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TECHNOLOGICAL DYNAMICS IN PUBLIC SERVICE. A CASE STUDY OF THE ESTONIAN RESCUE BOARD

Master's thesis

Technology Governance

Supervisor: Professor Dr. Robert Krimmer

Tallinn 2016

Hereby I declare that this master's thesis, my original investigation and achievement, submitted for the master's degree at Tallinn University of Technology, has not been submitted for any other degree or examination.

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The master's thesis meets the established requirements

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Allowed for defence: „....."…..... 2016

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ABSTRACT

Modern public service organizations of the world have changed considerably due to technological developments around us. New ICT solutions and technological equipment are applied in the internal operations of the organizations as well as virtual services are offered to the population in these countries. Estonian Rescue Board, an Estonian public service organization responsible for the public fire and rescue service in Estonia, is an organization where new technological solutions play an important role for offering good fire and rescue service to the population of Estonia.

Main research question of the present thesis is how the application of new technological solutions has impacted a public service, including delivery, use and institutional aspects, on the case of the Estonian Rescue Board. Author of this thesis has examined the present technological condition of the organization under study and tried to find out how to improve upon the technological dynamics of the organization. To answer the main research question, an ERB TDT framework was applied. Three out of five main fields of activities of the Estonian Rescue Board were scrutinized in the light of technological development and appropriateness of technological change of the organization has been tried to put through test in this paper. Main findings of the thesis proved that the application of new technological solutions has greatly impacted the activities and institutional aspects of the organization and assisted in the better delivery of fire and rescue service to the population by offering speedier and more comfortable services to the population of Estonia. In the following it has been proved that technological dynamics of the Estonian Rescue Board is good and organization belongs to the group of modern public service organizations by being technologically well developed, but by still having some space for further technological dynamics.

Key words: ICT solutions, technological equipment, virtual services, E-governance, digi map

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1. INTRODUCTION

General topic of the present thesis is technological dynamics in the public service and it is developed by using an example of technological developments in public service institutions on the example of one concrete public service institution, the Estonian Rescue Board.

We live in an era of fast technological developments. Speed and operational reliability of internet have improved; mobility and instant connectivity; immediate records, data and information interchange present grand conveniences for persons, institutions and governments (Milakovich 2012, 246). Modern public service with its numerous organizations is not intact of technological developments. According to Hood (1991, 3) one of the administrative „megatrends" is dynamics of automatization, supremely in IT for the fabrication and diffusion of public sector services. In Great Britain it all started already in the 1970s with the use for internal purposes and since the end of the 1990s external population provision became viable (Local Government Association Report 2014, 12). Hence, one might say application of IT-solution has started in „inner circles"of public institutions with vital importance to the organizations operations like book-keeping and expanded into IT-solutions and services offered to the public. According to Garson (1999, 45), the World Wide Web as a technological development is the booster of the activities of the public service, enabling unbounded possibility to gain information from online for the offering of better public services and information delivery for the population. E-governance and e-government are present trends in the modern public services to employ ICTs and enhance better public services for the population through the use of the „World Wide Web" (Ramnarine and Endeley 2008, 23). Digital technological solutions are offering a wide range of possibilities to carry out the tasks of keeping records, managing databases and online public services for the citizens in a new way and are adopted by the public service organizations (*Ibid.* 213).

Concept of Smart Cities is becoming more and more popular and towns are reaping benefits from governance enhancing ICTs or „smart governance" by broadly involving technological solutions (Chourabi et al 2012, 2292). Smart cities are part of smart states.

For such smart state development, public services, top of the notch equipment and technological solutions should be integer (Lee et al 2013, 286–306). Modern public service organizations use up to date ICT-solutions as well as top of the notch equipment. The police has been midst bosses of ICT change in public services (Ericson and Haggerty 1997, 389), but is using also new technological devices like closed circuit television (CCTV) cameras to ensure public safety and get the necessary information are used. Innovative technological equipment and solutions, just to mention some of these, smoke detector[i], eCall technology[ii], TIC[iii], UAS[iv], CobraColdCut technology[v] are available at the market also for the fire and rescue services.

Estonia is among the few countries of the world which has declared access to internet as one of the legal rights for its citizens (Milakovich 2012, 209). In the year 2013 internet was used by 80% of the population of Estonia between the age of 16 to 74 years (Ministry of Economic Affairs and Communications of the Republic of Estonia 2015). This fact in itself has given and is continuously giving a strong stimulus for the rapid ICT technological developments and have made inhabitants of the country more prone to the acceptance of new technological solutions, which can be observed in the process of the fast development of e-banking services (Luštšik 2003, 17-19, 22) alike in the process of impetuous development of E-governance in the country (Schware and Deane 2003, 13).

Institution under research is an Estonian public service institution Estonian Rescue Board (ERB) which is responsible for the ensuring of civil protection services in the Republic of Estonia. Main fields of activities of ERB are prevention work (fire and water accidents), fire safety supervision, crisis management, rescue works, explosive ordnance disposal (Estonian Rescue Board 2014). According to the objectives and strategic choices of the new „Strategy of the Estonian Rescue Board 2015-2025" out of date technologies should be modernized and new technological solutions assimilated to improve upon the quality of public services provided by the ERB (Estonian Rescue Board 2014, 38). This way ERB votes for the technological progress. On the other hand, Strategy admits the fact that this makes the organization and other related actors more vulnerable because of growing dependency upon different technologies not controllable by the institution (Estonian Rescue Board 2014, 8-9).

In the present thesis technological condition of the ERB is researched and analysed. Appropriateness of technological change at the ERB will be tried to put to the test in this paper.

There is no overly amount of researches carried out so far concerning the technological change in public services and specifically in the area of the fire and rescue service. Research is limited to some specific areas: rescue operations, where various projects, technological researches are carried out in developing of series of technologies enabling to save human lives in largescale disasters (Kitano and Tadokoro 2001). In the field of fire technologies researches have been carried out already in 1977 i.e. about the use of Landsat digital technology to map the fuel types of fires in forests (Kourtz 1977). An important topic handled in fire technological research is how home smoke alarms turn out to be the most effective technological fire prevention solutions at home in comparison to other fire technological solutions (Bukowski et al 2007, xxiii). Topic of rescue robotics has been researched widely and internationally (Murphy et al 2008, 1151-1173).

Most of previous researches are about finding, developing and possibly applying new technological solutions by the fire and rescue field and are directed outwards. There is a gap in literature describing the technological state of the art for institutions like the one under investigation. Hence, present research is making its modest contribution to this gap in literature with a notion, the more we know about the technological condition of a public institution and related scientific approaches and frameworks, the better we possibly are prepared for actual forthcoming technological changes. In case of the ERB these change are supported by important policy documents which are the ERB Strategy 2015-2025 and Internal Security Development Plan 2015-2020 where smart, optimal and effective solutions are foreseen as means of ensuring fast and competent assistance for the inhabitants of Estonia for improving the safety in country (Estonian Rescue Board 2014, 16, 38; Ministry of the Interior of the Republic of Estonia 2015, 22).

The main research question is:

- How the application of new technological solutions has impacted a public service, including delivery, use and institutional aspects, on the case of ERB?

In order to find the answer to the main research question of this thesis, two sub-questions will be scrutinized:

1. How and what technology has ERB used so far for internal and external purposes?
2. What new technological solutions have been lately considered for the improvement of the technological condition of the ERB?

Present thesis intends to be an exploratory case study of a public institution responsible for the fire and rescue services in Estonia. Method of semi-structured interviews is used to get a clearer picture about the technological condition of the ERB.

