necessary security level is achieved by applying the standard organisational, infrastructural/physical and technical security measures. All Estonian government IT systems must apply ISKE by law since 2004, whereas in private sector vital service providers must implement either ISKE or ISO 27 000' family standards (RIA, 24.04.2016).

Every government IS, or database is assigned with a security level – L (low), M (medium), or H (high). It has three security sub-classes: availability; integrity, confidentiality. The security class is formed from the combination of security sub-classes (RIA, 24.04.2016).

ISKE defines threats (force major, organizational shortcomings, human errors, technical errors and defects, cyber-attacks), measures and guidelines for implementation. The owners of IS or databases should apply and revise ISKE as a continuing process. In Estonia, RIA is responsible for implementation and supervision of ISKE (RIA, 24.04.2016).

2.1.2.2.2 CERT

CERT stands for computer emergency response teams who handle security incidents. Such organizations are established worldwide, and they work in close cooperation by sharing information about information security incidents and give notifications about security hazards.

Estonian CERT was formed in 2006 and deals with security incidents that occur in Estonian networks (.ee computer systems), start there, or which have been notified by citizens or institutions either in Estonia or abroad. They handle incidents; give warnings about security gaps or attacks; provide support for system administrators, network administrators or customer support that the end users should contact in case of security incidents; and take preventive measures (media campaigns to raise awareness, etc.).

It is also important to add that Estonia has a Cyber Security Strategy 2014-2017 document which gives an overview of current situation in different sectors, provides the general trends in incidents and cyber risks which Estonian governmental IS/database

owners and CERT face on the daily basis. The document highlights important recent developments, evaluates threats to Estonia's cyber security and presents measures to manage risks (MKM, 1.05.2016).

2.1.3 Communication measures

In Estonia, the Government Office is responsible for developing aligned communication in the government, and their goal is to provide citizens with information about Government actions, policies and objectives as well as reasoning them in a neutral manner. Every government body is responsible for planning, organizing and evaluating the agency's communications. The head of the agency is responsible for creating a position of communications specialist or communications unit. (Government Office, 1.05.2016).

The Government Office has issued the Government Communication Handbook which provides a broad overview of about media relations, crisis communication, communication-related to national security and defence, European Union and international communication; also communication campaigns, government bodies and visual; and internal communication at public institutions (Government Office, 2011).

An important role in communicating Estonian e-state accomplishments to the world is e-Estonia Showroom, which is an executive briefing centre and an innovation hub whose focus is to introduce global policymakers, political leaders, corporate executives, investors and international media the success story of e-Estonia. They work in close collaboration with both the public and the private sector to satisfy the interests of mainly foreign delegation by tailoring the content of the briefing for the guests according to their needs. Therefore, they present the e-Estonia concept and acts as a coordinator between G2G, B2G, and B2B relations (e-Estonia.com, 1.05.2016).

The overviews of different measures discussed above provide the second hypothesis, which is:

Hypothesis 2: Government designs trustworthy e-services by combining administration, organizational, legal, technical and communication measures.

This concludes the second chapter. In order to build trust on public authority level different measures must be implemented on administrative, organizational, technical, legislative and communicative levels. Different aspects and purposes require specific measures which were discussed above.

3 Theoretical backgrounds

In this chapter, I will give an overview of the theoretical background, which includes related work and previous studies about trust. Trust has fascinated a variety of researchers from philosophy to economics and politics, due to the reason that it is considered a vital factor in most forms of human interaction.

3.1 Related work and previous studies

Although there are various studies conducted on trust the author of the thesis focused on the information technology, e-government, and e-services. Therefore, only the most relevant background findings are discussed below and listed in greater details in Table 2 under appendices. The table presents studies with their scope and connection towards building trust, also suggests the limitations of the particular theories or models regarding researching trust in using state e-services. Theories are listed in the format of the table to give a quick and coherent overview to secondary research performed to find the suitable model(s) to perform qualitative and quantitative analysis for the current thesis.

Several previous types of research on trust referred to Game theory for the assumption that trust must be based on something, for example, mutual or general net benefit (Myerson, 1997 (26.03.2016)). Game theory by definition is a study of mathematical models of conflict and cooperation between intelligent, rational decision-makers which provides general mathematic techniques for analysing situations where two or more stakeholders make decisions that will influence the welfare of another (Myerson, 1997 (26.03.2016)). However, it is limiting because people are prone to act upon emotions and are not always aware of all the possible information to make the mathematically calculated choice. Also, Game theory assumes continues action and monitoring over a longer period, which would exceed the volume of master's thesis research, therefore, is considered as background knowledge. Piotr Sztompka suggests his book that Trust consists of belief and commitment components, therefore, is closely related to risk, because believing something will happen does not necessarily mean it will (Sztompka, 1999). As a result, belief is a gamble (Sztompka, 1999). The theory focuses on

sociological aspects of trust, where he defines trust objects and functions but is limiting regarding technological issues.

Further research was needed to understand technical perspective. Agreement Technologies (Springler, 2013) states that a reliable trust measure includes three factors: prior knowledge, time (e.g. something has worked in the past) and context which is why somethings behave as they do, therefore, agent-based approaches have been studied. For example, trust verification agent, which entities that in the e-government security there are two types of factors. For one hard technologies factors (IT infrastructure, applications), soft management factors (policies, controls, regulations), and internal knowledge about actual security and e-government is merely an intermediate layer to communicate with external public (Rana Tassabehji, 2006 (1.05.2016)). No model was created nor tested in this study because it was concluded that established expert systems technology would be sufficient. However, artificial intelligence falls out of the scope of the current thesis.

Trust in the electronic environment has been studied rather extensively from a commercial viewpoint, which is limiting because the aim of the public sector is to generate public good whereas private sector intends to make a profit for the business owner(s). Nonetheless, there are several important connections which are important to be considered when studying trust towards state e-services. For example Generic Model of Trust for Electronic Commerce says that Trustor's transaction trust consist of two determinants: Threshold (risk and potential gain); and trust (in other party and trust in control mechanisms). It is pointed out that important are fulfilment, disposition, dependence and competence belief (Yao-Hua Tan, 28.04.2016). Familiarity and Trust Model on the example of Amazon.com focuses on the role of familiarity and trust in e-commerce and brings in the notion that one must have confidence in the online environment to conduct a purchase. They list five important dimensions: disposition of trust, familiarity, inquire, trust and purchase (Gefen, 28.04.2016). Another example studies the importance of the social presence of consumer trust in B2C e-commerce, where e-Trust consists of integrity, predictability, ability, benevolence; and is influenced by the social presence, trust disposition and familiarity (with the website), which as a result leads to purchase intention (W.Straub., 28.04.2016). Another study brings forth the following terms considering trust in Internet shopping: perceived competence, integrity, privacy and security control; and perceived risk (Christy Cheung,

2000 (28.04.2016)). The overview of different approaches is presented in under the appendixes 1.

3.2 Conceptual models

Previously discussed studies, researchers and models provided a variety of viewpoints to address trust and government e-services, however, did not give a one coherent model to be tested in Estonian context. Thanks to an empirical study on trust and electronic government success (Thompson S.H. Teo, 28.04.2016) the author of the current thesis came across with DeLone and McLean Information System success model (William H. DeLone E. R., 28.04.2016) based on which the theoretical approach was further developed. The authors contribution is merging two models which complement each other, from the technological side the IS success model and from the e-government side conceptualizing Citizen's Trust in e-government. The following chapter will give a detailed overview of both models.

3.2.1 DeLone and McLean IS success model

At the beginning of 1999, DeLone and McLean studied the definitions and corresponding measures of IS success which they classified in six categories and presented in a multidimensional model. Which inspired many researchers to validate the model which in turn motivated DeLone and McLean to evaluate contributions done over ten years, re-evaluate the model and present an updated IS success model in 2003, please see Figure 3 below.

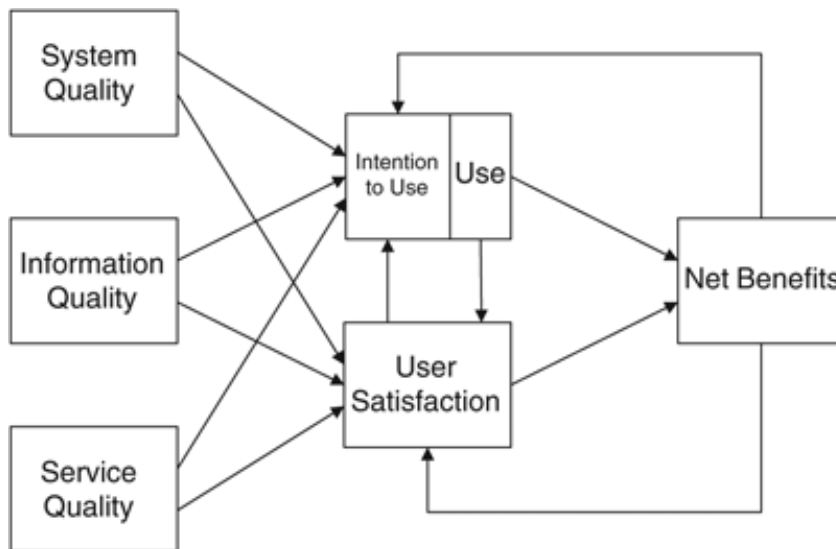


Figure 3 DeLone and McLean IS success model (William H. DeLone E. R., 28.04.2016)

The model should be interpreted as follows: a system can be evaluated regarding information, system, and service quality; these characteristics affect the following use or intention to use and user satisfaction. After using the system, certain benefits will be achieved. The net benefits (positive or negative) influence user satisfaction and the further use of the information system (William H. DeLone E. R., 28.04.2016).

The six dimensions of IS success model are explained as follows:

- 1) **System quality** measures the following characteristics in the Internet environment: usability, availability, reliability, adaptability, and response time (e.g., download time).
- 2) **Information quality** measures the content: IS should be personalized, complete, relevant, user-friendly, and secure if the end users are expected to initiate transactions via The Internet and continue using on a regular basis.
- 3) **Service quality** measures the overall support delivered by the service provider, and it applies regardless of whether this support is carried out by dedicated IS department, different organizational unit, or outsourced. Keywords in this dimension are assurance, empathy, and responsiveness. It is important because end users who have received poor user support will translate into lost users.
- 4) **Intention to use/use** measures everything from a visit to e-service, to navigation within the site, to information retrieval, to the execution of a transaction. Intention to start using and actual Use is presented for clarity reasons. Therefore, the keywords are nature of use, navigation patterns, some site visits and the number of the operations executed.

- 5) **(End) user satisfaction** is an important mean of measuring end user opinions of our e-service system, the greater the user satisfaction, the higher the probability that the user will continue to use the IS. Keywords in this dimension are repeat visits, repeat transactions and user surveys.
- 6) **Net benefits** are considered the most significant success measures as they capture the balance of positive and negative impacts. Net benefits measures must be determined by context and objectives for each investment. Net benefits as success measures are most important. However, they cannot be analysed and understood without previously mentioned system quality and information quality measurements. Several examples of different net benefits are presented as follows: Internet transaction saving end user's time and money. Benefits such as larger coverage of user groups, efficiencies growth, and user's responsiveness which yielded positive net benefits for the organization in general. Investments in electronic infrastructure yield in positive growth of the economy by the development of new industries and a larger variety of opportunities in education (William H. DeLone E. R., 28.04.2016).

The proposed model was initially designed to measure e-commerce system success, therefore, to research state e-services their success and trust, an e-government perspective must be included. It is derived from the following research model for conceptualising citizen's trust in e-government environment.

3.2.2 Research model for conceptualising Citizen's Trust in e-Government

The purpose of this study was to identify the factors that most likely affect citizen's trust in e-government and to propose an instrument to measure the theoretical constructs in proposed model. The theoretical research model is presented below in Figure 4 and followed by explanations of the factors.

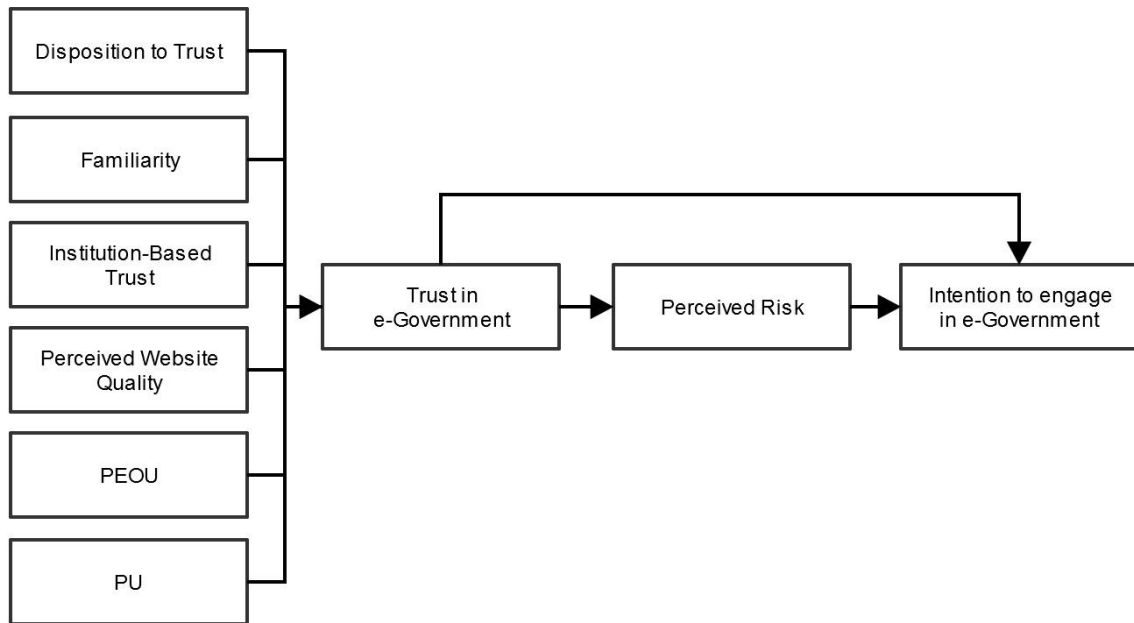


Figure 4 Theoretical research model (Hisham Alsaghier, 28.04.2016)

The study developed the following factors based on theoretical research:

- 1) **Disposition to trust** is citizens' general attitude towards trust and other people, their faith in humanity, well-meaning, dependability of others and general trust in society.
- 2) **Familiarity** is knowledge based on previous experience, interactions, education and understanding of what, where why and when is done. It is the notion that I have previously used it or seen how it is used; therefore, I trust how it works.
- 3) **Institution-based trust** is trust in governmental bodies and agencies, their structural assurance that provides situation normality in society.
- 4) **Perceived website quality** is how the website is presented and how easy it is to navigate there. This consists of two sub-factors:
 - a. **Perceived Usefulness (PU)** of the e-government website for the citizens.
 - b. **Perceived Ease of Use (PEOU)** – the ease of use of the e-government website.
- 5) **Trust in e-Government** – previously listed factors affect the trust in e-government and therefore the likelihood of citizen's intention to engage in e-government in general.
- 6) **Perceived Risk** – is citizen's opinion whether they find the website trustworthy or risky. These risks may include risks such as the possibility of network instability, online malware or other (Hisham Alsaghier, 28.04.2016).