In order to present the analysis, the paper is divided into five parts. The first or the present part gives an overall picture of technological dynamics in the public sector, substantiates the selected topic and is finalized by a brief overview of the paper. The second part comprises the used framework and methodologies applied. Theoretical framework used is Pollitt's conceptual framework for analysing the effects of technological change on the public services (Pollitt 2012, 70). Third part is the case study of the ERB, where interviews are carried out with the employees of ERB and IT Development Centre of the Ministry of Interior (SMIT) and analysed. Fourth part of the paper is followed by discussion about the validity of the results from the research paper and links the theoretical and empirical parts. Last part is conclusion which contains and re-accents the main findings of the thesis.

It should be noted that main obstacles on the way of technological dynamics in the public service are deficiency of political volition and managerial know-how for the application of new technological solutions (Milankovitch 2012, 247) and main pace reducers are finances, organization of institution, developments in politics (West 2005, 172). Public service organizations in general are not fast to improve upon their technological dynamics as adaptation of new technological solutions requires numerous changes including changes in position names, rephrasing of the partition of tasks, new job descriptions, over calculation of wages (West 2005, 172). Hypotheses of Milankovitch and West will be put at a test in the present thesis.

Next step of this research paper is to take a solid look at the framework of the present thesis.

2. THEORETICAL FRAMEWORK

The present chapter of the thesis contains the applied framework and the research methodologies used.

Several models and frameworks have been proposed earlier by the researchers to analyse the technological situation. Author of the present thesis has considered applying as a framework for this research the technology acceptance model (TAM), which allows testing information systems (Davis 1985, 2). According to Davis (1985), this model enhances the comprehension of the processes how users accept new information systems and assists in finding out prior to the use of new information systems if these will be appropriate to the needs of the users as well as to find out through testing the motivation to use such new solutions. Still, this model would remain insufficient to find the answer to the main research question and would be information systems oriented, while at the ERB technological devices, equipment and people play also a remarkable role in the technological development. Another possible framework considered by the author of this thesis, was an evaluation framework for the information systems based on content, context, process (CCP) and proposed by Stockdale and Standing (2005). With this framework the main emphasis would be on evaluation of the information systems, but objective of the present thesis is to find out the current technological situation of the ERB, possible ways forward and not just about the information systems, but also about equipment, organizational approaches. Aim of the present thesis is to answer the main research question by using a concentrated framework, rather than getting an analysis of related wide scale social, political and cultural factors.

Therefore, as mentioned already in the Introduction, Pollitt's conceptual framework for analysing the effects of technological change on the public services (Pollitt 2012) will be applied as a framework for this thesis. This framework shows the influence of new technologies on public service, how have these influenced the implementers of new technological solutions, what other significant modifications have these produced in public service. Further on, Pollitt's framework will assist in the analysis of the technological dynamics of ERB in the core chapter of the research paper as well as to find answer to the main research question.

2.1 Conceptual framework for analysing the effects of technological change on the public services

Framework used in the present paper is elaborated by Pollitt and contains in original ten variables. In this thesis a limited set of variables or „dimensions" from Pollitt's framework are used. Variables of the framework used are the ones which add value to the present research, namely assist in the case study analysis of finding out how and what technology has ERB used so far for internal and external purposes and what new technological solutions would improve the technological condition of the ERB. Framework variables not adding perceivable value to the current research, are excluded. For example a dimension „Changes in service users" does not add value to the current research paper as most public services offered by ERB to the population are face-to-face services like extinguishing of fire or cutting out victims from the cars in traffic accidents. For that purpose no expanded internet literacy of the service user is requested in a rather highly internet-minded population and inclusion of the dimension does not add value to the paper. „Changes in location of activities" framework dimension does not add value either like the previous dimension as in the digital era public service institutions not being face-to-face service providers can take advantage of this dimension by offering most of their public services via internet. Criterion „Technological change and profit" is not appropriate in the context of the ERB technological case study as most of the ICT public procurements for the ERB are not carried out by the organization itself. „Shifts in perceptions of space and time" is a dimension applicable equally in all societal sectors and therefore not included into the framework of the present thesis.

2.1.1 Shifts in citizen′s perspective

Citizen′s perspective or what is the approach of the citizens when public institutions use new technological solutions for the providing of public services has been put at a test constantly through the last decades in the UK by numerous reallocations of public

institutions to the regions, contracting out tasks, movement to the internet of most public institutions. Uniting key word for the use of new technological solutions by the public sector is Internet and internet-based services. (Pollitt 2012, 56-58, 70)

Internet-based public services or „digital governance" give substantial advantages for the service users by saving their time and money and is the best solution for all stakeholders if implemented functionally and focused towards the citizens (Milakovich 2012, 248). Mobile phone related new solutions and rapidly enhancing web technologies are widening the pool of possibilities for the citizens for self-catering as well as electronic communication with the public service organizations by possibly decreasing demand or switching to cut-rated means of communication (Local Government Association Report 2014, 38).

2.1.2 Shifts in service provider′s perspective

Use of mobile phone, its handy developments and new web solutions render possible for the employees of the public service organizations to carry out their work tasks even when not physically in the office, spread necessary information between different institutions, decrease costs of operation, remove doubling, enhance capacity (Local Government Association Report 2014, 38).

The question related to the above shift is how does public service institutions personnel look at the appearance, application of new technologies, what does it change for them? New technologies make locational shifts for public service organizations and employees possible with the goal to decrease costs (rent and salary), more versatile pool of employees, to lower the level of unemployment in outskirts and healthier living environment (than in big towns) when transport and communication technology solutions are good (Pollitt 2012, 58).

Big database systems supporting the work of public service institutions can be located anywhere, like the Schengen Information System (SIS) which is located in France and Austria, but serves UK (and all other Schengen countries) (Pollitt 2012, 59).

Communication and surveillance technologies allow police to carry out its work more efficiently than in the past (*Ibid.* 59).

Another shift in service providers perspective is closing down of smaller units and maintaining single bigger units like in case of closure of small hospitals in Europe by serving „professional, financial, technological logic"(*Ibid.* 61).

New technologies can be crafty when they appear in public services as officials act according to the established networks in the daily grind by using the internet data and systems of communication and suddenly alterations in structures appear to settle the new technologies (Fountain 2001, 90). Acceptance of structural modifications in organization caused by the application of new technologies, depends greatly on the individuals overall acceptance of innovations and new challenges. Another new technology related challenge for the officials emerges when the digital governance and virtual services work admirably with a focus towards the service user, but the price for the system effectiveness is dismissal of not apt to technological changes personnel (Milakovich 2012, 248).

2.1.3 Changes in tasks

Traditionally hierarchically disposed public service organizations are turned more and more into digitally governed network organizations, which means these organizations must face a lot of new technological (as well as organizational) challenges in the process of technological transformation of the public sector organizations in many countries of the world (*Ibid.* 214). According to Sarter et al (1997, 7) existing systems do not remain the same and the human's role in the system will change remarkably upon implementation of new technologies or expansion of the existing ones.

Arrival of new technologies always creates the need to carry out previously implemented operations in a new manner, even if we consider the simplest examples of moving from ordinary phones to mobile phones and now to smart phones; from type writing to computerized typing. This technological progress required new skills, knowledge and widened the options for carrying out previous operations, tasks in a new way or in essence, changing the tasks.

According to Pollitt (2012, 61), application of new technologies by the public services requires carrying out of novel type of work. Prior to appropriate and available ICT

solutions, most state pensions were paid out in cash in post offices of UK, after the technological change, payment takes place electronically (*Ibid.* 63).
Tasks of public safety organizations have been altered because of the proliferation of numerous new technologies and technological solutions like positioning systems, technologically improved uniforms for fire fighters, devices imaging heat as well as connection nettings rendering possible contact among all public services via internet and last but not least improved and enhanced transport means for specific uses (Gray and Stockbridge 2004, 31).

2.1.4 Changes in public officials

As it was marked in the previous sub point, arrival of new technologies transforms the former existent tasks. Usually new technologies require acquiring of new knowledge. In organizations there is always the possibility to re-train or re-educate the existing employees, but when we speak about technological change and re-training of an official, time and capabilities of an official are crucial aspects. Ceaselessly volatile new technological solutions claim upwards and faster employees teaching and training.