3.2.3 Proposed research model by the author of the thesis

Examining different approaches and various studies listed in the Appendices Table 1 the author of the current thesis found that DeLone and McLean have made a remarkable contribution by examining e-commerce services and representing the usage of the updated model of IS success. Nevertheless, to conduct research on the trust in state e-services, the model has limitations as it does not take into account government as an institution and public service provider. Also the aspect of previous knowledge or familiarity of the end user with the IS(s) is missing and lastly, the aspect of risk is not represented on the model. However, it is evident in all Internet and network-related activities and transactions. These shortcomings became evident to the author while examining previous theoretical and empirical studies conveyed in the field of trust and e-government. Therefore, the existing model is developed further with Conceptual research model on Citizen's Trust in e-Government.

Five dimensions from Conceptual research model on Citizen's Trust in e-Government model are added to the model of IS success. Disposition to trust, familiarity, institution-based trust affects overall trust in e-government. Also, the notion of risk has been discussed in several previous studies; therefore, the contribution of the author of the thesis incorporates the relation between Trust in e-Government (with previously stated three elements) and Perceived Risk because they are important to be added to analyse e-government aspect in DeLone and McLean IS success model. Perceived website quality, perceived ease of usage and perceived usefulness are covered in greater detail in IS success model by information, system, and service quality dimensions, whereas intention to engage is covered by the intention to use/use dimensions. User satisfaction and net benefits are important factors in the IS success model because they define the reason for the usage and whether the user will continue or discontinue the usage.

As a result, two models are synthesized to complement the limitations of each model presented individually to conduct empirical the research on trust towards government e-services. Based on which the questions for qualitative and quantitative research are developed. The three vertical lanes represent the blocks which will be studied from institution point of view to build trust in e-services considering administrative, organizational (with technical and legal measures). Two models are shown in Figure 5 and are explained in the following paragraph.

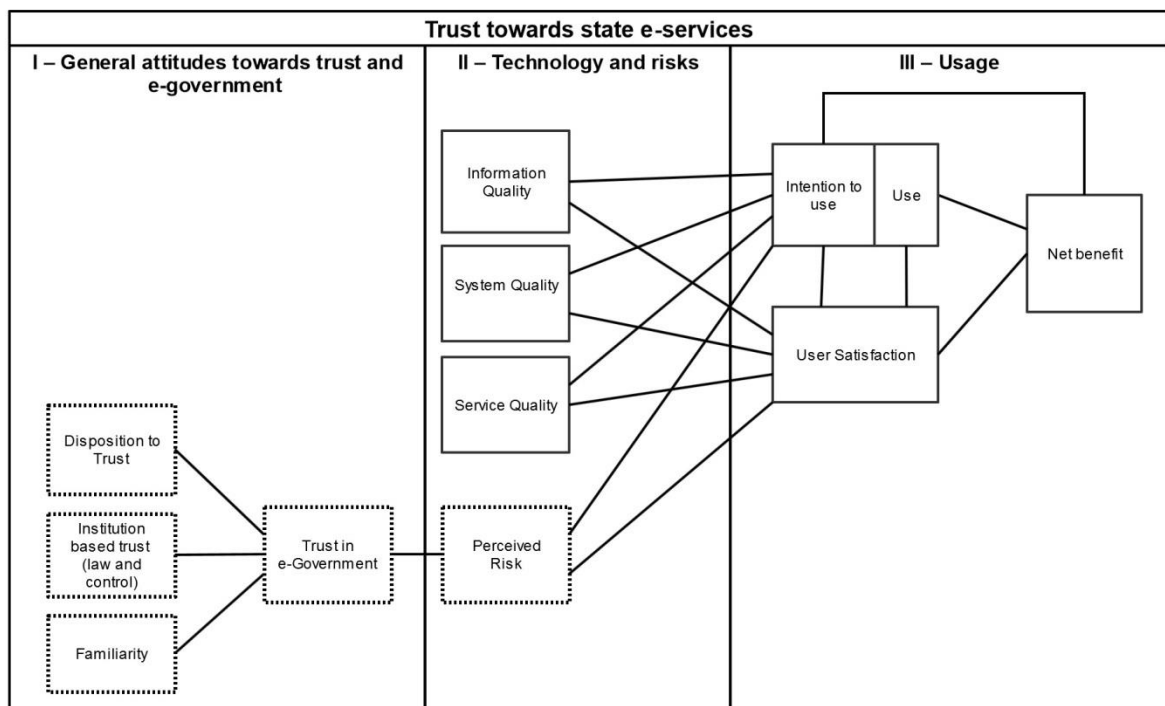


Figure 5 Trust in state e-services by the author of the thesis based on IS success model (William H. DeLone E. R., 28.04.2016) and theoretical model (Hisham Alsaghier, 28.04.2016).

3.2.3.1 Explanation of the proposed model

The proposed research model is divided into three main blocks. In the first block, there are dimensions which analyse general attitudes to trust and e-government. In the second block risks and technology dimensions are examined. The third block studies the usage point of view. The division of 3 blocks provides a higher level of generalization; therefore, this will be taken as the basis for developing qualitative research to understand the inside out perspective.

To have a better understanding of the proposed model an example scenario from end user perspective (outside in) is described as follows. Let's imagine a young mother who needs to register her newborn baby to receive social benefits she is entitled to by state law. Therefore, the goal of the mother is to receive child support in monetary value – we will call this net benefit which will be the reason to interact with the state and in an automated manner, i.e., interacts with government e-service.

First of all, it is important to view the ability of a person to trust in general (this might depend on the culture, welfare of society, well-being and economic environment). The

second factor is trust in institutions (this depends on the image and effectiveness of institutions to enforce state power and provide a public good for the citizens). And third, familiarity with technology, which depends on education and previous experiences related to technology (here is also considered the knowledge of legislation, etc.). All three factors affect the mother's perception and therefore trust in e-Government. If the person is trusting, familiar with using computers and smart gadgets, and trusts that government has his or her best interest in mind, then it is likely that the person trusts the e-government and is willing to interact in the format of an e-service.

Next, come in the picture the notion of Perceived risks in the technological environment. The person understands that while using a computer might convey risks (viruses, malware, spam, etc.), nonetheless the person is consciously accepting them and continuing the use for the convenience or other reasons.

From information system perspective it is also important that the information provided online is up-to-date, helpful, relevant and accessible for the person. At the same time it is important that the system quality is good as well, this means that the e-service platform is easy to use and understand, secure and reliable (i.e. it does not crash or freeze during the usage). Similarly important is also the service quality that the e-service provides, this includes the customer support (being helpful, supportive and responsive towards the person) and the fact that the expected service or product or in the case of our example child support is received in expected/promised timeframe.

Therefore, if the mother has previously experienced an e-service which provided relevant information, was easy and convenient to use or received needed customer support when required in other similar services. Then the person is likely to accept the risks of the online environment and lead to an intention to use e-services to apply for the child support as well. If the usage of the service brings expected net benefit the user is satisfied and is likely to continue using e-service and the system provides the expected gain, therefore, is trusted.

To conclude the chapter of theoretical background of previous studies and related works analysed to provide the third hypothesis, which is:

Hypothesis 3: End users trust is influenced by administration, organizational, legal, technological and communication measures.

4 Empirical research on trust using Estonian state e-services

The following chapter will firstly present the purpose of the empirical research with proposed hypothesis and derived research questions. Secondly, the quantitative and qualitative research methodologies will be explained with sample descriptions. Thirdly, the author will present the results of correlation analysis of the online survey with expert panel interview outcomes developed based on the proposed model presented at the end of the previous chapter 3. And fourthly, implications depending on the results of the analysis will be expressed.

4.1 Purpose of the research, hypothesis and research questions

The purpose of the empirical research on trust using Estonian government e-services is to understand whether and why the Estonian public e-services are trusted by citizens' and incorporated into the everyday life. Based on the Estonian context using e-services, measures on building trust and theoretical background the first hypothesis was proposed in the section 1.3 and the research questions are derived and presented below:

Hypothesis 1: Estonian state e-services are used because they are trusted.

- a) Is disposition to trust positively related to trust in e-government?
- b) Is perceived risk negatively related to intention to use/use; and End user satisfaction?
- c) Is Net benefit positively related to intention to use/use; and End user satisfaction?
- d) Is end user satisfaction positively related to intention to use/use?

Considering public e-services as a medium for interaction between government and its citizens the author of the thesis, on the one hand, wants to understand what are the measures of the government to provide citizens trustworthy public e-services. What is being done in the back-office to plan, develop, implement and maintain trustworthy e-services – i.e. the **view from inside out**? Whereas on the other hand, the author wants to understand how citizens perceive e-services from the trust aspect. In other words, what is the view of the citizens from behind the screen of a computer, smartphone or a tablet – i.e. the **view to e-services from outside in**, regarding trust? Therefore, the hypotheses

2 and 3 were proposed in sections 2.1.2 and 3.2.3, and the research questions are derived and presented below:

Hypothesis 2: Government designs trustworthy e-services by combining administrative, organizational, legal, technological and communication measures.

- e) What are the general attitudes and measures towards trust and e-government?
- f) What are the risk aspects and technology measures to build trust in e-governance?
- g) What is the dynamic of e-government services usage?

Hypothesis 3: End users trust is influenced by administration, organizational, legal, technological and communication measures.

- h) Is information quality positively related to intention to use/use; and user satisfaction?
- i) Is system quality positively related to intention to use/use; and user satisfaction?
- j) Is service quality positively related to intention to use/use; and user satisfaction?
- k) Is institution based trust positively related to trust in e-government?
- l) Is knowledge and familiarity with ICT solutions positively related to trust in e-government?
- m) Is perceived risk negatively related to trust in e-government?

4.2 Methodology and Sample Descriptions

To study the trust towards e-services both qualitative and quantitative research methods are in use. Qualitative research methodology was used to conduct the interviews with five experts from different IT institutions important from e-government perspective.

To understand the current situation of Estonian e-government and how different implementation measures are used are investigated under the chapter 2. The actions of building trust in Estonia are viewed from administration, organizational, legal, technological, and communication perspectives, as these are the main ways how the state executes the governmental power.

To conduct the empirical study in Estonia related works and previous studies will be examined under Chapter 3 Theoretical backgrounds. Based on the earlier studies the author of the thesis proposes a new model for investigating precisely Trust towards government e-services. Previous studies of the chosen models provide a broad range of

sample questions which are amended to fit the scope of the current thesis Trust towards government e-services. Based on the combined model proposed by the author, two sets of questionnaires are developed: one for the expert group to conduct qualitative research and second for end users to conduct quantitative research. Both research methodologies will be described in the following section.

4.2.1 Quantitative

4.2.1.1 Methodology

A quantitative method in the format of an online questionnaire was used to explain the end users perceptions. End user group consists of average e-service users or potential users. For them, the online questionnaire was conducted on the Surveygizmo.com online platform. The author tested several other platforms (Google Forms and SurveyMonkey). However, they did not meet the complexity the particular survey required on the visual and outcome criteria's.

The questionnaire had five blocks which derived from the proposed research model presented in the section 3.2.3. Four blocks had the questions about state e-services in Estonia, in 3 of which the end users were asked to rate their agreement with 44 statements on the 6-point Likert scale and one block of demographic questions. The questionnaire had two versions: one in Estonian and other in English, although the structure and the questions remained the same. The outcomes of interviews will be analysed in the section of 4.3. The questionnaire with division into blocks is added to the Appendices number 2. The example of research questionnaires can be found under Appendix 2 and 3.

4.2.1.2 Sample Description

Before the questionnaire was distributed it was tested by three persons from different socio demographic backgrounds. The questionnaire was distributed in a snowball sampling method¹ via email and Facebook to approximately 200 people during the period of 22nd April to 1st of May 2016. Snowball sampling method was used to reach the maximum amount of responses for a limited time. Facebook was used because it is

¹ The process of snowball sampling is much like asking your subjects to nominate another person with the same trait as your next subject. The researcher then observes the nominated subjects and continues in the same way until the obtaining sufficient number of subjects. (<https://explorable.com/snowball-sampling>)

one of the most accessible channels to the author to reach many personal contacts. During this period, there were 255 responses, 69 of which were partial (therefore not included in the outcome and analysis section) and 186 responses were complete which were used in the outcome and analysis section.

From 186 respondents 61,8% were women, and 38,2% were men, thus 115 females and 71 male. The age groups division was the following: 49,5 % were between the age of 19 to 29; 37,6 % were between the age 30 to 44; 9,7 % were between the age of 45 to 59 and 3,3 % were either under 18 or over 60 years. 93% of the respondents stated that their mother tongue was Estonian, 3,2 % Russian, and 3,7% Georgian, Ukrainian or English.

According to the Figure 6 below, 45% have Bachelor's, college or associate degree and 36% have Master's degree.

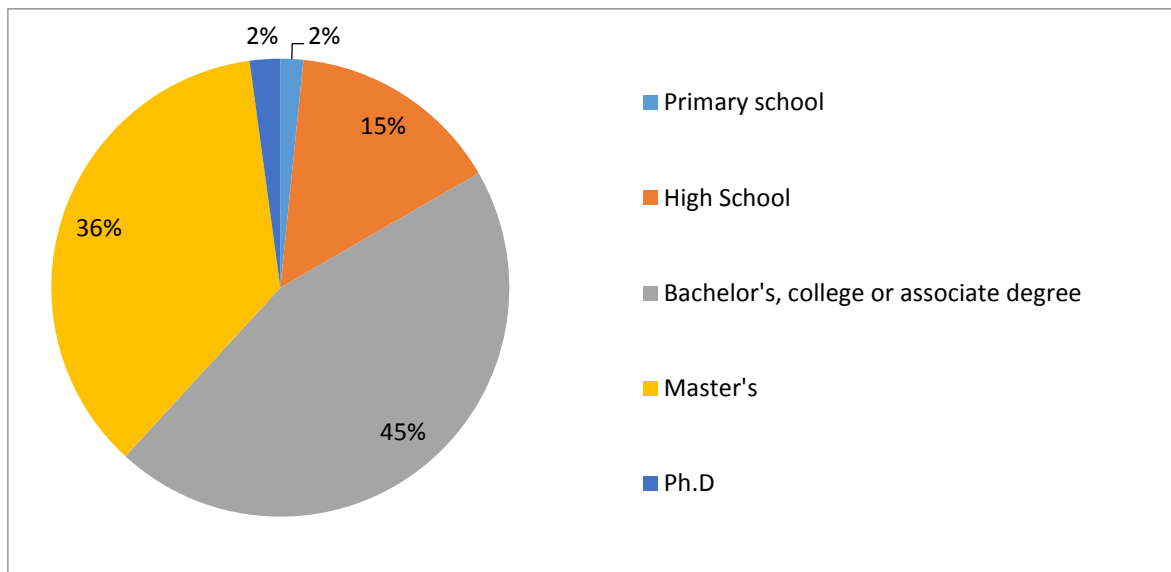


Figure 6 Highest level of completed education

The Table 3 shows the position or occupation and the percentage of total respondents. 109 stated that they were employees, 59 students, 26 entrepreneurs, 19 at home and 17 officials. In this question the respondent could state all the positions that they found applicable, meaning many were both students and/or employees, entrepreneurs or on parental leave, etc. in different variations. Employees were 58,6%, students were 31,7%, entrepreneurs were 14%, and either unemployed, house spouse or on parental leave were 10,2 of the respondents.

Table 3 Respondents' current position

	Frequency	Percent (%)
Employee	109	58,6
Student	59	31,7
Entrepreneur	26	14,0
Unemployed/ House spouse/ Parental leave	19	10,2
Public servant/Official	17	9,1
Self-employed	4	2,2
Retired	1	0,5

99,5 % of the respondents said that they have used Internet 6 or more years. Therefore, it can be concluded that the respondents are computer literate and/or tech-savvy, this can be due to the reason that questionnaire was distributed through email and social media. It is considered as a limitation in the research as it might not represent the all Estonian population.