New technology related tasks are becoming more complicated and hence more highly educated and trained employees are required and hired into public service organizations. In addition, public officials and personnel employed to public service organizations are becoming further reliant on external experts as application and maintenance of new technological devices and IT-solutions in public service organizations require technical know-how which is not available in the organization itself. Another aspect is that today's ICT solutions enable very often to reposition certain jobs from the capitals to local areas, which might draw in the local labour market and new personnel with necessary for the service know-how. Whereas traditional positions at public service like clerks responsible for catalogues and files in physical archives lockers and typist have vanished in modern public service. (Pollitt 2012, 63)

2.1.5 Technological change and savings

In present chastity of public budgets, discharge of public personnel, finding new ways „to create additional finances" a lot of officials can see only the one (although important) perspective of technological change which is the big launching costs, but cannot see the opportunity for benefits or savings (Milakovich 2012, 248). State sector in general looks towards new technologies in a belief of costs economy as well as to become more rapid and efficient in its operations (*Ibid.* 66). Is it always the case in public sector institutions that new technologies enable to reduce costs? The answer to the question is yes and no. It is rather yes if new technological solutions allow to carry the same tasks out more swiftly, with less of time in comparison to the use of old technologies and by this way, allowing to increase the number of tasks for the same money or dismiss part of employed personnel (*Ibid.* 66). One factor which might reduce the surplus optimism of public organizations managements concerning adaptation of new technological solutions, is the fact (already mentioned beforehand) that in order to benefit on savings from new technologies used, big investments are requested at the initial launching stage to pay off in the future (*Ibid.* 66). One one hand, promising opportunities to reduce on costs, time, people exist for the public service through the application of new technologies and technological solutions as market is full of innovative and rapidly developed technologies. On the other hand, public service managements face the problem of finding new and free financial means for the launching and application of these new technological solutions. From the „no savings" side speak the numerous governmental IT projects, which have failed *en bloc* or survived partly by virtue of vast and unanticipated fund injections (*Ibid.* 67). Causes for such failures may vary. However, according to Pollitt's notion traits present are absence of in-house expertise, feebly composed agreements, continual alterations in „data sheet" by politicians or officials and the situation where in course of the adaptation of new technological solutions it is cheaper to stay in a project than to leave, yet the increasing expenditures and weak technological performance are obvious (Pollitt 2012, 67). Savings on time and on money through the technological change can be created per joint sharing of technological IT-resources of the public service organizations i.e. the Public Services Network (PSN) in UK in which the purpose is to decrease governmental

costs all over the country as well as to have safe information distribution and „joined-up and shared public services" for citizens. (Local Government Association Report 2014, 26). It is also worthwhile to keep in mind the observation by Milakovich (2012, 248) where if governmental institutions base their technological investment decisions on just their own in-house earning power, it freely may occur that they might misplace means or underrate benefit from technological investment.

2.1.6 Impacts on rules

The Weberian bureaucratic model suggests that government and its institutions must be arranged according to sheer rules promoting predictability and legitimacy (Lane 2000, 165). This is the way how governmental organizations operate.

Upon the arrival of new technological solutions, tasks are carried out in a novel way, which does not fit comfortably with the old, accustomed rules. This in turn generates the need for transformation of old existent rules. (*Ibid.* 67) To say it rather simply, novel technologies have to be involved into institutions daily grind and officials must be innovatively and collectively minded (West 2005, 31).

Data management is one of the tasks carried out with supreme strictness in public organizations and all set rules must be followed. New and multiple communication technology solution uses in parallel in public service institutions have caused contradictions in data and its management and this has led to the review of old rules and replacing these with new ones *(Ibid.* 67). Using of new digital technology solutions raises the question of security and confidentiality: who should have what level of access to which databases and for what purposes. Prior to e-governance these topics where not relevant, but with the application of digital governance the situation and the „rules of the game" have changed. Public IT and e-governance security policy ingredients like „authentication", „encryption", „data disposal","data sharing" key words have all rules, procedures and plans behind them (Garson 2006, 215- 216), which did not exist prior to digital governance era. According to Sharma (2004, 33) in course of e-governance, former clear lines which were easily visible between public institutions, are becoming

cloudy. This cloudiness in between organizational borders will need to be defined newly (Pollitt 2012, 68).

To sum up the present framework point, Milakovich (2012, 3) states that numerous public service institutions are reviewing their old rules, which include strategies, workforce set up, technological norms in order to serve the public in an over "wired", yet at the same time fewer steady economics life**.**

2.1.7 Conceptual framework

Technological development, dynamics is about carrying out of previous processes in a new and expectedly better way with the assistance of new technological solutions. Progressively public services in the world understand the need for enhanced technological dynamics and *automatization of processes* in order to survive under the conditions of financial austerity by ameliorating services for the public, companies and through the enhancement of public service employees' effectiveness. I.e. the Government of Liechtenstein has one scenario in public services which includes bettering *the internal and external processes through automation* (Nintex Case study, Public Administration of the Principality of Liechtenstein 2013). Most of the modern public services, including ERB have the same technological approach. If we talk about the technological dynamics of the ERB, its automatization, in order to be successful, it might be beneficial to keep in mind the Process Model according to which automatization itself has to be followed by monitoring and analysis and last but not least optimization for improved technological results (Cumulative Engineering 2014).

On the basis of the previous Pollitt's framework above listed six criterions and the Process Model, the author of the present thesis has put together a conceptual model which is used in this thesis further on. This conceptual model later serves as the basis for the qualitative fieldwork and is summarized in the ERB techno-dynamical template or ERB TDT (Chart 1, can be seen below).

ERB TDT aims to find the answer to the question of how the application of new technological solutions has impacted ERB, including delivery, use and institutional aspects, along with the findings of how and what technology has ERB used so far for internal and external purposes and what new technological solutions might improve the technological condition of the ERB.

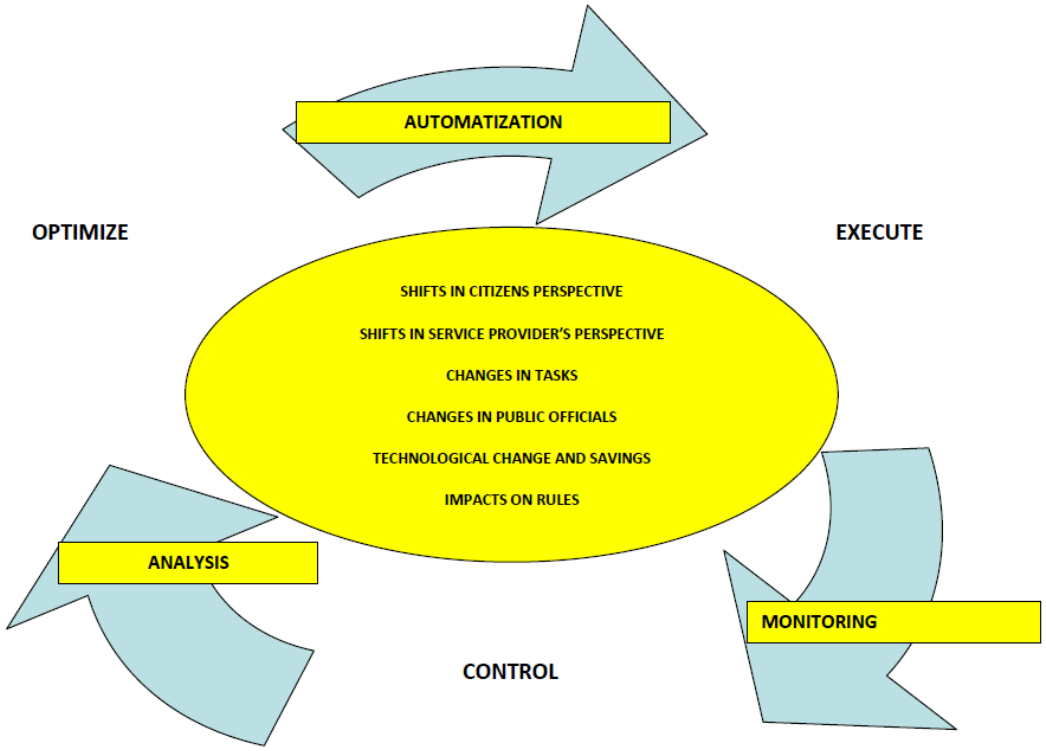

Chart 1: ERB TDT (Vilu 2015)