The respondents are active users of Internet this can be concluded from the activities for which Internet is regularly used – in this question respondents could select all options that were applicable. Using The Internet for e-mails, reading news, social media, online shopping is regularly used over 95% (Figure 7).

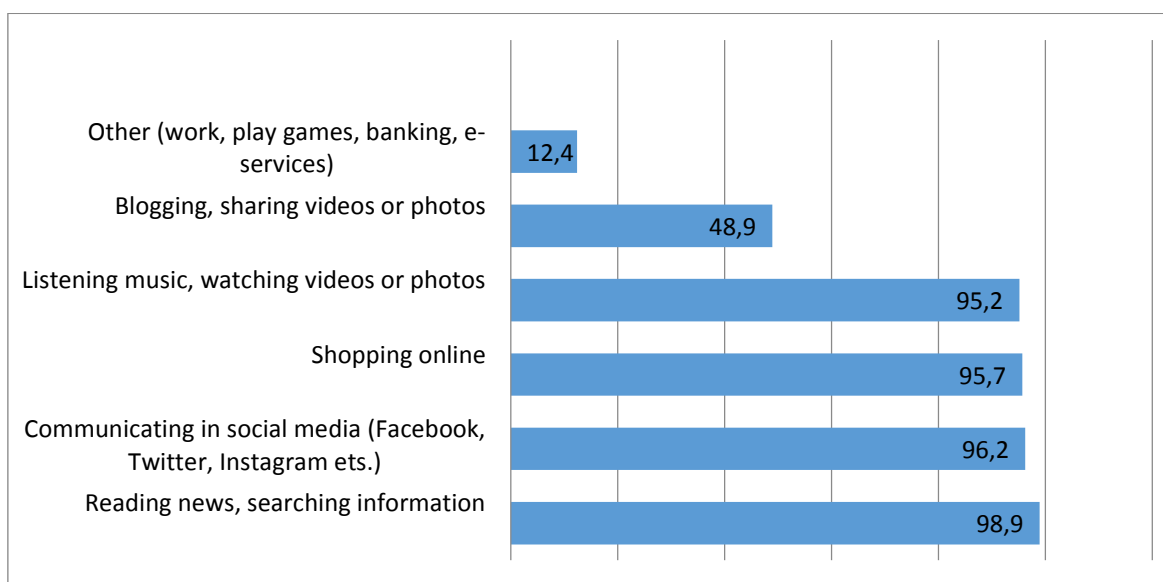


Figure 7 Respondent Internet usage activities for regular use (%)

97,3 % of the respondents access Internet from home or smartphone on a daily basis. 91,4% access Internet from work (including home office) on a daily basis; and 54% of the respondents access Internet at least once a month and 54,8% at least once a year from a public terminal (e.g. school, library, internet cafe).

The division among user’s computer platform preferences is shown in the pie chart below. 94% of the respondents use Windows, Android or Apple operating systems. It is pleasant that respondents are aware of the computing platform that they use as only 1% marked that the “Do not know” (Figure 8).

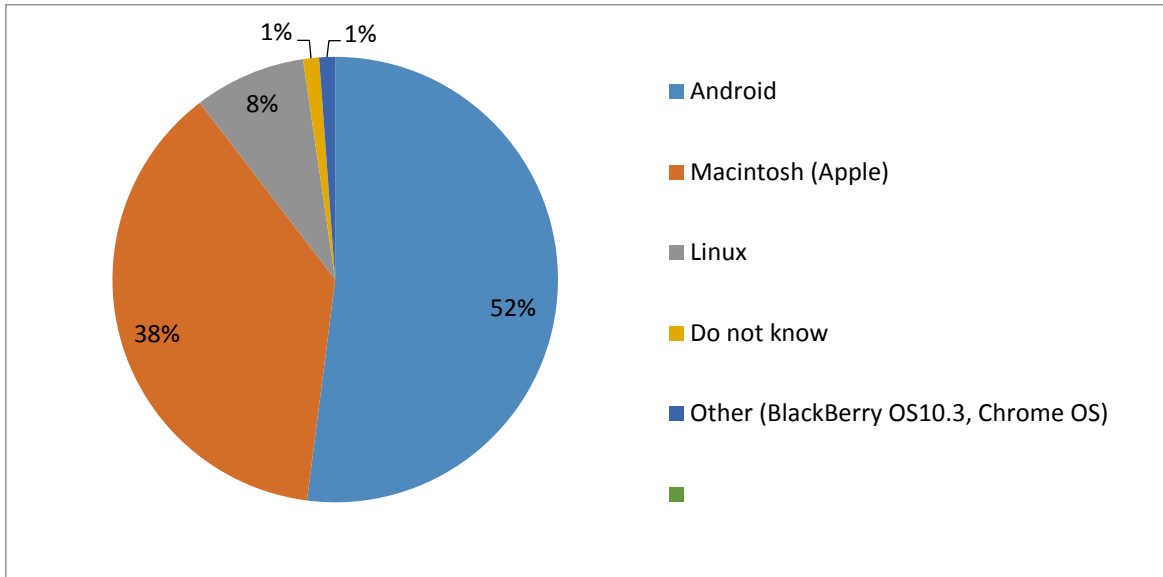


Figure 8 - Primary Platform

Sample included respondents from different socio demographic backgrounds. However, there were more females than men. In general the people who replied the questionnaire were well educated; majority had either Bachelor’s or Master’s degree. Also they had used internet over 4 year period and well aware of technical particularities which can be interpreted from the last pie chart.

4.2.2 Qualitative

4.2.2.1 Methodology

The interview questions were developed on the proposed model of the author. The interview was semi-structured and consisted of an introduction, three blocks of questions and summary. The three blocks of questions are listed below. Author prepared a set of questions with few additional questions in case of need to specify details, context or reasoning; depending on the institution and the pace of interview.

The panel of experts consisted of professionals who work actively in planning, analysing, developing and managing e-services provided by Estonian public sector or to government agencies, businesses or citizens. The goal of the interviews was to understand which measures are used by the institutions to build trust in their end users.

Interviews were held with the expert group participants from the planners, developers, and managers of well-known Estonian IT public sector institutions to understand the criteria used. The chosen organizations are in charge of most well-spread or most used Estonian e-services in the public sector.

The structure of the interviews and questions was developed based on the proposed model by the author at the end of chapter 3. Interviews were semi-structured in three main blocks: first general attitudes towards trust and e-government, second technology and risks, and third usage. The questions were taken from the previous empirical studies done (discussed under the section 3.2). They were slightly amended to fit the purpose and scope of the current thesis. The interview began with a short introduction which included an overview of the author, thesis scope, hypothesis and details about the course of the planned interview. The author of the thesis lead the discussion with questions, made notes and recorded all the interviews. The interviews were concluded with asking for additional comments and remarks and thanking for the time and answers.

The outcomes of interviews will be analysed in the section of 4.3. Data is analysed from an objectivist viewpoint which assumes that information about the social world could be analyzed to reveal reality or social structures beyonds the data itself (Marvasti, 2004). To analyze the outcomes the author first transcribed all the recordings (voice and notes), reread the answers and started to code the text by highlighting the recurring statements which could be described with particular keywords (e.g. ISKE, ITIL, SLA, Law, etc.) with a different color. Then the keywords, interviewee name, interview block numbers, question numbers and highlighted statements were entered into a table format. The keywords and expert statements are analysed under the section 4.3 and presented in italics and quotation marks. The example of research questions in English for expert panel can be found under Appendix 4.

4.2.2.2 Sample Description

The panel of experts consisted of 5 professionals who work in planning, analysing, developing and managing e-services provided by Estonian public sector or to government agencies, businesses, and citizens. To contact the experts' author used personal connections and suggestions of the supervisor. The interviews were settled via email, Skype or phone. Out of 10 contacts, a total of 6 interviews was held among the expert group. Out of 6 interviews, 1 was a pilot interview to test the model and the

questions, after which the main structure of the model and interview remained the same, but the wording was slightly amended for clarity purposes; however the answers of the pilot interview are not used in the outcome and analysis section. The expert group is presented in the Table 4 under the appendixes.

The experts were contacted, and the interviews were arranged through personal connections or supervisors' suggestions via email, Skype or phone. The interviews took place during one week period between 24th of April to 5th of May 2016. One interviewee requested the questions in advance, and one asked to revise the outcome interview draft before submission of the thesis, both were provided.

4.3 Results of analysis

In the current section, the author will present the results of quantitative research in the format of an online survey done among end users and qualitative research done in the form of interviews with the panel of experts. The methodologies used are described in the previous section 4.2.

To analyse online survey outcome of different dimensions Spearman's correlation analysis is used. Correlation is a statistical technique that shows whether and how strongly pairs of variables are related to one and other. Correlations might be positive (increase in one variable is associated with the growth of the other) or negative (increase in one variable is associated with a decrease of another) (Oxford, 1998). The closer the coefficients are to +1.0 or -1.0, the greater the strength of the relationship between these variables (0,7 to 1 represents a very strong relationship; 0,3 to 0,7 is moderate relationship and 0,0 to 0,3 is weak link (Osula, 2009/2010). Spearman's Rank-Order Correlations using SPSS Statistics were used because the questionnaire was built on an ordinal scale where respondents had to indicate their agreement on Likert scale 1 to 6 (Laerd statistics , 2013). Significance tests offer various levels of significance or confidence, meaning they state that particular statistical results would only occur by chance less than one in a thousand times (the 0,01 level represented with **) and less than one in twenty times (the 0,5 level described with *) (Oxford, 1998). The author of the thesis focuses on the ** correlation significant at the 0,01 level. For calculation relationships, analysis author used IBM SPSS Statistics version 24 software.

4.3.1 Disposition to trust – Trust in e-government

Under the dimension of Disposition to trust five questions were asked about citizens' general attitudes towards trust, in other people and their competences and well-meaning, dependability of others and general trust in society. Under the dimension of Trust in e-government, five questions were asked about peoples' attitude towards government e-services, their confidence in e-services and e-election and their willingness to interact with government using electronic services and therefore the likelihood of citizen's intention to engage in e-government in general.

To the statements about Disposition to trust 85,5% of the respondents agreed and none disagreed, whereas 87,8% of all the women and 81,7% of all the men agreed to these statements. 82,3% of the respondents agreed, and 2,2% disagreed with the statements about Trust in e-government, whereas 83,5% of all the women and 80,3% of all the men agreed to these statements.

The correlation between Disposition to trust and Trust in e-government is 0,471** which suggests that there is a positive relation. It means that if one raises then the other does too. The strongest relationship is between statements about Internet voting trustworthiness and security, which is 0,916**, it means I-voting security is considered as a synonym for trustworthiness. Very high correlations are also between trust in Estonian public e-services and specialists who develop e-services (0,647**); I-voting security (0,687**); and I-voting trustworthiness (0,687**). It can be assumed that security and trustworthiness are considered as synonyms. Correlation analysis shows that Disposition to trust is related to Trust in e-government, which means the most trusting people are in general, the more they tend to trust e-government solutions.

Expert interview outcomes provide insights to help explain the institutional view and activities in regards to **Disposition to Trust:**

Discussing what represents trust to e-government solutions, experts point out that “*E-services are used if their process works smoothly and without interruptions.*” Or “*Trust is first built with correct language, semantics, correct terminology (especially important in critical infrastructure, medicine or law) – should the IS or e-service fail at this point, any trust building ends there.*” And “*Citizens' have entrusted their data to the state, so they would be available only to the ones who should have the right to access them*” – these clauses indicate that **accountability** is one important keyword. It is important that

e-government solutions would provide **additional value**: “*E-service must be useful, adding value and be needed*” and the value can vary from money to time or convenience “*If the user gets additional value, either in money, or saved time which can also be measured in money.*” Therefore, useful e-services become habitual for the citizens “*Thanks to added value the using habit is being developed*”. Government e-services must provide both **technical** and **legal security** to the citizens’ and the officials suggest the following statements: “*Trust is security and integrity,*” “*Process integrity is important from the privacy aspect,*” “*Availability and integrity feed trust.*” Moreover “*Trust is built with legislation*” or “*IS are needed for the authority to conduct supervision they are obliged to by law*”, but then again “*There is a legal authority data protection inspectorate, which states the required conduct and does the supervision on data collection on the state level*”.

When asking about Estonian cultural, social and economic environment and whether it favours general trust in society interviewees foremost pointed out that **institution based trust** is an important component as it occurred in statements. For example “*Estonian state institutions are trusted*”, “*Police, Ambulance, Defence forces are highly trusted, therefore if the authority is trusted the services can be put into an electronic environment where they will also be trusted.*” Also suggesting that Estonian authorities are knowingly working on it “*The reputation of Estonian institutions is held high,*” “*The structural changes in organizations over years are reflected in organization culture(s) and better communication*”, but also “*State has not misused or abused the citizens’ trust.*” Also, they stated the importance of **communication** “*Communication is vital when building trust,*” “*Institutions must communicate what they do, why and how the end user is affected.*” And “*Institution activities must be transparent, and if there are problems/issues, they must be presented and explained to the public.*” Therefore “*Well-organized and trustworthy communication build trust*”. They also pointed out some **human** factors such as “*Estonian society and environment are uniquely favourable towards e-services*”, which comes from the goal-oriented mind set “*Estonians are goal and outcome oriented*” or “*A quote by A.H.Tammsaare is applicable for Estonians “Work and sweat, then love will come.”*” But also “*Estonian do not expect the worse unless there is a lot of bad publicity*”. What is more, Estonians feel that they have participated in **building the state** and **feel pride** in doing so

“Estonian history is rather short. Therefore, people consider rebuilding Estonia as a personal deed (good or bad),” “We made this country; we sang for its freedom.”

Expert panel interview outcomes provide insights to help explain the institutional view and activities in regards to **Trust in e-Government:**

When talking about what makes an e-service trustworthy the interviewees mentioned once again that it depends on the **context or need** *“Trustworthiness of an e-service is context based”* or *“If the context does not require then everything is trusted by default, otherwise trust but control.”* At times, there are already existing services or products that can be used *“Commercial services or freeware are used, depending on the particular need where it will be used”*, but then again some need in-house development *“Often trustworthy services/products cannot be outsourced; therefore they must be done in-house”*. The last statement brings another important notion of **control and audit** which *“If the context does not require then everything is trusted by default. Otherwise trust but control”*, *“Experience model usage – have been tried, has been worked - therefore, trusted”*, *“Trust is built if there are no incidents/issues/problems.”* Moreover *“Employees are checked against crime registers”*, *“Partners are audited,”* *“In-house audits are done”* and *“Internal and external attack-tests are done.”* Nevertheless, also, the legal aspect plays a role *“Legal implications are important in creating trustworthy e-services”*. Openly speaking about e-services the keyword **risk** occurs as well in statements such as *“Trustworthiness must be assessed with risks,”* *“Every risk is assigned to an owner, who decides measures for dealing, accepting or managing it”* and *“Risk analysis is regularly updated with stating the future revision date.”*

The main organizational action that institutions use to build or provide trustworthy e-services is through **conduct** it is supported with statements such as *“All services have owners”*, *“Security training, measures, conducts, guidelines, correct organizational structure, role-neutrality is implemented”*.

To answer which are the legal means that institutions use to build or provide trustworthy e-services the it was referred to different **legislations** *“Implementing EU legislation,”* *“Implementing Estonian local law,”* *“International agreements,”* *“Contracts with partners,”* *“State regulations for institutions, databases and codes of conduct.”* Furthermore, *“All authorities and institutions are governed by state laws”*, *“All relevant databases have state regulations (where requirements, ISKE classification and SLA is*

specified by business side)”, “*Legal aspects are dealt with by our dedicated layer (revision of acts and drafting amendments, etc.)*”. And yet again keyword is **conducted** arises “*Different procedural conducts and user manuals*” and due to the international eco-system of ICT private sector entities must be considered “*Big international players such Apple, MS, Google, etc. have their set of rules and regulations*”.