Chart 1: ERB TDT (Vilu 2015)

2.2 Research Methodology

Main methodology used in the present thesis is qualitative research as it assists in acquiring an integral picture of the topic under study, its modus operandi by trying to gather information „from the inside" and deduct or draw together prejudices about the thesis subject (Miles et al 2014, 9). Technological condition of the ERB has not been researched prior to the present thesis. Qualitative research unstandardized method was applied due to its openness to novelty in the material under study (Flick et al 2004, 5). Objective of the qualitative research, and in particular of the present research work, is to study the overall sophisticated suite of coefficients around the topic under research and render wide and different outlooks or thoughts gained from the involved into research individuals (Creswell 2014, 140). Selection of the qualitative method is also reasoned for enabling to use construing rapprochement to the scarcely researched field of research and to do it without collation of the studied subject in terms of volumes or the use of the quantitative method (Thomas 2003, 1). Qualitative research implemented in this paper is focused on getting knowledge about the present technological condition of the ERB and about its objectives and ideas for the improvement of the technological dynamics in the organization. Qualitative studies include rather research upon a condition, a subject as a whole than finding out of representative variables according to Lichtman (2013, 19). This understanding is a basis for the present thesis.

Strategy of case study is applied in the paper and it intends to be an exploratory single-case study due to the selection of one concrete organization, the ERB. Reasoning for the selection of a single-case study is to seize in-depth „the circumstances and conditions of an everyday situation" (Yin 2013) of an organization. According to Klenke (2008, 65), single case-study is of great benefit for carrying out initial researches or exploratory studies, by suiting as the primary leap for more extensive researches. This is an exploratory case study, where questions are on the basis of past use of the technology, reasons for lack of using its potential, and future possibilities for its use. Main tool for collecting the necessary data has been carrying out of semi structured interviews with the relevant to the subject individuals. Personal observations and document analysis are part of the research methods in the present research paper. Methods particularized above will be implemented side-by-side by testing the feasibility of the ERB TDT.

Thesis focuses on the overall technological situation of the ERB. In order to reach the objective of the present thesis, to map the technological condition of the ERB and technological solutions enabling ERB to offer better public services, variety of internal and external aspects of the technological development of the organization are scrutinized. Analysis of the case study is focused both on IT-solutions as well as on technological devices, equipment for the use of ERB and for the welfare of the inhabitants of Estonia.

Hereby, a few words should be said about the role of the researcher. According to Adler and Adler (1994) researchers are divided into the group of „insiders" or people who are part of the organization under study and have certain previous knowledge about the organization or people who have no previous knowledge, contacts at all with the organization under study, called „outsiders". Author of the present thesis has been in the role of an „insider" of the ERB for several years and hence had knowledge about the organization preliminarily. However, it should be noted that the author's knowledge about the technological part of the organization was scarce prior to the present thesis writing. Therefore, writing of this thesis has been a promoting challenge for the researcher. Being an insider renders trust and openness when carrying out research in your organization and interviewees sense the researcher being „….one of us….. versus them (those on the outside who don't understand)" (Corbin Dwyer, Buckle 2009, 58). This trust was of a big benefit for the researcher of the present thesis. According Webber and Sherman (2008, 66) „insiders" know the language and culture spoken inside the organization under study, what also served the benefit to the researcher of the present thesis. According to Smyth and Holian (2008, 34) there always exist pitfalls for the truthfulness, subjectivity and following the rules of ethics when an internal researcher carries out the study of an organization. These possible defaults were kept in mind when carrying out interviews with the employees of the ERB and aimed to evade.

Prior to submerging into the empirical part of the thesis, some substantial definitions related closely to the topic concerned must be reviewed. According to Oxford Dictionaries, technology means use of scientific wisdom for hands-on objectives (Oxford University Press 2015). Technology has also been given numerous definitions by scientists. Definition given by Dosi (1982, 151-152) where technology is a package

of knowledge, technics, proceedings, taste of progress and failures and last but not least the hardware, appeals most to the present research paper as all these components are all embedded in the applied thesis framework. In the present thesis technological dynamics, technological change in public service is under research. Definition of the change in public service by Osborne and Brown (2005, 4) states that it is a process of graduated amelioration and/or enhancement of the existent public services granted by public sector institution. Technological change definition given by the IPCC Fourth Assessment Report (Intergovernmental Panel on Climate Change 2007) consist of two stages, where the first one is related to the establishment, promotion of already existent technologies and the second stage concerns propagation or application of technologies. This definition matches with the analysis of the current case study as ERB is interested in the technological enhancement to specific needs, propagation and application of the already existent technological solutions.

To sum up the present chapter, ERB TDT will be tested in the next chapter of the thesis, in the empirical part of the thesis and it will be scrutinized which points of the framework hold place, in what way and extent in the context of technological dynamics of the ERB.

2.2.1 Limitations

Generalization is possible on ground of a sole case, which is then central for the scientific progress through the generalization being an upgrade or variant for the other technics used. Yet, generalization is overrated as a resource for scholastic dynamics, whereas „the force of example" is undervalued. (Flyvbjerg 2006, 12)

In this thesis single case study strategy is applied and no generalizations are made. This case study is not a „sample" and objective is to extend and synthesize theoretical knowledge, but not to „extrapolate probabilities" (Yin 2013). According to Punch, generalization of the case study should be conditioned on the casing as well as objective of the specific research paper (Punch 2014, 122). Main objective of the present case study is not direct towards generalizations, but to gain new knowledge about the technological condition of the public service and specifically of the ERB. This objective is sustained by the understanding of the prime utilization purpose of case study by Stake

(1978, 7) to supplement the already existent know-how and „humanistic understanding“.

The paper investigates the technological situation of one concrete Estonian public service institution and therefore the likelihood of extension of the present research conclusions into the context of other countries fire and rescue service institution is small. Though, the outcomes of the analysis might present hypotheses for future scientific researches for the other Estonian public service institutions or fire and rescue organizations of the other countries of the world with an analogous level of transition.

This paper is centred on the public sector organization and discounting greatly the private and third sectors. Hence, it is not unduly probable to use the research results for the needs of private companies or NGOs.

In addition, technological condition of just one Estonian public sector internal security organization, namely the ERB is put at a test. To get a more integral picture, carrying out of a joint technological research of internal security organizations subordinated to the Ministry of the Interior of the Republic of Estonia would be of great relevance as all these organizations must cooperate and work for the goal of internal security of Estonia. Results from a joint technological research are probably more eloquent due to organizational peculiarities and should enable to make more politically substantiated decisions for the improvement of the technological condition of the internal security organizations, including the ERB.

Several authors have assessed the use of the case study strategy and pointed out the main danger, which is leaving the analysis into the orphan role and concentrating only on the description. It is important to have a strong theoretical framework to have a good and comprehensive case study and framework assists in forming the adequate study design as well as in data collecting (Yin 2009, 40).

Another limitation for this thesis which has to be mentioned, can be the prompt changes and developments in the new ICT technological solutions used by the ERB. Due to such changes, the data related to the new applicable technological solutions at the ERB, is becoming fast out of date and need constant updates. To minimize the appearance of false details for the conclusion, technology and related details of the thesis are updated during its writing period constantly.

2.2.2 Data collection

Empirical data for the present thesis was collected by document analysis, expert interviews and personal observations. For describing the ERB and its technological situation, legal documents, reports, written expert opinions and news articles were used.
Author of the present thesis carried out expert interviews with 11 interviewees. Sampling was carried out mainly from the public organization under research, the ERB. ERB interviewees were selected from different structural units of the ERB in order to get a broader picture of the overall technological situation inside the organization. Interviewees of ERB were selected from different positions inside the organization like expert, heads of departments, head of division, advisors as well as a member of the management. Interviewees were was also included from SMIT as the main ICT service provider to the organization and ERC as a substantial cooperation partner for ERB through the use of new technological solutions for the improvement of the lifesaving capabilities of the ERB. To add citizen perspective to the thesis from outside the organization, interviews were carried out with two external interviewees. In course of the interviews information was also gained from the Ministry of Interior in the topic of the technological development.
Although the number of samplings might have been even bigger by including also the level of specialist and rescuer, the extent of the organization under study, its broad field of activities and time set the limits for the inclusion of more interviewees.
Objective of the empirical research was to get an answer to the main research question, specifically, how the application of new technological solutions has impacted the ERB, including delivery, use and institutional aspects. To find the answer to the main research question, in course of the interviews it was scrutinized how and what technology has ERB used so far for internal and external purposes as well as what might be the new technological solutions in the future to improve upon the technological dynamics of the organization.

3. THE CASE OF THE ESTONIAN RESCUE BOARD

Present chapter is the empirical part of this thesis. Chapter contains the case study of the ERB along with the carried out semi structured interviews, their analysis and summary of the main findings. Empirical study is carried out with the assistance of the ERB TDT framework.

In the first section of this chapter brief overview of the present ERB technological solutions used and related actors is given. In the second section impact of the ICT solutions and fire and rescue equipment on the ERB is scrutinized through the carried out interviews with the assistance of ERB TDT. In the third section possible future use of new ICT solutions and fire and rescue equipment at the ERB, as well as ERB technological development preconditions, pace reducers, accelerators, vision of the current technological situation are studied to assist upon the improvement of the ERB technological dynamics. Present chapter is concluded by a summary.

3.1 Current use of the technologies at the ERB

ERB is a state institution under the jurisdiction of the Ministry of Interior of the Republic of Estonia and is responsible for the forming and sustaining secure living environment in Estonia. Its general objectives are related to preventing dangers and to assist inhabitants in case of emergencies rapidly and professionally. Organization has 2249 employees (as from 8.12.2015) and is the third largest public employer in the country. Organizations vision is to diminish the number of accidents and losses to level equal with Nordic countries. (Estonian Rescue Board 2015, 6)

ERB has five, but very large-scale main fields of activities: fire prevention work (fire and water accidents), fire safety supervision, crisis management, rescue works, explosive ordnance disposal. Organization has defined 33 public services. (*Ibid.* 9) As an e-service, ERB has three services: fire safety self-control, submission of information requirements and fire safety test (Ministry of Economic Affairs and Communications of the Republic of Estonia 2016).

Due to time and space limits, the present thesis will concentrate not on all of the technological solutions of all five ERB fields of activities. I.e. the field of explosive ordnance disposal will be excluded completely due to time limits and safety restrictions. Some field will be covered more than the others due to more technological solutions at hand.

According to Milakovich (2012, 290), IT operations are divided into „internal and external operations", where the former one supplies a reference to the appliance of IT-solutions to automate, better cooperate, enhance infrastructures, inter-organizational embodiment as well as tool to assist in decision-making. External operations in public service organizations on the other hand, are directed to the use of technological solutions (including internet) for the exchange of information and to provide the population with online-services (*Ibid.* 290). ERB uses both, internal operations as well as external operations. However, it should be noted beforehand that a fire and rescue organization like ERB is an organization which is further directly in contact with the population (saving people, extinguishing fires) or is more a hands-on public service institution in comparison to many other public service organizations where external services are more visible and pertinent. Thence, more information can be gained and researched in the field of internal operations on the example of the ERB in the current thesis. Present thesis is concentrating mainly on e-governance and ICT solutions, but will also slightly touch upon technological equipment, which is one component of a *hard technology* in a public service according to Osborne and Brown (2005, 19). Fire and rescue services request far more utilization of technologies and technological outfits (Andrews and Entwistle 2014, 68-69) for up-to-date services and ERB is a representative of such public service organization. An evidence for this statement is a large technological procurement in the Estonian rescue area, when in the year 2015 and in the coming years ERB has received and will receive altogether new and technologically up-to-date 83 technical units, including 46 fire engines, 26 water tanks, 8 hook lifts and 3 UTVs with the co-assistance of the EU Cohesion Fund (Ministry of the Interior of the Republic of Estonia 2015; Head of the Administrative Department of the ERB 2015).

According to the Measure 1 of the Estonian Information Society Development Plan 2020, it is planned to develop better public services through the ICT developments in the country (Ministry of Economic Affairs and Communications of the Republic of Estonia 2013, 29).

According to the Administrative System of the State Information System RIHA (2015), ERB holds 6 information systems and the oldest one was established already in 2001. To be more precise, ERB is the chief processor of 2 information systems, Postipoiss and PÄIS and an authorized processor of 4 information systems.

By taking a brief look at the ICT solutions in use at ERB chart below, it is clear that the technological development of the ERB has been remarkable since the start of the ICT revolution. Official name of the data collection of the rescue institution or ERB is Rescue Information System or PÄIS (Minister of the Interior 2012), stipulated with a statute and is the „heart of the rescue activities" of the ERB. At ERB a lot of different information systems for different purposes are in use in parallel, being subject to constant development and phases of change. This is the overall picture of the technological systems and solutions at ERB, but it is of great importance to find out the performance. More specifically, how these technological solutions have so far impacted the ERB in its activities, including the use and application of new technological solutions, services offered by the organization, institutional aspects. Present chapter intends to find out what technological solutions and how has ERB used so far both for internal and external purposes and whether any technological solutions might be foreseen for the future to improve upon the technological dynamics of the organization.