Also, it is important to point out the keyword **time** as an influencing factor “*Using IS and e-services over longer period creates trust*”, “*Trust is developed over time*”, “*Trust evolves over time and experience*” and “*Estonia has e-state for some time already. Therefore, we trust it*”.

It can be concluded that Disposition to trust is positively related to trust in e-government. However, the relation is moderate. **This information supports the first hypothesis.**

4.3.2 Intention to use/use – End user Satisfaction

Under the dimension of Intention to use/use four questions were asked about citizens’ attitudes towards opinion on using services electronically if they plan to use e-services in the future, or they have used e-services because it has been the only option. Whereas under the dimension of End user satisfaction four questions were asked from citizens’ whether they trust Estonian e-services, are they satisfied with the quality of e-services, why have they used e-services and if the option of use state services electronically is important to them?

Between the statements using e-services because they have been satisfied with the quality and save respondents money there is a relation 0,544*, which means that monetary value is important to respondents to be satisfied with the e-service. Between intention to use/use e-services in future and preferring to face-to-face interaction there is a negative relationship -0,384**, which can be logically reasoned, that if a person prefers in person interaction, they do not plan to use e-services.

The younger the respondents were, the higher responses were to the dimension of End user satisfaction. For example from the age 19 to 29 nearly all (90,2%) of the respondents agreed with the statements about e-services satisfaction, whereas 88,6% of the age group 30 to 44 and 83,3% in the age group from 45 to 59. It implies that

younger people like to use e-services more than older people, which can be related to the notion that the youth today find that e-services are convenient and time-efficient.

The overall relation between Intention to use/ use and End user satisfaction dimensions is 0,212** which suggest that there is a weak relationship. It suggests that other factors such as convenience, saved time or money are more important for user satisfaction. There is a moderate relationship (0,550**) between planning to use e-services in the future and the opinion that e-services are necessary, meaning if the user finds e-service needed they plan to use e-services.

Expert interview outcomes provide insights to help explain the institutional view and activities in regards to **Intention to use and usage:**

Estonian e-services are mainly addressed to Estonian citizens, officials or internationals who are active in Estonia. The definition of active users was interpreted differently depending on the institution, whether to count only the user (who might be an official or a doctor) or to count the users of the users as well (the patient or the criminals) as they are part of the interaction and transaction as well. The author concludes that is dependent on the context and particular institution. Therefore, the number of end users varies from hundred up to hundred thousand.

The number of end users depends on many aspects such as the institutions, the structural changes that they have gone under in recent years or e-service focus groups - the number of public official end users has decreased due to the state downsizing. Whereas a number of end users tend to trend up across different fields while using e-services. In some public e-services, the growth of end users has been remarkably exponential in recent years.

Expert interview outcomes provide insights to help explain the institutional view and activities in regards to **end user satisfaction:**

User satisfaction and the feedback is mostly collected though support depending on the institutions, IS and e-services either through dedicated studies are carried on a regular basis, or even recommendation index is being researched in some institutions.

The author concludes that End user satisfaction is positively related to intention to use, nevertheless rather weakly. **This information supports the first hypothesis.**

4.3.3 Perceived risk – Intention to use/ use; and End user satisfaction

Under the dimension of Perceived risk four questions were asked about citizens' awareness about the possible risks online and the knowledge how e-service provider uses, stores or protects their personal data. The questions of dimensions of Intention to use/use and End user satisfaction were described in previous section 4.3.2.

There were remarkably strong relations between the knowledge how e-service provider uses and stores (0,867**); uses and protects (0,825**); and stores and protects (0,851**) their personal data, which implies the better the user knows why the data is gathered, the better they understand how it is used and protected. 57% agreed, and 6% disagreed with the statement: I acknowledge the possible risks online (e.g. cyber threats). 14% accepted the statement I know how e-service provider uses my personal data. 13, 6% admitted the statement I know how e-service provider stores my personal data. 16, 6% accepted the statement I know how e-service provider protects my personal data. It can be interpreted that about half of respondents do not know or acknowledge cyber risks, nor they know how e-service providers use, store or protect their personal data.

There were remarkable relations between users appreciation towards the fact that state services can be used electronically and planning to use e-service in the future (0,610**). Moreover, there was a strong relation between using e-services because they save time and planning to use e-service in the future (0,679**). The relation between e-services saving time and being convenient is 0,641**. These relationships suggest that users are happy to use e-services if there is such option; provided it saves users time and are comfortable to use. The link between Perceived risk and Intention to use/use dimensions was 0,093 which suggest that there is no relationship between them.

The relation between the Perceived risk and End user satisfaction were close to 0,0 – this provides interesting implication that acknowledging risks is not related to users satisfaction with e-services. 13% of women and 14% of men did not agree to the statements that they acknowledge the risks online, or know how their data is used, stored or protected, whereas agreement to the same statements among women was 24,3% and among men 29,6%. This information provides that majority of respondents are somewhat aware of the risks online (e.g. cyber risks or viruses) while using public e-services online; furthermore, the percentage proportions were similar across different,

age, gender and education groups. The overall correlation between Perceived risk and User Satisfaction dimensions is 0,296** which suggest that there is a minimal statistical relation.

Expert interview outcomes provide insights to help explain the institutional view and activities in regards to **Intention to use/use; and End user satisfaction**, which is described in greater details the previous section (4.3.2).

Expert panel interview outcomes provide insights to help explain the institutional view and activities in regards to **Perceived risk**:

Discussing perceived risk perspective from institution inside out view to maintaining and develop e-services probable risks are listed *“Complicated to use,” “Loss of data, availability – it is service specific.” Also “Too weak system, or falls, breakable system” and “Every IS development should come with risk analysis”*. Experts assured that risks were considered throughout the processes *“Risk management is the responsibility of security departments,” “Risk analysis is conducted.”* But there are also areas which need improvement *“Developments are too slow, the e-services are not ready in time”*, or institution political and organizational issues arise which must be addressed *“Not fully acknowledged institution strategy on roles and responsibilities”*. Risks are mostly mitigated through implementing ISKE measures *“Risks are mitigated with the implementation of ISKE”, “Risk mitigation is done by implementing ISKE”*.

The end user view from outside in, there are different risks perceived *“Integrity risk is understood by the end user,” “End users understands confidentiality risk.”* Also, the end user understands which can be concluded from the following statements *“System, or service is down,” “System or information is compromised.” Or “System or service must function as intended”, “End users understands if the system is up or down,” “System or service is down.”, “Data leakage,” “Incorrect data” and “Data integrity.”* To mitigate these risks **control and audit activities** must be in place *“Central log – events are listed and can be checked”, “End users must be consulted or agreed upon down-times and changes” and “Mitigation is done through in-house NFR, which is required from the development partners.”*

Experts stated that most institution have been subject to cyber-attack or are constantly under the flow of different attacks. But to manage them different **conducts** are used

“Processes and required activities are mapped in conduct(s)”, “There is conduct for critical incidents.” And “Risks are dealt with according to the conduct”, “Crisis conduct and guidelines for actions”, “Conduct is followed (notice to police, CERT, press, etc.)”. To the general public, data protection is an important topic as well *“Data leak is not accepted in media, consequences follow”, “Data leakage is not accepted in media” and “Data is protected by separating it from the personality.”* But then again the risks have different impacts *“Data mining, but the effect on a citizen is minimal”* and humans are most vital in these cases *“Human-risk is greatest, but for this there is conduct(s) and legislation in place”.* But this must be dealt with through correct **communication** *“Conduct is followed (system or service is revised, fixed and the press release is done)” and “Data leak is not accepted in media.”*

The Perceived risk is not negatively related to intention to use/use is. Therefore, knowledge and acknowledging the online risks does not affect the citizens’ intention to use or continue using e-services in general. It can be due to the reason the state has not misused or leaked the personal data provided by the citizens in online or electronic format. **This information does not support the first hypothesis.**

Also, Perceived risk is not negatively related to End User satisfaction. On the contrary, there is a weak positive relation, which can be interpreted relying on the expert panel answers that sometimes e-services do get hit or taken down, but as the state authorities take immediate actions of taking the systems down, fixing them and doing honest communication about it – the Perceived risks dimension gets reverse effect. **This information does not support the first hypothesis.**

4.3.4 Net Benefit – Intention to use/use; and End user satisfaction

The questions of dimensions of Intention to use/use and End user satisfaction were described in previous section 4.3.2. Under the dimension of Net Benefit, three questions were asked from citizens’ if they use e-services because they are more convenient and save time or they understand how Estonian e-service system works.

87,8% of the female and 88,7% of male; and 79,9% respondents of the higher education (Bachelor’s and Master’s) agreed to the Net Benefit statements. Suggesting that both women and men value the benefits e-service provides and citizens with higher education are more likely to use benefits that e-services provide.

There is a rather strong relation between the aspects of saving time and plan to use in the future (0,679**), which indicates that if the e-services are time-efficient, the users will continue using in the future. Also, the rather strong relation is between saving time and convenience (0,641**), which provides implication that e-services convenience is directly related to its value of saving time for the user.

The overall correlation between Net benefit and Intention to use/use dimensions is 0,288** which suggest that there is a minimal statistical relation. The overall correlation between Net benefit and User Satisfaction dimensions is 0,653** which suggest that there is a very high statistical relation, meaning the higher the value end user receives from using e-service, the more satisfied they are. This means that additional value provided to citizens affects the citizens' satisfaction with e-services.

Expert interview outcomes provide insights to help explain the institutional view and activities in regards to **Intention to use/use; and End user satisfaction**, which is described in greater details the section (4.3.2).

Expert interview outcomes provide insights to help explain the institutional view and activities in regards to **Net Benefit**:

E-services should always be well thought through and applied if **needed and context requires**, meaning not all public services can or should be put in an electronic environment *“E-services should be used if they are rational only, a person does not add value in rational decisions, the machine does.”* Or *“e-service should be viewed as part of the integrity, meaning e-service being one inseparable part of the whole process (e.g. medical personnel and available data must be used in a combination).”* And *“Critical thinking is important here – which processes should be digitalized and which not – all cannot and should not be electronic”*.

Citizens use e-services if they provide some additional value to them. Therefore, experts mentioned several reasons why e-services are good for citizens: *“0-effort service is the best e-service.”* Or *“Minimal effort for maximum result”, “End user wants to do business and have a personal life, they do not know what to hassle with public services, e-services provide the means for this.”* Also *“E-services can be used 24/7”, “e-services are faster, people are impatient – they do not know what to wait. They want to get it done with”* and *“E-service should be used when if they create (additional) value”*.

Therefore, according to the experts if e-services are reasonable and need based then they represent many positive qualities “*E-services are more effective, data quality is higher when juridical, or medical clarity is crucial*” or “*e-services are fast and simple*”. Moreover, there is, of course, the financial aspect from the governance perspective “*E-service is cheaper to maintain. Contact price is so much lower*”.

The net benefit is positively related to intention to use and usage; however the relation is rather weak. **This information supports the first hypothesis.**

On the other hand, Net benefit is positively related to user satisfaction in a rather strong way. It provides that when creating e-services, the additional value should be foremost representing the saving of the time and money of the end users and also provide relevant/needed and up-to-date information on electronic services. **This information supports the first hypothesis.**

Based on the results of correlation analysis and interview outcomes, the author concludes that e-services are used because they are trusted, due to the reason of Trust in e-Government in general and the Net value e-services provide to satisfy the users’ needs. However, Dimensions of Perceived risks; Intention to use and usage notes relevant while using e-services.

Based on the sections 4.3.2, 4.3.4 and 4.3.4 the dynamics of e-government services in regards to end users usage of e-services according to expert panel outcomes can be driven. Estonian public e-services are developed for either citizens or officials, therefore for the whole Estonian population. Citizens, who to live their everyday life and public institutions need to provide the proper framework to support. Therefore, e-services are public services put into an electronic or digital format with the help of ICT. And officials who need to provide or mediate governments’ public benefits (e.g. police, healthcare, education, etc.). E-services are used, and users are satisfied if they receive public goods in a simple and understandable manner. Furthermore, e-services should only be considered if they are rational, needed and adding value (e.g. the users save time or money).

4.3.5 Institution Based Trust - Trust in e-Government

The questions of Trust in e-Government were described in section 4.3.1. Under the dimension of Institution based trust, five questions were asked from citizens’ whether

they agree with statements that suggest they trust Estonian institutions if they fulfil the responsibilities to Estonian citizens and treat users personal data in a legal and ethical manner, and also do they trust the specialists who work for the government.

Between statements about trusting Estonian public institutions and trusting Estonian public e-services is a relation 0,566**, stating that if institutions are trusted then the services can be put into the electronic environment, and they will be trusted as well.

There are clear relations between agreeing on statements that Estonian government uses personal data in a legal and ethical manner only to the statements about Internet voting security (0,567**) and trustworthiness (0,583**). Whereas 125 respondents agreed with the statement that Internet voting is secure and trustworthy (which is 88,2% from all the respondents). This gives ground to assume that majority of people who answered the survey believe that Internet voting is secure, therefore, can be trusted, and it is due to the reason the Estonian public authorities are acting in a lawful and ethical manner.

The overall relation between Institution based trust and Trust in e-Government dimensions is 0,655** which suggest that there is a strong relationship. Meaning the higher the trust towards state institutions or authorities is the higher is the likelihood that respondents trust e-government solution.

Expert interview outcomes provide insights to help explain the institutional view and activities in regards to **Trust in e-Government** in the previous section (4.3.1).

Expert panel interview findings provide insights to help explain the institutional view and activities in regards to **Institution Based Trust**:

To understand what institution do on an administrative level to build trust in citizens' first keyword was **control-audit** which occurred in statements such as "*Regular audits are done and they are available for feedback and comments.*" And "*User-interfaces are available for users to test*", "*Particular frameworks are followed for control and supervision purposes*", also "*Targeted control (background and ad-hoc checks on personnel).*" Another measure that was mentioned was **ISKE** with phrases like "*Implementing ISKE provides all needed measures*" and "*Highest ISKE requirements are set depending on the data handled.*" And yet again it was said that **communication** must be in place "*Communication department is an important measure in creating a positive image of e-services,*" "*Area workshops are done.*" Or "*User reads the news if it*

says data has leaked, been misused or information systems have been hit (with a cyber-attack, virus, etc.) – This is where end users start to distrust“. To maintain and grow trust among end users **communication** must be done “End users trust is built with positive customer support and communication,” “Trust is built by building general trust and positive image.” And “Dealing with raising awareness builds trust”, “Trust is built by keeping a positive image and communicating with press”, “In the case of incidents the system is taken down, fixed, put up and apologies sent out (press releases).” However, some difficulties arise with communication as well, meaning that one thing is to inform the public about the issues, problems and maintenance needs. But this message often have a negative implication such as the system is temporarily down and cannot be used “Clients/Users are informed about downtime”, “Notifications when system is down.” Whereas the good news can rarely be presented without them looking like spam “Have not found good ways to communicate positive notifications (e.g. six months no incidents).” Or “Too many notifications decreases trust because notifications usually carry a negative meaning (downtime, incident, etc.). Therefore, selected notifications are applied (e.g. not every maintenance is announced if does not affect the end user)”.