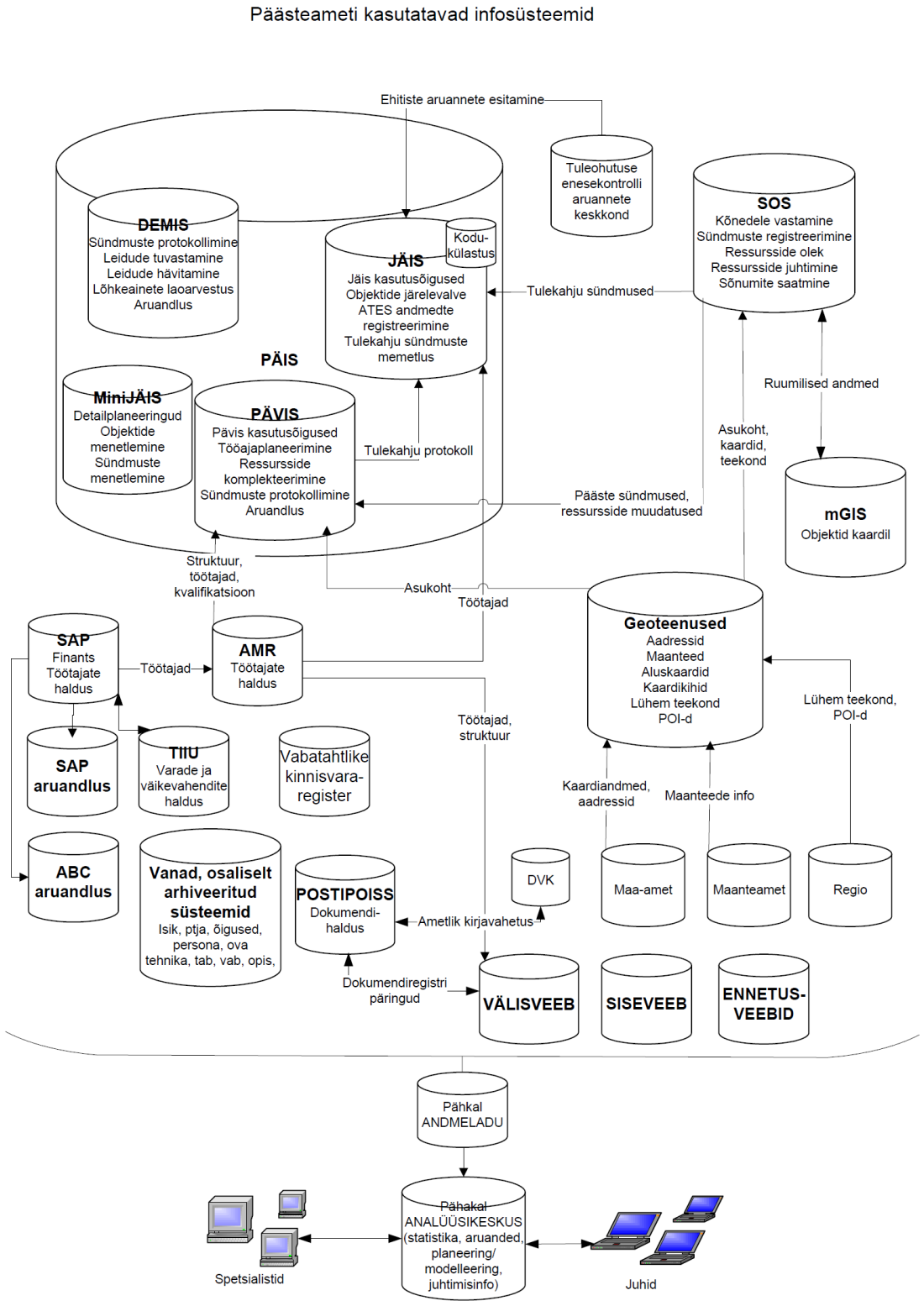

Chart 2: „Information systems used by the ERB“, by the Development Department of the ERB (2014)

ERB is not an independent organization in its ICT and technological developments. Several public security related organizations are subordinated to the Ministry of the Interior, among these ERB, SMIT, ERC (Emergency Response Centre) (Ministry of the Interior of the Republic of Estonia 2015).

According to the Ministry of Interior SMIT Statute, main field of activity of SMIT is to develop and manage the ICT services necessary for the implementation of the tasks of the organizations under the jurisdiction of the Ministry of Interior, including ICT solutions for the ERB. Tasks of SMIT include among other tasks procurement, development, administration of ICT solutions and systems. (Ministry of the Interior 2014). In this sense, it can be noted that the topic of ICT technological solutions is outsourced from ERB into SMIT. SMIT elaborates in cooperation with ERB new necessary ICT solutions based on the needs of ERB and provides ERB with new technological solutions and acts as an ICT operator for the organization. Thence, SMIT plays a crucial role in the technological dynamics of the ERB. It is of utmost importance that cooperation between ERB and SMIT works smoothly as according to the ERB Strategy, breakdowns in centralized IT systems influence remarkably the performance of the society and security of its inhabitants (Estonian Rescue Board 2014, 9).

Another crucial to the rescue activities of ERB organization is the ERC, which receives the rescue related emergency calls (as well as ambulance and police calls) in Estonia to the number 112 and on basis of its instructions, ERB leads the work of rescue crews in cooperation with regional rescue centres (Ministry of the Interior of the Republic of Estonia 2015).

Digi map GIS-112 is an important tool of ERC and vital to ERB activities. It assists in positioning of the location of a person in distress, find out the closest available rescuers, as well as to find out the fastest road to reach that person. The whole event information is forwarded electronically by the ERC to the digi maps in the board-computers of rescue cars. (Ministry of the Interior of the Republic of Estonia 2015)

According to the ERC webpage, main purpose of this technological solution is to reduce the time, from receiving the accident notice to ERC until rescuers/ambulance to reach the site with the persons in distress. Speed of arrival to the accident site is considered to be one of the most important factor, due to which the number of fire casualties should

decrease and the number of successfully reanimated patients increase. Today it can be said that the speed of arrival to the accient site can not be improved substantially more, but the efficiency of the firefighter activities at site, from the moment of arrival until handling over the victim to the ambulance, can be improved.

Not less important is the fact that through the implementation of the GIS-112 technology, environmental and material losses in consequence of fires, car crashes and other accidents, will diminish. (Emergency Response Centre 2014) Using this system is vital for the ERB activities and services offered to the public by ERB in saving more human lives, environment and properties. Acknowledgement of the start to use of such important technological solution was given at the Estonian Annual Logistics Conference in 2014, where GIS-112 received the nomination of Annual Logistics Performance or in other words, was the winner of all logistics activities in Estonia in the year 2014 (AS CGI Eesti 2014).

According to the 3rd strategical course of action of the Strategy of the ERB, technological modernization of the organization includes adjustment and promotion of new technological solutions in order to decrease the time necessary to get to the victim; adjustment of new simulation technologies for improving upon prevention activities, training; adjust new e-solutions for better prevention results; introduce modern fire safety technological solutions to the inhabitants. According to the 4th strategical course of action of the Strategy, objectives are to establish a „long-term resource planning system“; adjustment of software in order to evaluate, predict and design the effects of activities; design of the fire crew net in correlation with demographical alterations and hazard criterions. (Estonian Rescue Board 2014, 38).

3.2 Impact of ICT and fire and rescue equipment on ERB

3.2.1 Shifts in citizen′s perspective due to the use of new technological solutions by ERB

Implementation of new technological solutions, equipment by ERB influences the inhabitants of Estonia very much as these new technological solutions assist in saving more human lives in Estonia (II).

Goal of the ERB is to reduce the number of injured persons and casualties and each new ICT solution must work for this objective. GIS-112 assists in reaching the persons in distress faster. PÄVIS assists in offering speedier communication about accidents to the population. (IA)

Implementation of the new GIS-112 system by the ERB in cooperation with the ERC assists in faster arrival of rescue teams to the accident scenes. It will most probably raise the satisfaction level of the population with the rescue services offered by the ERB as the customer satisfaction with the rescue service depends upon the quality of the offered service. Speed is one of the most important estimable variables in rescue service offered by ERB. Also it is very important to know how well are carried out the rescue operations at site by the rescuers. Implementation of a new GIS-112 technological solution has assisted already in a short period of its exploitation time the public service users. I.e. searching operations of people who got lost in forests earlier needed involvement of numerous policemen, rescuers, and helicopter. Now there have been cases where one patrolling policeman has solved the situation and found the missing person with the assistance of the GIS-112 and SOS positioning systems. GIS-112 system has remarkably improved the information movement between the ERC and rescue car driving to the accident scene as the coordinates of the location of the person asking for assistance are forwarded immediately to the digi maps in rescue cars. (ID)

ERB is trying to improve its services to the population, by making the life of inhabitants more comfortable through the use of new technological solutions. I.e. the fire safety self-control report environment serves this role by making the fire safety reporting for the obliged organizations more comfortable; as well as construction projects can be

presented to the ERB electronically. On one hand, it turns the delivered to the population service into more comfortable; on the other hand, it reduces the costs and simplifies the process for the ERB. (IC)

At the same time, it can be said that external ICT solutions are not developed enough as i.e. inhabitants are still sitting behind the engineer-technical offices doors of the ERB regional rescue centres and there is no possibility to agree the meeting time prior to the inspector, but this issue is included into the ICT development plan of the ERB. (IJ)

Home fire safety consulting activities were carried out just some years ago only by visiting the homes of people, today it can be carried out with the co-assistance of prevention web-consultant or testing yourself the fire safety of your home via the interactive fire safety test environment of the ERB (Estonian Rescue Board 2015). At the moment face-to-face consulting at homes and web consultation are in parallel, but after five to ten years there should be no need to go actually to homes due to the use of new and improved technological solutions. (IH)

One of the latest technological developments for the inhabitants of Estonia is that ERB has created in cooperation with an NGO MTÜ Raikküla Vabatahtliku Tuletõrje Selts an e-learning course for those inhabitants of Estonia who wish to contribute into the safety of Estonia and to become voluntary firefighters (Estonian Rescue Board 2016, 31).
Creation of this virtual service for the population has been a good example of cross sectoral cooperation for the technological development of the ERB and rising of the safety level in Estonia.

Population of Estonia has a virtual service delivered by ERB to raise their feeling of security, where people can find at the ERB webpage the fire stations network map, insert their home address and find out where is located the closest to them professional or voluntary fire station (IA).

It was noted by interviewee IB that new technological solutions implemented by ERB can influence the population in two ways. Firstly, by adding more convenience for the

services offered to the population and secondly, can bring along new additional obligations to the population on the example of the creation of the possible new chimney-sweepers database. Into this database chimney-sweepers must report about swept chimneys in the country and population becomes more visible with their often unfulfilled obligation of swept chimneys. Yet, it makes the society safer in general.

For the population of Estonia ERB has a webpage, uses actively Facebook, YouTube, Twitter and demo webpages for promoting fire and water safety in the country. Virtualization was considered as a favouring external technological factor in the services offered by the ERB for the population by most of the interviewees as it increases population trust and satisfaction with ERB.

Satisfaction of the population with the ERB services has been for years between 96% and 97%, which is the highest level among the Estonian public service organizations. The awareness level of the populations, pattern of safety behaviour of the population of Estonia have improved remarkably as the level of fire victims has decreased in the last 10 years four times and new technological solutions have surely played their positive role in it. Estonian population is aware of the need and obligation to use fire detectors, a small however crucial technological device, to raise the fire safety level in the country. (II) Yet, it should be noted that it is hard to measure, how much role has virtualization plaid exactly in the high trust level in ERB as no virtualization influence inquiry has been carried out by the organization (IA, IJ).

According to interviewee IC, virtualization of the ERB shows the openness of the ERB and has increased rather the population trust and satisfaction with ERB with its services and it should be noted that ERB Facebook page has the highest number of followers among public institutions in Estonia. Implementation of new social technological solutions i.e. Facebook by ERB influences and changes the public service users and assist in the raise of fire safety awareness of the population in Estonia (IA, IF, IH).

Interviewee IE noted that virtualization adds communication channels to the population, possibilities to communicate with the ERB and if this communication has been on the positive side, it increases also population trust and satisfaction with ERB. Also it was noted that virtualization at ERB has to be carried out in a balance, specifically, to have

both components present, virtualization hand in hand with face to face meetings in order to give the best perspective for the inhabitants of Estonia (IF).

Most of the public services offered by the ERB to the population are not offered to the population on their request, but rather based on the tasks created through the political process. Nature of the tasks of ERB dictates the reality that there is not excessively much public service which ERB could turn into virtual for the population. (IJ) Nevertheless, not all services offered by the ERB to the population which could be turned into virtual services, are turned into virtual services yet.

Public service related to the information concerning heating systems should be turned into a virtual environment. So far it has not been done as chimney sweepers and potters claimed some years ago that they do not have the internet option, computers to insert the necessary data into the new heating systems database. Another reason is that the present law does not require such a new database creation and it is not very easy to create such a law as it sets new obligations to a wide range of the Estonian population. Yet, the work has been started to reach the goal one day and to have the new technological solution related to the heating systems in the country. (IB)

Annually around 10 000 fire safety consultations are carried out at homes and it requires unreasonable time resources from both, the population as well as the employee of the ERB (IC). Fire prevention consulting is not virtual yet and should be turned into virtual (reception hours via skype) and i.e. for the consultation of home fire safety, the present condition at home could be forwarded via mobile phone picture and consultation could take place through the camera. It could eliminate the need to go actually to the homes for fire safety consultations. ERB has also a prevention web-consultant and this service should also be connected to camera in the future. (IC, IH) This virtualization has not been done so far as not all prevention employees are ready for such change as well as not the whole population in the country is ready for this, but the younger the population, the bigger the acceptance for such a virtual service (IH). Also fire and water accidents prevention services and fire safety supervision services of the ERB could be turned more into virtual services (II).

The reason behind not turning some public services offered by ERB into virtual is also related to financial aspects and that the efficiency of turning the service into virtual has not been big enough or the time of profitability has been too long (IC).
As a result of the interviews analysis it turned out that interviewees believe that if ERB uses new external technological solutions for the population, population gets better and more up to date public services from the ERB and are more pleased with the public services offered by the ERB to the population of Estonia.

When speaking about the option to move most ERB services for the population into internet, all interviewees shared the viewpoint that ERB belongs to a group of traditional public service organizations, where direct contact with the population is a must as well as it is not possible to extinguish fires or save people lives via internet. Hence, ERB is a public service organization, which can make some of its public services to the population more comfortable by implementing internet-based services, but there always remain services in ERB which cannot be virtualized.

Most of the ERB public services to the population are not aimed to be carried out in ERB offices and population does not have to wait behind the ERB office doors like is the case in public organizations where i.e. different licences are issued. Rescuers are the main front-line staff of the ERB, but at the same time also, preventionists and fire safety supervision employees. Although, it should be noted that even certain previous front-line staff tasks are being virtualized for the population at the ERB.
Fire safety self-control report environment is a new service to the population of Estonia since 2015 which can be found and used from the ERB webpage. Organizations like kindergartens, schools, accommodation places, healthcare institutions, shopping centres, bigger agricultural and industrial buildings, high-rise buildings, underground garages and other organizations offering critical services are obliged to report about their fire safety and now it can be done virtually on the ERB webpage (Estonian Rescue Board 2015). Fire safety self-control report environment had a preliminary test period, where 15 testing organizations remained pleased with the new technological solution of the ERB to the obliged organizations (IB).

It was accented by several ERB interviewees that the goal at the ERB is not so much to close down the actual offices and move into internet-based services for the population, but rather to maximize the efficiency, save time on the internal activities of the ERB and offer more comfortable, less time and money consuming external services of ERB to the population with the assistance of new technological solutions.

To offer the best citizen′s perspective due to the use of new technological solutions by ERB it was noted by interviewee IF that as the public service user is directly in contact with social media channels and as technology develops, changes very fast, population uses more of it, public service organizations like ERB have to keep the pace with technological developments to offer the best possible technological public services to the population.
From some external to ERB interviewees interviews it turned out that even people who are well aware of the most novel technological solutions, do not know sufficiently about the technological solutions and virtual services offered by the ERB for the population. External interviewees knew about the ERB webpage, have heard about the obligation of the use of smoke detectors and slightly heard about GIS-112, ERB Facebook page, but not more. (IF, IK)

3.2.2 Shifts in service provider′s perspective

The main shifts due to the use of new technological equipment in the ERB fire and rescue services offered to the population, took place in parallel with the restoration of the Republic of Estonia and with its opening to the rest of the world. At the end of the 1990-ies ERB started to use integrated nozzles together with breathing apparatuses and it made possible to extinguish fires inside the buildings as prior to that extinguishing operations were carried out only outside the buildings. Hydraulic rescue equipment in car accidents has been used by the ERB since the middle of 1990-ies. Thermo-cameras used by the rescuers of the ERB assist in fast finding of injured persons in fires and fume and have turned rescuers into seers as before the use of thermo-cameras rescuers could not see anything in the rooms with fires and fume. This has shortened the time of

finding the victim, starting from the moment of entering the building, ten times. It has also increased remarkably the rescuers personal safety in a room with fire as he can see with the assistance of thermo-camera. Compressed Air Foam System (CAFS), which decreases the fire extinguishing time remarkably, is used in high-rise building fires by the ERB. ERC is operating for the ERB an M-GIS system, which means that all fire engines are equipped with an on-board GIS-system, enabling to find out the fastest route to the accident scene. (II) This brief overview of the fire and rescue equipment development at the ERB shows how big technological leap has been taken by the ERB to improve upon the quality of the offered fire and rescue service to the population.