When asking if and how the institution has studied trust among end users then it appeared that some have not studied it “Customer satisfaction or trust has not been studied.” Whereas most organizations do ask **feedback** “Customer satisfaction surveys and researches are done - customer support has been rated very highly,” “IS based studies are being done,” “Surveys among end users are done.”

Also, it is necessary to point out one more keyword which emphasized by the panel of experts on many occasions; this was **best practice ITIL**. ITIL was referred throughout the interview blocks with statements such as “Best practises are used e.g. ITIL”, “Problem management, change management, event and incident management, monitoring, portfolio management.” Or “Trust is built with transparent maintenance which can be done by implementing ITIL framework”, “ITIL implementations (using some elements)”, “ITIL: configuration, change, event, problem, accessibility management, etc.” or “Service Portfolio and Service level agreements (SLA)”.

Institutions based trust is positively related to Trust in e-government. Therefore, it can be concluded that respondents trust Estonian public authorities which mean they also trust the e-government solutions. **This information supports the third hypothesis.**

4.3.6 Information quality – Intention to use/use; and End user satisfaction

The questions of dimensions of Intention to use/use and End user satisfaction were described in previous section 4.3.2. Under the dimension of Information quality, four questions were asked from citizens' if they find important the option of using state services electronically, or do e-services provide needed and up-to-date information; and if the expected e-service outcome is provided in expected (promised) time.

There is a moderate relation between knowing that e-service outcome will be provided in expected time and intention to use e-services in the future 0,527**. Therefore, if e-services provide the outcome promptly the user shall continue using e-services. Moreover, several statements have moderate relations within the Information quality - intention to use dimensions, indicated and highlighted in the Table 5 below. These relations provide information that for the End users it is important that the information provided in e-service is relevant, up-to-date, but also to plan using it in the future e-service must save time and money for them.

Table 4 Information quality - intention to use correlation

	Receive needed information	Information is up-to-date	e-services option is important	Outcome in expected time	Plan to use in the future	Saves me money
Receive needed information		,605**	,425**		,405**	
Information is up-to-date	,605**				,416**	
e-services option is important	,425**			,529**	,610**	,486**
Outcome in expected time			,529**		,527**	
Prefer in person interaction			-,392**		-,384**	
Plan to use in the future	,405**	,416**	,610**	,527**		,465**
Saves me money			,486**		,465**	

The respondents agree to the statements that they understand how Estonian e-service system works and that using e-services they receive the needed information 0,529**. This suggests that if the information provided in public e-service is relevant to the user, then they understand how it works as well. Also, several statements have relations within the Information quality - End user satisfaction dimensions, indicated in the Table 6 below. The highlighted relations indicate that receiving needed and up-to-date

information, and understanding how e-service system works are indicators of quality of e-service.

Table 5 Information quality - End user satisfaction correlation

	Receive need information	Information is up-to-date	e-services option is important	Outcome in expected time	Satisfied with quality	Saves me money	Know how it works
Receive needed information		,605**	,425**		,511**		,529**
Information up-to-date	,605**				,500**		,460**
e-services option importance	,425**	,395**		,529**	,440**	,486**	
Outcome in expected time			,529**				
Saves me money	,511**	,500**	,440**	,441**		,426**	,544**
Satisfied with quality			,486**		,426**		
Know how it works	,529**	,460**			,544**		

The overall correlation between Information Quality and Intention to use/use dimensions is 0,203** which suggest that there is a very weak relation. On the other hand, the overall correlation between Information Quality and User Satisfaction dimensions is 0,754** which suggest that there is a very strong statistical relation, meaning the better the information quality of e-service the more satisfied end users are.

Expert interview outcomes provide insights to help explain the institutional view and activities in regards to **Intention to use/use; and End user satisfaction**, which is described in greater details the section (4.3.2).

Expert interview outcomes provide insights to help explain the institutional view and activities in regards to **Information Quality**:

Institution assures availability and accountability of e-services through **SLA** (service level agreement) “Services have SLAs,” “*SLA is one of the most important things we own,*” “*Availability is enforced though SLA,*” “*SLA monitoring 24/7,*” “*SLA must come with implementations and supervision. Otherwise, it is useless,*” “*Based on business requirements with SLA the IS are developed.*” And “If we have such SLA what kind of actions it require from us?”. Further e-services require **control and audit** “*Service SLA fulfilment is monitored and supervised,*” “*Some services have in person monitoring,*” “*Availability of SLA is monitored and reported on weekly bases, if in red – it is investigated,*” “*Problems and incidents are reported up to management level.*” However, it must be supported by **continuous process and revision** as it occurred in

statements such as “*If we change SLA what does it mean, what else should be amended?*”, “*Sometimes risk management does not help and we get hit, revise and fix it,*” “*Risks are revised and assessed, what can be accepted, managed and must be dealt with.*” These measures provide **availability** by understanding the situation at all times “*Following the conduct and planning,*” “*One must understand the boundaries, up to where the availability can be provided, and from where not*” and “*Availability is enforced by SLA.*”

Different interest or target groups need different information, therefore, depending on the **context and need** e-services are personalized, and adaptable “*Services are institution and authority specific, therefore, personalized.*” Or “*Depending on the IS the personalization varies, newer ones can be personalized more, older less*”. Also educational view is important not to over-personalize because “*Learning curve must be minimal*”, “*The most costly is teaching end user*”.

Discussing technological and procedural measures in building or providing trustworthy e-services experts talked about applying **ISKE** “*Technological measures, processes based on ISKE, where class and level are assigned, and measures are enforced accordingly,*” “*Technological trust is built by implementing ISKE, digital signature, crypto, configuration and change management.*” Another keyword in technical meaning is **eID** “*Using public key infrastructure*”, “*Technological trust is built by implementing ISKE, digital signature, crypto, configuration and change management*”. But also **notifications** were mentioned “*Automatic reports can be checked against person’s words,*”, “*The e-service says that is down or under maintenance all the time, then this creates distrust.*”

Information quality is positively related to intention to use and use, but weakly, therefore an incentive to use e-services does not come from information quality. **This report supports the third hypothesis.**

Information quality is strongly positively related to user satisfaction, providing evidence that if the information in the e-service(s) is relevant and regularly updated then the e-service users are satisfied with the e-service. **This report supports the third hypothesis.**

4.3.7 System quality – Intention to use/use; and End user satisfaction

The questions of dimensions of Intention to use/use and End user satisfaction were described in previous section 4.3.2. Under the dimension of System quality four questions were asked from citizens' if they agree that the provided e-services are necessary, are they created in persons' best interest and e-service providers use security measures to protect their data, plus are the respondents in control and can monitor the result of e-services.

The relation between e-service providers are using security measures to protect my personal information and e-services being necessary is moderately strong 0,526**; and between quality and security measures the relation is also noticeable 0,488**. Therefore, it can be suggested that the quality of the system is related to using security measures to protect persons' personal data. There is rather a strong relation between saving time and using e-services in the future 0,679**, suggesting that e-services usage is directly connected to time efficiency. There is also a reasonable relation between saving time and money while using e-services (0,565**), which implies that users are satisfied with the e-services if they feel that they receive monetary or timely value.

The overall correlation between System Quality and Intention to use/use dimensions is 0,208** which suggest that there is a minimal statistical relation. The overall correlation between System Quality and User Satisfaction dimensions is 0,672** which suggest that there is a very high statistical relationship, meaning the higher the system quality of e-service the more satisfied end users are.

Expert interview outcomes provide insights to help explain the institutional view and activities in regards to **Intention to use/use; and End user satisfaction**, which is described in greater details the section (4.3.2).

Expert interview outcomes provide insights to help explain the institutional view and activities in regards to **System Quality**:

Talking about system quality this comes with the notion of building secure IS, so while describing security measures like **ISKE**, was referred to *“ISKE states technological and organizational measures”*, *“ISKE is mandatory by law to government authorities.”* And *“There is security department, who performs supervision of ISKE and other security standards and measures, so they must be consulted in case of changes.”* Or other standards such as ISO *“ISO 27 001 certificates are applied, or specific elements are*

used.” And other measures such as *“Physical security policies”, “Access policy and limited accesses”, “Password security policy”, “Information assets are classified by categories”, “Log analysis, events in different modules”, “International standards are followed”*. While talking specifically about standards interviewees named a variety of the ones used for developing or maintaining the IS or e-services in addition to ISKE and ISO, also ITIL, PKI, crypto, particular data gathering and exchange standards depending on the particular institutions. Furthermore, institutions try to observe what is happening internationally in regards to technology trends, and directions *“Departments and teams decide which technology to use, have control over decision-making,” “International players, standards, activities and innovations are being observed through conferences, seminars, workshops.”*

System quality outcomes are similar to the results of the previous section. It means System quality is positively related to intention to use and use, however weakly. Therefore, incentive to use e-services does not come from system quality. **This information supports the third hypothesis.**

System quality is positively related to user satisfaction rather strongly, providing evidence that if the system is built and presented in the way the user can find, use and understand it, and then the e-service users are satisfied with the e-service. **This information supports the third hypothesis.**

4.3.8 Service quality - Intention to use/use; and End user satisfaction

Under the dimension of Service quality, four questions were asked from citizens’ if they think that their personal data is electronically better protected than on paper, have they had issues while using e-service and terminated the usage due to this, or felt the need to contact customer support. The questions of dimensions of Intention to use/use and End user satisfaction were described in previous section 4.3.2.

The relation between the dimensions were all below 0,3 meaning all relationships were weak. Also, no remarkable socio demographic outcomes were found, therefore, will not be discussed in greater details. The overall correlation between Service Quality and Intention to use/use dimensions is 0,207** which suggest that there is a nearly inexcistent statistical relation.

The overall correlation between Service Quality and User Satisfaction dimensions is - 0,094 which suggest that there is a slight negative statistical relationship, which might be related to customer support. Meaning if the service quality is low the users feel the need to turn to the customer support and receive additional help from there to complete the service – therefore, they are satisfied with the customer support service, not the e-service itself. Whereas, if the service quality is high, the users do not need to turn to customer support (where customer satisfaction is usually measured), therefore, user satisfaction will not be measured by the end user will not contact service support where they receive additional information or guidance.

Expert interview outcomes provide insights to help explain the institutional view and activities in regards to **Intention to use/use; and End user satisfaction**, which is described in greater details the section (4.3.2).

Expert interview outcomes provide insights to help explain the institutional view and activities in regards to **Service Quality**:

Describing the service quality one important keyword is **communication**; therefore, experts talked about procedures and measures that institutions use to interact with the end users or public in statements such as *“With incidents media goes viral.”* Moreover *“Important is not to irritate the specialists, because if practitioners start to doubt trust, the users will follow.”* And *“Specialists must be dealt with in person – special workshops, conferences, focus group panels as the target group is rather small.* The proper communication is managed by proper specialists *“Communication professionals and managers are in charge of internal and external communication of the institution”, “Communications guidelines for authority internal specialists are provided”,* Then again there are exceptions such as stated in the following *“Initial strategic decision was not to do public communication, because of fear of failure.”*

To provide comprehensible, simple, and easy e-services different measures are used whereas the keyword is **users** *“User groups are involved in analysis and development”, “Services are simple and understandable when they are intuitive”* and *“User interface is easy and intuitive”*. However, there might be drawbacks on organizational level *“End user suffers due to political and structural changes and delays – this decreases trust”*. Therefore, **feedback** must be gathered while developing e-services *“From end users and development team,” “User questions and request are taken into account when*

developing.” To assure the e-services are of high quality and up-to-date institutions must involve other parties *“Service quality is achieved through innovation and cooperation with universities, NGOs, etc.”*

Institution usually has **customer support**, but its availability depends on the need of the particular e-service *“Support is available 24/7”* or *“Customer support on working times”*, or combined *“Monitoring 24/7 and customer support works during working hours”*. The institution must also assure that the customer support is correct and empathic which is **controlled** *“Does the support provide correct information in a correct (positive) manner.”* Moreover, **feedback** is asked as well *“II level support is assessed upon emails, as there are no calls,”* *“Empathy is achieved through training (both in-house and external)”* and *“customer support feedback is asked, reported and analysed.”*

According to the correlation analysis based the proposed model Service quality is not related to intention to use and use; nor user satisfaction. However, this might be due to the implication that service quality was viewed from the customer support viewpoint, where users usually turn to with a negative emotion (the e.g. system is down or not working properly). It would imply that if the user needs to turn to customer support, then the system is not very well functioning. Therefore, the incentive to use e-service(s) and be satisfied with its outcomes creates a negative attitude towards e-services. **This information does not support the third hypothesis.**

Based on the sections 4.3.3, 4.3.6, 4.3.7 and 4.3.8 the risk aspects and technology measures to build trustworthy state e-services from expert panel viewpoint will be concluded as follows. Estonian institutions that are responsible for developing e-services must obey Estonian local laws, and also follow the legislation of European Union. Also, international standard organizations, private sector software and hardware organizations with different ICT communities need to be observed to keep up with ever changing eco-system. Nevertheless, state IT coordination is done through legislation that supports ICT changes in the government and if needed the law must be revised and amended to suite the altered environment. Through legislation, structural changes are implemented, and responsible institutions are assigned. Essential is to point out the importance of secure authentication methods (eIDAS), data exchange environment or platform (X-Road) and ISKE (provides organizational and security measures) implementation. And lastly, if the risks are managed with technological and procedural

measures the role of open and transparent communication is vital in implementing e-services.

4.3.9 Familiarity (knowledge based) - Trust in e-Government

Under the dimension of Familiarity five questions were asked from citizens' about their experience of finding and using e-services on the Internet, if they think e-services have positive media coverage or their close ones use e-services, or do they agree with the statement that using crypto algorithms and technological solutions provide secure e-services.

Within the Familiarity dimension, there was a strong relation between knowing how to find and using e-services on the Internet (0,654**). It gives ground to assume that if the person knows how to use The Internet for finding e-services, they are likely to know how to use them as well. Within Trust in e-Government dimension, there were strong relations between trusting Estonian public e-services and considering I-voting secure (0,687**) and trustworthy (0,697**). It means that if public e-services are trusted in general then conducting electronic voting online should be perceived secure and trustworthy as well.

The overall correlation between Familiarity and Trust in e-Government dimensions is 0,580** which suggest that there is a noticeable statistical relation. It means that knowledge based familiarity should be considered important in regards to Trust in e-Government.

Expert interview outcomes on **Trust in e-Government** are described in the previous section (4.3.1).

Expert meeting results provide insights to help explain the institutional view and activities in regards to **Familiarity (knowledge based):**

When using any ITC tools, it is important to understand how the users are educated to build the knowledge and to reach user familiarity. To describe how institution supports its end users experts talked about the importance of **training** by saying the following “*Depending on the IS the training, workshops, guidelines are conducted,*” “*training for focus groups are done.*” Or “*Seminars and workshops for software developers are held*”, “*With initial development of IS 20-25% of the budget was spent on training the*

staff.” Whereas institutions develop the knowledge of officials usually in-house “*Institutional customers need a little training, or institutions themselves provide it*”, “*the super users write context guidelines*”. The exact measures for education often **context or need to be based** because “*The e-service or IS exists because exists the end user*”, “*Focus is to develop easy and straightforward user interface, then there is less need for training.*” Therefore “*Depending on the IS the training, workshops, guidelines are conducted*” and “*When implementing new system(s) class-room trainings are held*”. But then again there remains the need for **support for the end users**, therefore, “*Internal and external support is provided*”, “*Knowledge is provided to the super users and end users*”, “*Service-based guidelines.*” And “*Many videos are provided online, some are embarrassingly outdated, but still used*”, but in the end monetary aspect plays a role as well “*Client is supported as much as possible and feasible*”.

Familiarity (knowledge) with ICT solutions is positively related to trust in e-government in a moderately strong rate. However, this provides sufficient evidence that if users are educated regarding how IS and e-services are builds and how they work (including usage of crypto algorithms and media coverage), then the trust towards e-government solutions is prominent among citizens’ as well. **This information supports the third hypothesis.**

4.3.10 Trust in e-Government - Perceived risk

The questions of dimensions of Trust in e-Government were described in section 4.3.1, and questions of Perceived risk were defined in section 4.3.2.

The correlation relations within the dimensions were very strong, as already discussed in sections 4.3.1 and 4.3.3. However, the overall relationship between Trust in e-Government and Perceived risk dimensions is 0,254** which suggest that there is a very weak statistical relation. IT implies that the respondents do not associate online risks while using e-government solutions, therefore, presumably they rely on other factors when using state e-services such as Institution based trust or Information quality or System quality. It implies that risk mitigation in Estonia is done though state authorities, providing proper supporting legislation, well-functioning systems with relevant and up-to-date information. **This information does not support the third hypothesis.**

Expert interview outcomes provide insights to help explain the institutional view and activities in regards to **Trust in e-Government** which is analysed in the section 4.3.1, whereas the **Perceived risk** is explained under 4.3.2.

According to the proposed model and correlation analysis done Perceived risk is not negatively related to Trust in e-government, as this could be attributed to the fact that the government and media openly present risks. Moreover, institutions are open to sharing their activities of providing security for the e-services (administrative, organizational, technological and legal) and even share audit results for public evaluation and discussion.

Based on the sections 4.3.1, 4.3.5, 4.3.9 and 4.3.10 the general attitudes and measures towards trust and e-government are examined from expert panel viewpoint. First of all, it is important to point out that their citizens highly trust Estonian institutions. It is clear that following the legislation to provide a public good is essential for agencies and authorities. General public sets high standards for IS and e-services developed. Therefore, they must be well-functioning, providing relevant information and adding value. For one, institutions implement ISKE by law, second third party authorities control them, and moreover they understand the need to make a communication attract users, receive feedback and educate general public if needed. Furthermore, best international practices are used to provide clear processes from organizational and administrative level. **Based on this information author of the thesis concludes that the second hypothesis is proven true.**

Electronic means are gladly used to interact with the state by 125 respondents. 146 respondents trust Estonian public e-services (agree completely and rather agree). 131 respondents (agree completely and rather agree) think that e-services are developed in my interests and good will. 172 respondents stated (agree completely and rather agree) that they plan to use e-services in the future. 139 respondents indicated (agree completely and rather agree) that while using e-services they have been satisfied with the quality. 125 of the respondents (agree completely and rather agree) think that I-voting is secure and trustworthy. **Based on this information author of the thesis concludes that the first hypothesis is proven true.**

4.4 Implications

The following section will present research limitations, conclusions of the empirical research analysis. The table with correlation analysis based on the proposed model dimensions can be found in Appendix 6. Theoretical research models and authors' proposed research model will be revised, and further amendments are suggested.

4.4.1 Limitations of the research

After analysing the quantitative research outcomes, few limitations must be stated. First of all the online survey was distributed through email and social media (Facebook) to personal contacts of the author of the thesis. Second limitation is that the respondents' socio demographical background is inclined towards authors' immediate circle of acquaintances, e.g. more female respondents than men, or large proportion of respondents have first or second level of higher education and most of the respondents were within two age groups 19 to 29 and 30 to 44. As the sample of respondents does not represent the whole population of Estonia, consequently the results cannot be extended to the general Estonian inhabitants. What is more, with online survey author was able to gather more data which can be analysed further, however as it exceeds the volume of one Master's thesis, the author had to remain within the limited scope of studying trust towards e-services.

4.4.2 Conclusion of empirical study

4.4.2.1 The view from outside in

To explore trust towards state e-services, the author considered different theoretical approaches and models. Two models emerged because they provided a set of different dimensions to study trust and e-government aspects. Moreover, there were previous empirical studies done. These two models were Delone and McLean IS success model and research model for conceptualising Citizen's Trust in e-Government. First focused on IS success factors and empirical study was done only from government Web page perspective, which author of the thesis considers limiting to review trust towards e-government solutions. Second, a conceptual research model was considered limiting regarding the lack of technological view. Nonetheless, both models provided a solid starting point for further studies. The author merged two models by adding absent

dimensions to Delone and McLean IS success model. The model is presented and explained in the section 3.2.3.

Based on the model two sets of questions were developed: one set for expert interviews and second for online survey. The methodology is explained, and samples are described in section 4.2. Results of the analysis are discussed in greater details under the section 4.3 and presented on the Figure 9 below. The correlation analysis conveyed provided evidence that the proposed model does not represent an adequate reality of the respondents of the online survey, meaning relations between some dimensions were very weak or nearly non-existent.

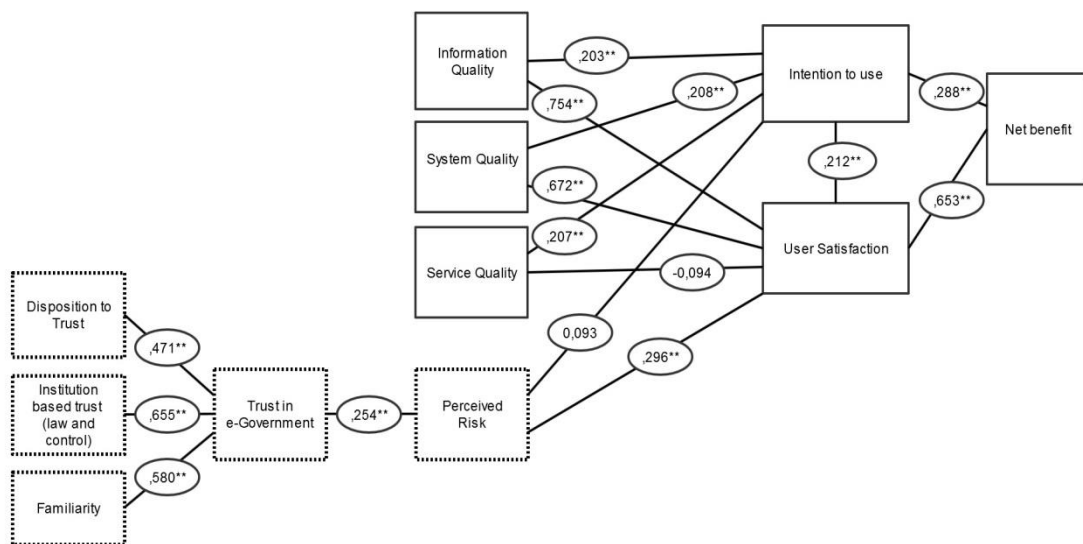


Figure 9 Proposed model with the correlations

As the proposed model was not justified, the author revised the conceptual research model as well. Nevertheless, based on the correlation analysis it was not justified either. The conceptual research model with the correlation relations is represented in the Figure 10 below, but it did not provide solid proof either.

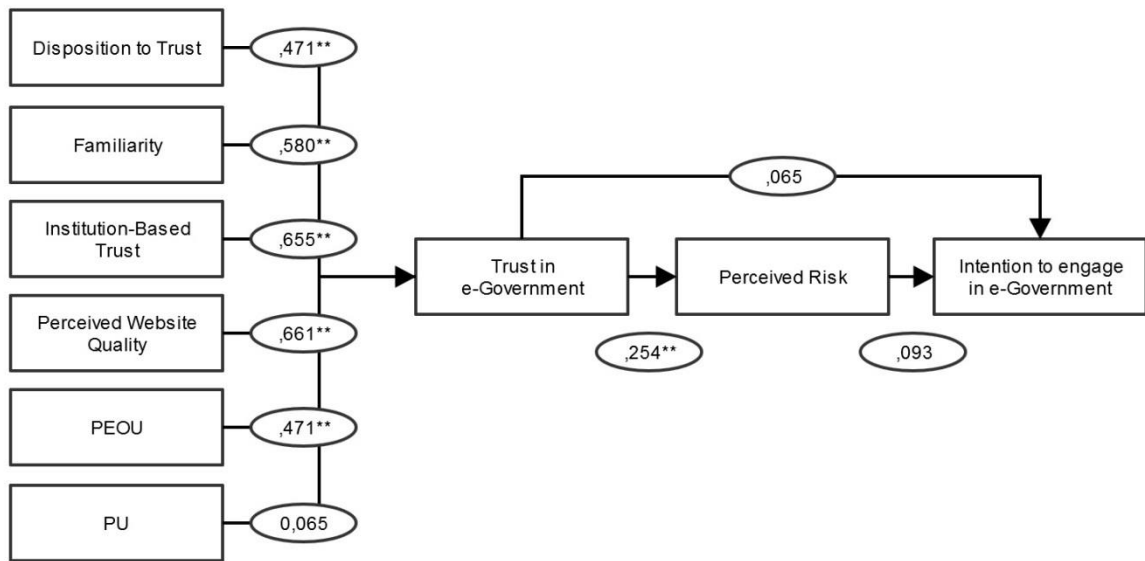


Figure 10 Conceptual research model with correlations

The outcomes of correlation analysis provided the author of the thesis a set of evidence to propose a corrected model which represents the respondents view more clearly. Only the statistically significant very strong (0,7 or stronger) or rather substantial (over 0,6) relations are taken into account in amending the model, as these represent the strongest relationships correlation analysis provided between different dimensions. Weak relations were not included into the amended model. The revised model with correlation relationships is shown in the Figure 11 below.

The dimensions were reorganized so they would be clear and easy to read. The three blocks are highlighted with different colours. Blue represents the first block general attitudes towards trust and e-government; purple represents the second block of technology and risks, and yellow represents the third block of usage.

First major difference is that Service quality dimension is removed, as in correlation analysis no statistically strong or very strong relations appeared with different dimensions. Also, excessive connecting lines which are smaller than 0,6 are removed. From the figure it can be said that the strongest relationships are between End user satisfaction and Information quality (highlighted with green); then End user satisfaction and Trust in e-Government (highlighted with green). Between End user satisfaction has a strong relationship also with System quality and Net Benefit. System quality has strong relationships with five different dimensions (End user satisfaction, Institution based trust, Trust in e-Government, Information quality and Disposition to trust) and

one rather weak relation with Perceived risk. The outcomes about Perceived risk were most surprising to the author, as the relations towards different risks were very small. It implies that in Estonian environment where the research was conducted the risks are somewhat acknowledged but in general ignored or neglected while using e-services.

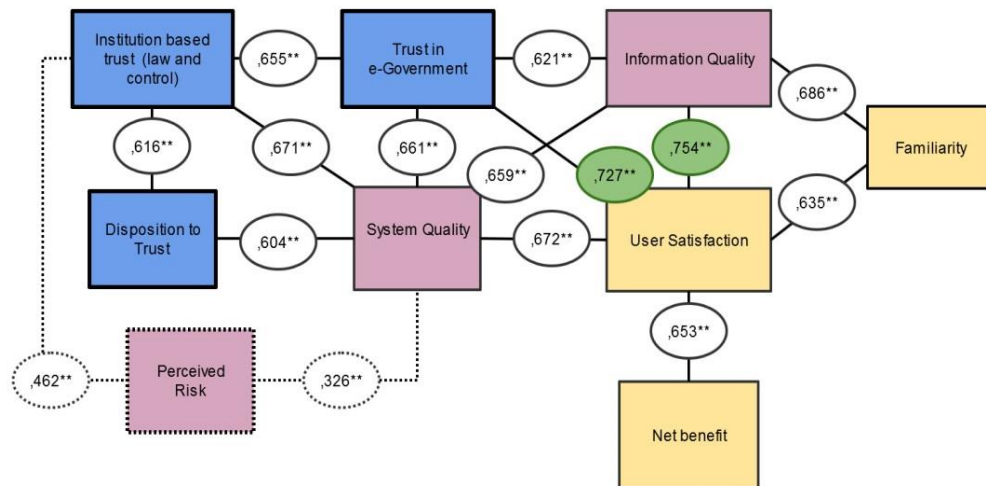


Figure 11 Authors' amended model with correlations

Based on the analysis done it can be concluded that End user satisfaction, System, and Information quality dimensions play the central role in building trust from the citizens outside in view. Therefore, author of the thesis concludes that when building trustworthy e-services the fulfilment of these dimensions must come first. The state system must provide a trustworthy structural (administrative and organizational) framework for the citizens' and officials, with open communication on building e-state systems and risk mitigation procedures by law.

4.4.2.2 The view from inside out

The expert interviews with experts were very insightful, straightforward and honest. The openness of experts was positively surprising when talking about trust towards e-services. Nevertheless, it required lots of transcription, coding and analysing from the authors' side. Based on the interviews with the expert panel the author of the thesis concludes the following.

On administrative level the following points must be in place:

- Clear administrative structures for planning, developing and maintaining ICT solutions. Estonia uses decentralized architecture. Therefore all the ministries

are responsible for their ICT developments, IS, databased and e-services. Best practices from Europe and other are observed, considered and implemented as part of the ordinary work. Using ITIL or some fragments of it is spread among Estonian ICT institutions. Additionally state should take care of the required structural changes in the state if needed, but in a clearly reasoned, transparent and rapid manner, so it would not affect citizens or ICT developments in a negative way.

- First of all on the organizational level the state must have a strong necessary legislation in place. The legislative framework must support the ICT developments in a way that the technological artefacts could be controlled, effects measured and if needed replaced. An important aspect of the legislation is that government must be politically willing to accept and endure the social and environmental changes, therefore, amend laws if processes, eco-system requires so. Estonia being the member of EU must implement eIDAS, which provides law for digital identification and digital signatures. Estonian institutions must implement ISKE by law, which essentially is a security standard that provides both organizational and technological measures to provide secure therefore trustworthy solutions. Information exchange has to be reliable and transparent as well; Estonian has developed X-Road for this purpose.
- Communication is a vital component that does not stand out in the dimensions of any theoretical models. However, author of the thesis concludes that this is for the very simple reason, which is communication is required in planning and executing any dimension, measure or e-service. The public e-services must be need based. Therefore, this information should be communicated from the citizens or officials to the higher public institutions. After which it will be assessed, analysed and reported back with explanations why it is not a good idea or fostered into planning and development. After the development, the implementation activities must have clear messages to the focus groups, and feedback must be accepted and considered in further amendments.

5 Summary

Trust is a phenomenon that interests researchers in many different disciplines. Numerous frameworks present various outcomes; nevertheless, there is one universal opinion across fields: trust is a vital component in any form of interaction. Technology is evident in our everyday lives providing a smarter and quicker ways to do things; consequently trust is interesting to study from information and communication technology (ICT) field from the context of state governance as well as many services go online.

The aim of the thesis was to study two different points of views: what is considered trustworthy from the citizen's point of view and what is being done on the institutional level to build trust. The thesis focused on studying trust in relation to government e-services. In regard to connecting state governance, public services, and ICT it is important to remember that state must always be trustworthy in its actions, dependable and provide security to its residents. Estonia is often brought as a show-case example in implementing government e-services; therefore the author of the thesis was fascinated to examine this field in greater details.

The first chapter made an introduction to general definitions, relevance and Estonian context. The second chapter focused on the Estonian institutional requirements and measures in building trust in people using ICT in the public sector. In the third chapter the author examined the theoretical backgrounds on how trust, e-services, and e-government have been previously studied; based on which the author proposed a new model for conducting a field research with two focus groups: expert panel and end users. The fourth chapter presented the empirical research on trust using Estonian state e-services, described the methodologies and sample descriptions with results of analysis and implications.

The proposed model was developed based on two previous models Delone and McLean IS success model and research model for conceptualising Citizen's Trust in e-Government. Based on this model two sets of questions were developed: one set for

qualitative research method to conduct expert interviews and second for quantitative online questionnaire for the end users.

The correlation analysis was done on the data collected from online survey which provided a set of evidence to correct the model which represents the respondents view more clearly. From the correlation analysis appeared that the strongest emphasis while building and maintaining state e-services are End user satisfaction in relation to Information and System quality; and also Trust in e-Government. From the expert panel interviews three main conclusions were driven. First, clear administrative structures for planning, developing and maintaining ICT solutions must be in place. Second, on the organizational level the state must have a strong necessary legislation in place. And lastly have an open communication in regards to public e-services.

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Appendix 1 – Overview of related work and previous studies

Table 6 Overview of related work and previous studies

Nr	Previous theory / model / study	Keywords	Scope and connection to building trust	Limitations
1	Game theory	situation, players as participants, net benefit,	<p>The goal of every player is to maximise the expected benefit.</p> <p>Players are intelligent and rational in their actions (Myerson, 1997).</p> <p>People need to cooperate, therefore, trust another party not to act opportunistically, instead work together for “public good” or net benefit (Rafael La Porta, 1996).</p> <p>The relation between game theory and trust has been suggested due to the assumption that trust must be based on something.</p> <p>Trust can be based on mutual or general net benefit.</p> <p>Large and governmental organizations build trust on the assumption of receiving a benefit for their stakeholders (a business owner in case of company and citizens in case of state (Mohd Anuar Mat Isa, 2012).</p>	<p>1) Citizens are not always aware of all the possible information to make the best-calculated choice.</p> <p>2) Citizens are a human who is prone to act upon emotions rather than mathematical calculations.</p> <p>3) Game theory assumes continued action, but in the current thesis, only a snapshot of situation can be viewed and stated.</p>

2	Trust: a sociological theory	communication, tolerance, compromise and consensus, participation, education, risk, gamble, reciprocity, objects and functions of trust, democracy	<p>Trust consist of belief and commitment components, therefore, is closely related to risk, because believing something will happen does not necessarily mean it will. As a result, belief is a gamble.</p> <p>1) Reciprocity expectation, that other will act in a similar manner.</p> <p>2) Trust objects: Primary (family, acquaintances, social categories, roles, groups, institutions) and secondary (organizations such as police, jury, UN).</p> <p>3) Trust has two functions:</p> <p>a. Personal functions – openness towards others; willingness to interact and enter relationships.</p> <p>b. Social functions – enriches interpersonal network, encourages communication and tolerance, strengthens the ties with the community and lowers transaction costs.</p> <p>4) Democratic requirements to measure trust:</p> <p>1) Communication among citizens: speaking up and listening.</p> <p>2) Tolerance to see differences as opportunities, not threats.</p> <p>3) Compromise and consensus to accept rules to show good will.</p> <p>4) Recognizing dignity of the opponent and focusing on the subject.</p> <p>5) Participation and readiness to engage in civil society.</p> <p>6) Education of citizens to access information and knowledge to evaluate the choices (Sztompka, 1999).</p>	<p>1) The theory focuses only on sociological aspect of trust.</p> <p>2) Current thesis is focused on trust towards government e-services. Therefore, the technological aspect is important to be considered, therefore, incorporated and analysed as well.</p>
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3	Trust verification agent	e-government, technology, management, security	<p>Entities that are involved in e-government security: Hard technology factors (IT infrastructure, applications), Soft management factors (policies, controls, regulations), Internal Organization has knowledge about actual security, E-government as an intermediate/communication layer. External Public - how public perceives security. How transparency is generated for the citizens regarding the trust, confidence, and privacy. The model consists of pre-interactional factors: a. Individual Citizen/Consumer Behavioural attributes. b. Institutional attributes. c. Technology. And Interactional Factors: a. Product/service attributes. b. Transactional delivery and fulfilment of services. c. Information content attributes (Rana Tassabehji, 2006).</p>	<p>1) The model was one presentation of how communication between citizens and state in e-government environment is transparent enough for the citizens to make informed decisions. 2) No algorithmic model was created nor tested, as it was concluded that established expert systems technology would be sufficient.</p>
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4	Generic Model of Trust for Electronic Commerce	Agents: trustor and another party; potential gain, risk, propensity towards trust, trust in the other party, trust in control mechanisms, personal experiences, communality, procedures and protocols control/monitor performance, understanding controls	<p>Competence belief - notion that the other party is useful for accomplishing my goal, the other party can provide/produce the expected result or another party can play a role in my plan/action.</p> <p>Dependence belief - the notion that another party is needed to accomplish my goal.</p> <p>Disposition belief - the notion that another party is willing to perform the task/action.</p> <p>Fulfilment belief - that my goal will be achieved (thanks to the other party).</p> <p>Trustor's transaction trust consist of:</p> <ol style="list-style-type: none"> 1) Threshold determinants: Risk and potential gain 2) trust determinants: Trust in other party and trust in control mechanisms (Yao-Hua Tan, 2000). 	<p>1) The model was developed for studying commercial environment rather than the government. This is a limitation because governmental activity cannot always be evaluated by financial gain, this can be one of the merits but not the main one.</p>
5	Commercial approaches			

5.1	Familiarity and Trust Model on the example of Amazon.com	e-commerce, vendor, purchase, familiarity, trust, disposition to trust	<p>Model consists of the following dimensions:</p> <ol style="list-style-type: none"> 1) Disposition to trust, 2) Familiarity, 3) Inquire, 4) Trust, 5) Purchase. <p>One must have trust in the online environment (in this case amazon.com) to undertake the action of purchasing.</p> <p>The study focuses on the role of familiarity and trust in e-commerce (Gefen, 2000).</p>	<p>1) Orientation towards commercial gains (purchase), whereas state e-services rarely end up with the purchase of a product or service.</p>
5.2	Consumer trusts in B2C e-Commerce and the importance of social presence	integrity, predictability, ability, benevolence, social presence,	<p>Research model:</p> <ol style="list-style-type: none"> 1) e-Trust consists of integrity, predictability, ability, benevolence. 2) e-Trust is influenced by the social presence, trust disposition, and familiarity (with the website). 3) e-Trust leads to purchase intention. <p>The research investigated the effect of social presence, trust disposition and familiarity on e-Trust and further purchase intentions (W.Straub., 2000).</p>	<p>1) Orientation towards commercial gains (purchase), whereas state e-services rarely end up with the purchase of a product or service.</p> <p>2) Research target group MBA students - does not give a full representation of population for general conclusions.</p> <p>The risks involved in the online environment were pointed out, but not investigated.</p>

5.3	Trust model and measurement instrument for Internet shopping	trust in service provider, security requirements (authentication, integrity, encryption), information protection, fairness and honesty of another party, competence skill, benefit, third party recognition, law and code, propensity of trust, perceived risk, loss	<ol style="list-style-type: none"> 1) Trustworthiness of Internet Vendor – in other words, trust in service provider <ol style="list-style-type: none"> a. Perceived Security Control b. Perceived Privacy Control c. Perceived Integrity d. Perceived Competence 2) External environment <ol style="list-style-type: none"> a. Third Party Recognition b. Legal Framework 3) Propensity of Trust 4) The consequence of Trust: Perceived Risk – perception that there are minimal risks that result in unexpected outcomes with undesirable consequences (Christy Cheung, 2000). 	<ol style="list-style-type: none"> 1) Orientation towards commercial gains (purchase), whereas state e-services rarely end up with the purchase of a product or service.
6	DeLone and McLean Information System success model		<ol style="list-style-type: none"> 1) Information Quality 2) System Quality 3) Service Quality 4) User Satisfaction 5) (Intention to use and) Use 6) Net benefit (William H. DeLone E. R., 2003) (William H. DeLone E. R., 2003) 	<ol style="list-style-type: none"> 1) The model initially designed to measure e-commerce system success. 2) The authors never conducted an empirical study; however other studies have done empirical validation. 3) General social and contextual factors are not addressed, such as risk, government as an institution, familiarity.

6.1	Trust and Electronic Government Success: An Empirical Study		<p>Different dimensions of the model:</p> <ol style="list-style-type: none"> 1) Trust in Government 2) Trust in Technology 3) Trust in e-government 4) Information Quality 5) System Quality 6) Service Quality 7) User Satisfaction 8) Intention to Continue Using <p>It was stressed that to understand e-government success; it is important to consider the role of trust as well as various Web site quality attributes (Thompson S.H. Teo, 2008).</p>	<p>1) The study focused on State Websites only, which is limiting it terms of e-services usage because State Websites might not provide e-service.</p>
7	Conceptual Citizen's Trust in e-Government: Q Methodology	e-government, trust, perceived risk, citizens' participation, technology acceptance model	<p>Dimensions of the proposed model:</p> <ol style="list-style-type: none"> 1) Trust in e-government, 2) Disposition to trust, 3) Familiarity, 4) Institution-based trust, 5) Technology Acceptance Model (TAM), 6) Perceived risk, 7) Intention to Engage. <p>The paper proposes a conceptual model of citizens' trust in e-Government. The model is integrated with multiple disciplines: psychology, sociology, e-commerce, and HCI. And the research was aimed to develop items to measure the theoretical constructs in the proposed model (Hisham Alsaghier, 2009).</p>	<ol style="list-style-type: none"> 1) The model focused on e-Government as a whole; the current thesis addresses state e-services specifically. 2) The model did not address the reason for use, nor the benefit or satisfaction of the user.

Appendix 2 – The online research questionnaire in English

Block I
How often do you use electronic means (web portal, email) while interacting with the state?
Which format of interaction with the state do you prefer?
Block II – General attitudes towards trust and e-government
Trust in e-Government
1. I gladly use electronic means to interact with the state
2. I trust Estonian public e-services
3. The specialists who develop e-services are trustworthy
4. I consider Internet voting secure
5. I consider Internet voting trustworthy
Familiarity
6. My family, friends and/or acquaintances use e-services
7. E-services have positive media coverage
8. I know how to find e-services on the Internet
9. I know how to use the Internet to use e-services or interact with the state
10. Using cryptographic algorithms and technological solutions provide secure e-services
Institution based trust

11. Estonian government uses my personal data in a legal and ethical manner only
12. Third parties do not have access to my personal data
13. I trust institutions of Estonian government
14. I trust specialists who work for the government
15. I trust that state institutions fulfil their responsibilities to Estonian citizens
Disposition to trust
16. E-services are developed in goodwill and in my interests
17. I think people are generally competent at their job
18. I can always count on my family, friends or acquaintances
19. Usually I trust people until they give a reason not to
20. People in Estonian generally keep their promises and are trustworthy
Block III – Technology and risks
Information Quality
1. When I use e-services, I receive the information that I need
2. Information in e-services is up-to-date
7. I use e-services because it saves me money (e.g. on paper, transport or other)
8. I know I receive e-service outcome in expected (promised) time
System Quality
3. E-services are personalized (they have been created in my best interest)
4. E-services provided are necessary
5. While using e-services I can control and monitor the result (e.g. i-voting, e-tax declaration, prescription status)
6. I think e-service providers are using security measures to protect my data

Service Quality
9. If I had issues while using e-services, I have terminated their usage
10. When I have had issues while using e-services, customer support has been helpful
11. When I have had issues while using e-services, customer support has not been helpful
13. My personal data is electronically better protected than on paper
Perceived risk
12. While using e-services I acknowledge the possible risks online (e.g. cyber threats)
14. I know how e-service provider uses my personal data
15. I know how e-service provider stores my personal data
16. I know how e-service provider protects my personal data
Block IV – Usage
Intention to use and USE
7. The option of using state services electronically is important to me
1. I have used e-services to interact with state, because that has been the only option
2. I have used e-services to interact with state, but I would prefer in person interaction
3. I plan to use e-services in the future
(End) User Satisfaction
2. I trust Estonian public e-services
7. The option of using state services electronically is important to me
4. While using e-services I have been satisfied with the quality

8. I use e-services because I understand how Estonian e-service system works
Net Benefit
5. I use e-services because they are convenient to use
6. I use e-services because it save me time
7. I use e-services because it save me money
Block V - Demographical questions
Gender:
Age:
Mother tongue:
What is your highest level of completed education?: (According to official levels of Statistics Estonia: http://pub.stat.ee/px-web.2001/Database/Sotsiaalelu/05Haridus/04Hariduse_uldandmed/HTG_01.htm):
Currently I am: Student
Currently I am: Self-employed
Currently I am: Entrepreneur
Currently I am: Public servant/Official
Currently I am: Employee
Currently I am: Military
Currently I am: Retired
Currently I am: Unemployed/ House spouse/Parental leave
I have used Internet:
Regularly I use Internet for: E-mail
Regularly I use Internet for: Reading news, searching information
Regularly I use Internet for: Listening music, watching videos or photos

Regularly I use Internet for: Communicating in social media (Facebook, Twitter, Instagram etc.)
Regularly I use Internet for: Blogging, sharing videos or photos
Regularly I use Internet for: Online shopping, travel bookings
Regularly I use Internet for: Other (please specify):
How frequently do you access the Internet from the following places?: Home / Smartphone
How frequently do you access the Internet from the following places?: Work (including home office)
How frequently do you access the Internet from the following places?: From public terminal (e.g. school, library, internet cafe)
What is your primary computing platform?: Windows (Microsoft)
What is your primary computing platform?: Macintosh (Apple)
What is your primary computing platform?: Linux
What is your primary computing platform?: Android
What is your primary computing platform?: Do not know
What is your primary computing platform?: Other (please specify):

Appendix 3 – The example of research questionnaire in Estonian

Eesti e-teenuste kasutamise usalduse uuring

Tere!

Magistritöö raames Tallinna Tehnikakõrgkoolis teen uurimustööd Eesti e-teenuste usalduse teemal.

Teie panus ja vastused aitavad mul saada põhjalik ülevaade sellest, millised tegurid mõjutavad lõppkasutaja usaldust e-riigi teenuste kasutamisel.

Küsimustik on anonüümne ja vastuseid kasutan üldistatuna.

Olen väga tänulik, kui leiate ligi 10 minuti selle täitmiseks.

Alustamiseks palun vajutage **Next**.

[Next](#)

0%

Eesti e-teenuste kasutamise usalduse uuring

Küsimused Eesti riigiasutuste e-teenuste kohta

e-teenus(t)e all peetakse silmas riigiasutuste elektroonilisi teenuseid (näiteks iseteenindusportaali), mille kasutamiseks peab end tuvastama (näiteks ID-kaardi, mobiil-ID, digi-ID, elamisloa või e-residendi kaardiga).

1. Kui tihti kasutate riigiga suhtlemiseks elektroonilisi kanaleid (email, veebiportaal)?*

- Alati
- Pigem tihti
- Pigem harva
- Mitte kunagi

2. Millist formaati eelistate riigiasutusega suheldes?*

- Telefon
- E-mail
- E-teenus(ed)
- Minna riigiasutusse kohale ja suhelda isiklikult riiki esindava ametnikuga (seegi, kui see tähendab sõitu teise linn)

[Back](#) [Next](#)

14%

Eesti e-teenuste kasutamise usalduse uuring

Küsimused Eesti riigiasutuste e-teenuste kohta

e-teenus(t)e all peetakse silmas riigiasutuste elektroonilisi teenuseid (näiteks iseteenindusportaalid), mille kasutamiseks peab end tuvastama (näiteks ID-kaardi, mobiil-ID, digi-ID, elamisloa või e-residendi kaardiga).

3. Palun märgi oma arvamus skaalal 1-6, seejuures 1 – ei nõustu üldse ja 6 – nõustun täielikult*

	1	2	3	4	5	6
1. Kasutan hea meelega riigiga suhtlemiseks elektroonilisi kanaleid ja võimalusi	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Usaldan eesti riigi e-teenuseid	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. E-teenuseid loovad spetsialistid on usaldusväärsed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. Leian, et e-valimised on turvalised	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. Leian, et e-valimised on usaldusväärsed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. Minu pereliikmed, sõbrad ja/või tuttavad kasutavad e-teenuseid	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. E-teenustel on meedias positiivne kuvand	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. Oskan leida riigi poolt pakutavaid e-teenuseid Internetis	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9. Oskan kasutada Interneti riigiga suhtlemiseks või e-teenuste kasutamiseks	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10. Tean, et krüptograafiliste algoritmide ja tehnoloogiliste võimaluste kasutamine tagavad e-teenuste turvalisuse	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11. Eesti ametiasutused kasutavad mu isiklike andmeid ainult seadusandluses lubatud viisil ja eetilisel moel	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12. Kolmandad osapooled ei oma ligipääsu minu isiklikele andmetele	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13. Usaldan eesti riigi asutusi	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14. Usaldan üldiselt spetsialiste, kes töötavad riigiasutustes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
15. Usun, et riigiasutused täidavad omapoolseid kohustusi kodanike ees	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16. Ma eeldan, et e-teenused on loodud heas usus ja arvestades minu huve	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
17. Arvan, et inimesed on oma töövaldkonnas tavaliselt kompetentsed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
18. Oma pereliikmete, sõprade või tuttavate peale saan alati loota	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
19. Tavaliselt usaldan inimesi, kuni nad pole andnud mulle põhjust neid mitte usaldada	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
20. Eesti kultuurinuumis inimesed üldiselt peavad oma lubadusi	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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Next

29%

Eesti e-teenuste kasutamise usalduse uuring

Küsimused Eesti riigiasutuste e-teenuste kohta

e-teenus(t)e all peetakse silmas riigiasutuste elektroonilisi teenuseid (näiteks iseteenindusportaal), mille kasutamiseks peab end tuvastama (näiteks ID-kaardi, mobiil-ID, digi-ID, elamisloa või e-residendi kaardiga).

4. Kuidas suhtud järgnevasse väidetesse e-teenuste kohta skaalal 1-6, kusjuures 1 – ei nõustu üldse ja 6 – nõustun täielikult *

	1	2	3	4	5	6
1. E-teenuseid kasutades saan tavaliselt mulle vajaliku informatsiooni	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. E-teenustes kuvatud informatsioon on ajakohane	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. E-teenused on personaalsed (need on loodud pidades silmas minu huve)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. Pakutavad e-teenused on vajalikud	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. Saan e-teenuse staatust kontrollida (nt e-hääletamisel häält muuta, digiretsepti väljaostu jälgida, arupärida enda kohta tehtud päringute osas)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. Anvan, et e-teenuse pakkuja rakendab vajalike turvameetmeid kaitsmaks minu andmeid	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. Mulle meeldib, et riigi teenuseid on võimalik kasutada elektrooniliselt	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. Tean, et saan e-teenuse abil tellitud dokumendi, andmed või muu tulemi lubatud aja jooksul	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9. Olen lõpetanud e-teenuse kasutamise, kui olen sellega hätta jäänud	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10. E-teenust kasutades olen tajunud vajadust pöörduda kasutajatoe poole ning saanud abi	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11. E-teenust kasutades olen tajunud vajadust pöörduda kasutajatoe poole aga ei ole saanud abi	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12. Kasutades e-teenuseid, teadvustan endale võimalikke riske (nt küberohud)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13. Minu andmed on elektroonilises vormis paremini kaitstud kui paberdokumentidena	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14. Ma tean, kuidas e-teenuse omanik/haldaja kasutab minu isiklike andmeid	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
15. Ma tean, kuidas e-teenuse omanik/haldaja hoiustab minu isiklike andmeid	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16. Ma tean, kuidas e-teenuse omanik/haldaja kaitsneb minu isiklike andmeid	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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Next

43%

Eesti e-teenuste kasutamise usalduse uuring

Küsimused Eesti riigiasutuste e-teenuste kohta

e-teenus(t)e all peetakse silmas riigiasutuste elektroonilisi teenuseid (näiteks iseteenindusportaal), mille kasutamiseks peab end tuvastama (näiteks ID-kaardi, mobiil-ID, digi-ID, elamisloa või e-residendi kaardiga).

5. Palun märki oma arvamus skaalal 1-6, seejuures 1 – ei nõustu üldse ja 6 – nõustun täielikult *

	1	2	3	4	5	6
1. Olen kasutanud riigiasutustega suhtlemiseks e-teenuseid, kuna see on olnud ainus võimalus	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Olen kasutanud riigiasutustega suhtlemiseks e-teenuseid aga võimalusel eelistaksin isiklikku suhtlust	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Plaanin tulevikus e-teenuseid kasutada	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. Olen e-teenuseid kasutades jäänud teenuse kvaliteediga rahule	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. Kasutan e-teenuseid, sest neid on mugav kasutada	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. Kasutan e-teenuseid, sest nii säästan oma aega	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. Kasutan e-teenuseid, sest nii säästan raha (paberi, transpordi vms osas)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. Eesti e-teenuste süsteem on hästi üles ehitatud	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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57%

Eesti e-teenuste kasutamise usalduse uuring

Üldised küsimused

6. Sugu: *

- naine
- mees

7. Vanus: *

- < 18
- 19-29
- 30-44
- 45-59
- 60+

8. Emakeel: *

- eesti
- vene
- muu (palun täpsusta) *

9. Kõrgeim lõpetatud haridustase (Statistikaameti haridustasemetete alusel http://pub.stat.ee/px-web.2001/Database/Sotsiaalelu/05Haridus/04Hariduse_uldandmed/HTG_01.htm): *

- Põhiharidus
- Üldkeskharidus
- Kutseharidus
- Esimese astme kõrgharidus (rakendus, kutse, diplomiõpe, bakalaureus)
- Magistriharidus
- Doktoriharidus

10. Hetkel olen: (võid märkida ka mitu valikut) *

õpilane/üliõpilane

FIE

ettevõtja

teenistuja/ametnik

töötaja

ajateenija

pensionil

töötu/kodune

muu (palun täpsustada)

11. Internetti olen kasutanud: *

alla aasta

1-3 aastat

4-6 aastat

6 või rohkem aastat

12. Internetti kasutan: (vali kõik, mida kasutad regulaarselt) *

E-kirjavahetuseks

Uudiste lugemiseks, info otsimiseks

Muusika kuulamiseks, failide ja videote vaatamiseks

Sotsiaalmeedias suhtlemiseks (Facebook, Twitter, Instagram vms)

Blogimiseks, videote ja piltide üleslaadimiseks

E-poodides ostlemiseks, lennupiletite ja majutuse broneerimiseks

muu (palun täpsustada):

13. Internetis käin:

	kord aastas või harvemini	vähemalt kord poolaastas	vähemalt kord kvartalis	vähemalt kord kuus	vähemalt kord nädalas	iga päev
Kodus / Nutiseadmes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Kontoris / Tööl (kaasaarvatud kodukontor)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Avaliku Interneti punkti arvutis (kool, raamatukogu, Interneti-kohvik vms)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

14. Kõige enam kasutan järgnevat platvormi: (võid märkida ka mitu valikut) *

Windows (Microsoft)

Macintosh (Apple)

Linux

Android

Ei tea

muu (palun täpsusta)

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Next

71%

Eesti e-teenuste kasutamise usalduse uuring

Ongi valmis!

Sinu vastused aitavad saada ülevaate eesti e-teenuste usalduse teemal.

Vastuste esitamiseks vajuta palun **Submit**.

Aitah Sulle!

Back

Submit

86%

Appendix 4 – The example of expert questionnaire in Estonian

Eestis kasutatakse e-teenuseid üsna laialdaselt (98% tuludeklaratsioonidest esitatakse ja 95% retseptidest kirjutatakse välja elektrooniliselt). Seega, mu esimene eeldus on, et riigiasutuste e-teenuseid kasutatakse, sest neid usaldatakse. Minu uurimusküsimus on, milliseid meetmeid kasutavad e-teenuste arendajad/omanikud/haldajad, et usaldust luua.

I Üldine usaldus e-riigi vastu

Disposition to Trust

1. Mis on Teie jaoks usaldus e-riigi lahenduste vastu? Millistest komponentidest see koosneb või mis on Teie jaoks usaldusest rääkides olulised tegurid/meetmed?
2. Kas eesti kultuuriruum, sotsiaalne ja majanduslik keskkond soosib üldist usaldust?

Institution Based Trust

Oma uurimuses olen jõudnud järeldusele, et asutused saavad mõjutada kasutajate usaldust administratiivsete meetmetega.

3. Kirjeldage millised administratiivsed (who does what and when and where) meetmed asutus kasutab, usalduse loomisel?
4. Kas Teie asutus on uurinud oma lõppkasutajate seas usaldust?
5. Mida teeb Teie asutus selleks, et oma lõppkasutaja usaldust hoida ja kasvatada?

Familiarity (knowledge based)

6. Kirjeldage, kuidas Teie asutus oma e-teenuste kasutajaid toetab. Näiteks, Teil on kasutusjuhendid, videod jms või pakute koolitusi. Kirjeldage natuke seda protsessi.
7. *Vajadusel: On Teie asutuse esindajad külastanud näiteks koole või asutusi ning teevad koolitusi?*

Trust in e-Government

8. Milline on Teie jaoks usaldusväärne e-teenus?
9. Kirjeldage millised organisatoorseid (how it is done?) meetmed asutus kasutab, usalduse loomisel?

10. Milliseid juriidilisi (seadus, määrus) või protsessilisi meetmeid Teie asutus rakendab, e-teenuste arendamisel/haldamisel – siin ma mõtlen spetsiifilisi seaduseid, mis mõjutavad konkreetselt Teie asutust (EiDAS)? Kuidas seostub usalduse loomine Teie asutuse strateegilistesse plaanidesse ja kuidas see väljendub (standardite loomisel kaasalöömine jne)?

II Risk ja tehnoloogia

Information Quality

1. Kuidas Teie asutus tagab e-teenuse kättesaadavuse ja töökindluse? Kas Teie e-teenustele on kehtestatud SLA-d (service level agreement) ja kuidas toimub selle järelevalve?
2. Kuidas Teie asutuse e-teenused on kohandatavad ja personaliseeritavad?
3. Milliseid meetmeid, protsesse, tehnoloogiaid Teie asutus rakendab, et luua turvalisi ja usaldusväärseid e-teenuseid?

System Quality

4. *Vajadusel: Milliseid tehnoloogilisi ja protsessilisi meetmeid Teie asutus rakendab, et luua turvalised ja usaldusväärseid e-teenuseid?*
5. Kuidas Teie asutus tagab e-teenuste turvalisuse ja milliseid turbemeetmeid (infoturbe, küberturbe jne) rakendatakse?
6. Milliseid standardeid asutus kasutab e-teenuste loomisel, haldamisel, edasiarendamisel?
7. Milliseid rahvusvahelisi tehnoloogia suundi (nt vabavara), standardeid vms asutus veel silmas peab e-teenuste puhul?

Perceived Risk

1. Millised on riskid on e-teenuste arendamisel/haldamisel? On Teie asutus teostanud e-teenuste riskianalüüsi? Kuidas neid riske maandatakse?
2. Milliseid riske tajub lõppkasutaja? Kuidas neid riske asutus maandab?
3. Ma oletan, et asutus on langenud ka küberründe ohvriks? Kuidas sellele olukorrale reageeriti (on selleks mingi konkreetne protokoll)? Kuidas on see e-teenuse kasutajad mõjutanud?

Service Quality

4. Milliseid kommunikatsiooni meetmeid Teie asutus kasutab suheldes avalikkuse või oma kasutajaskonnaga?

5. Kuidas tagab Teie asutus, et e-teenused on lihtsasti arusaadavad?
6. Kuidas Teie asutus tagab, et e-teenused on kvaliteetsed ja ajakohased (kas teenus on kogu protsessi vaates kasutatav e-kanalis või on kasutajal vajalik lisaks e-teenuse kasutamisele veel kuhugile kohale tulla)?
7. Kas teil on kasutajatugi? Ja milline on kasutajatoe kättesaadavus?
8. Kuidas teie asutus tagab kasutajatoe empaatia kasutajate suhtes?

III Kasutamine

Intention to use and Use

1. Kui palju on Teil aktiivseid e-teenuste kasutajaid?
2. Milline on e-teenuste kasutajate hulk ajas? Kasvanud, langenud või jäänud samaks.

(End) User Satisfaction

3. Kas Teie asutus uurib e-teenuste lõppkasutajate rahulolu?

Net Benefit

4. Miks peaks tavakasutaja eelistama e-teenuseid, telefoni teel asjaajamisele või asutusse isiklikult kohale minemisele?
5. Mille poolest on e-teenused lõppkasutajale paremad, kui näiteks paberil?

Mina olen oma küsimustele vastused saanud. Kas soovite midagi täiendavalt lisada?
Tänan, et leidsite võimaluse minu uurimustöös osaleda ning küsimustele vastata!

Appendix 5 – The panel of experts who participated in the interviews

Table 7 Panel of experts.

Name	Position	Time of the interview.
Kalev Pihl	Member of the Board of Certification Centre	29.04.2016
Andrus Voolaine	Quality Expert in Information Technology Centre of the Ministry of the Interior	29.04.2016
Andres Kütt	Head Architect in Estonian Information System Authority	2.05.2016
Martti Allingu	Head of the Internal Audit and IT Security Department in Centre of Registers Information Systems	4.05.2016
Peeter Ross	Expert in E-health, E-health area professor in Technomedicum of Tallinn University of Technology	5.05.2016

Appendix 6 – Correlation analysis between studied dimensions

Table 8 Correlation analysis between studied dimensions

Correlation analysis											
	Trust in e-Government	Familiarity	Institution based trust	Disposition to trust	Information quality	System quality	Service quality	Perceived risk	Intention to use/use	End user satisfaction	Net benefit
Trust in e-Government	1	,580**	,655**	,471**	,621**	,661**	0,029	,254**	0,065	,727**	,471**
Familiarity	,580**	1	,523**	,469**	,686**	,557**	-,162*	,326**	0,08	,635**	,522**
Institution based trust	,655**	,523**	1	,616**	,587**	,671**	0,029	,462**	,154*	,594**	,372**
Disposition to Trust	,471**	,469**	,616**	1	,540**	,604**	-0,023	,298**	,251**	,581**	,458**
Information quality	,621**	,686**	,587**	,540**	1	,659**	-,152*	,240**	,203**	,754**	,587**
System quality	,661**	,557**	,671**	,604**	,659**	1	-0,07	,373**	,208**	,672**	,495**
Service quality	0,029	-,162*	0,029	-0,023	-,152*	-0,07	1	0,049	,207**	-0,094	-0,114
Perceived risk	,254**	,326**	,462**	,298**	,240**	,373**	0,049	1	0,093	,296**	,172*
Intention to use/use	0,065	0,08	,154*	,251**	,203**	,208**	,207**	0,093	1	,212**	,288**
End user satisfaction	,727**	,635**	,594**	,581**	,754**	,672**	-0,094	,296**	,212**	1	,653**
Net Benefit	,471**	,522**	,372**	,458**	,587**	,495**	-0,114	,172*	,288**	,653**	1
**. Correlation is significant at the 0.01 level (2-tailed).											
*. Correlation is significant at the 0.05 level (2-tailed).											