Very important for the activities carried out by ERB and offering public services to the population of Estonia is the GIS-112 system, implemented since August 2014 (ID). According to the law, ERB uses one rescue information system (RIS), which is divided into parts. GIS-112 is an important part of RIS. Emergency calls are handled by ERC through the GIS-112 system. (IC) Beside GIS-112 system, operated by ERC and used by ERB, ICT system assisting in offering better fire extinguishing and rescue public services to the population is the nationwide radio communication system (ID).
In the preceding years ERC was under the ERB and now is a separate institution. Emergency information is going from the ERC SOS system and GIS-112 branches into the rescue information system PÄVIS and part of it branches into the fire safety supervision information system (JÄIS). An internal prevention ICT module is planned to be launched at the beginning of the year 2016. This prevention module of the ERB RIS ties together all prior related to the object data, necessary for the carrying out of better coordinated, without duplication and successful prevention work. (IC, IA)

Another technological solution which is crucial for offering good fire and rescue service to the population (carrying out of rescue operations as well as for the communication of accidents to the population) is the PÄVIS system, containing the whole operative information. (IA).
Work of the fire safety supervision officials of ERB is assisted greatly by the JÄIS-system (Fire Safety Supervision Information System) (IB). Another new technological solution assisting the same officials is the previously mentioned internet-based fire

safety self-control report environment. Although, it has to be noted that such a virtual service for the obliged organizations does not free the fire safety inspectors from the whole obligation to go and inspect the dangerous objects at site as done prior, but rather they will have more remaining time due to the new virtual public service to carry out some novel and important for the fire safety additional tasks. (IA)

Postipoiss ICT document management system is an everyday working environment for the most of the ERB office employees, where all documents of the organization are harmonized, implemented and signed digitally. Postipoiss replaced the management of documents on paper at the ERB. (IA, IB) It was stated by most of the ERB interviewees that Postipoiss is a good way to manage the documents without paper, still its user-friendliness is insufficient. Postipoiss document management system has been struggling for years with its development problems, specifically the problem to optimize it, improve its user-friendliness (IB). Postipoiss is replaced by a new document management system DELTA in the year 2016, which should be more user-friendly as has been developed according to the needs of the Ministry of Interior jurisdiction organizations (IB, IC, IG).
It should be also mentioned that ERB has an Estonian Bomb Data System DEMIS, but it is not handled in the present thesis due to the limiting made in the beginning of the present thesis and the systems confidential nature and range.

ERB has gathered into its ICT systems different data necessary for the fire and rescue service, but one latest trend is that the data gathered into different systems of ERB is being associated to each other. SMIT coordinates the ICT systems of ERB as before SMIT, the ICT systems appeared and disappeared; now ICT systems are systematized. Now data gathered by the ERB enables to give answers to the questions arising. All existent ICT systems are developed further constantly. (IJ)

Teleworking solutions, video-conferences are very used technological solutions at the ERB and between its 4 regional rescue centres.

Most office employees of ERB have laptops and under certain conditions, work can be carried out also outside the actual office. Access to intranet is guaranteed by SMIT service by using ID-card for security reasons. (IA)

Digital networking, teleworking and video-conference opportunities were mentioned and very much appreciated by most of the ERB interviewees. In 2006 ERB was not ready for teleworking, now this is not a question anymore if you work from the headquarters in the capital or from smaller towns or regional centres for the ERB (IH). It was mentioned that teleworking is very much favoured in the organization (IA); enable to carry out work more efficiently as most of the ERB ICT systems and environments can be entered from all over Estonia and abroad with the use of an ID-card (IB); enable to hire good new professional office employees, who necessarily do not have to live in the four big towns of Estonia where main office employees of ERB are located (Tallinn, Tartu, Pärnu, Jõhvi) (IC).

The teleworking ICT solutions which are developed today for the ERB are meant not to carry out more work from home offices and close down actual offices at the ERB (IA). In the ERB there are no employees whose moving from actual office into home office would save considerably costs of operation of the ERB. (II)

Interviewees of the ERB consider the Microsoft Outlook with its e-mails, calendars, group work being of great assistance in ERB employees' daily work.

ERB as an organization as a whole is considered technologically innovation-minded and it should be noted that in the recent years ICT systems have been changed constantly, which requires constant learning from the ERB employees. ERB as one of the biggest Estonian public service organization with its huge number of employees, contains always some people who are sceptical concerning new technological solutions or even are antagonistic, but through explanatory work and training these issues are handled with this minority. (IA) It was mentioned that the older the employee of ERB, the more passive in the application and implementation of new technological solutions as not understanding how to use these, they resist new technological solutions use (IH).

If a new technological solution proposed to the ERB employees is user-friendly, operates efficiently and it facilitates their everyday work, employees accept it rather fast and start to use it in their everyday work (IB, IE).

While office personnel of the ERB is considered rather technologically progressive, rescuers-firefighters are the most conservative persons in the world.

New IT technological solutions are accepted by the rescuers not with big enthusiasm, but they accept more easily new technological equipment which has justified its use in the world for the saving of human lives. (II) I.e. infra-red cameras which are used in all professional fire stations of Estonia by the fireman, raise the safety of firemen and increase the speed and level of rescuing people from fires (IA). Rescuers do not like to fill in the PÄVIS system data-sheets as they cannot feel direct positive influence on their work through the use of the system. (II, IA, ID, IG) ERB has struggled for years by now with the problem that rescuers should insert into the PÄVIS system more and better quality accident-related data. Learning process is sometimes difficult for the rescuers and it might be that some mistakes have been made, by presuming that they understand new technological equipment better than they actually do, while they have been in a need for more training in the issue. (IC)

New technological solutions which are aimed to improve the work of the ERB and have been long time awaited by the employees, are accepted very well by the employees of the ERB. I.e. prevention employees have been waiting for years for their internal prevention ICT module (JÄIS ennetusmoodul) and will be very warmly accepted when launched at the beginning of the year 2016. Start of the implementation of the fire safety self-control report environment was very well accepted by the fire safety supervision employees and more and more organizations are using it to report about their fire safety condition. (IJ)

New technological solutions have enabled ERB to have 4 well-operating regional rescue centres in four different towns and effective cooperation between the centres and the ERB headquarters in the capital, Tallinn.

New technological solutions used at ERB at the present, would enable to reallocate also the ERB headquarters from the capital of Estonia to rural areas of Estonia, but ERB headquarters should stay in the capital of Estonia as i.e. it was tried out to move the Ministry of Education and Research from Tallinn to Tartu and it did not work out well.

The main reasoning against the reallocation of ERB headquarters to the rural is that organization is very densely related to the Ministry of Interior and constant and immediate contact between these two organizations in Tallinn is very important. (II)
It should also be noted that employees inside the structure of the ERB make often changes in their positions and locations and new technological solutions play an insurmountable role in this possibility.

When speaking about the ERB TDT aspect of closing down smaller public service divisions and having less numerous bigger units for the sake of „professional, financial, technological logic", on the example of the ERB it was noted by the interviewees that it should not be a criterion applicable so much to the ERB as: the main rule is that rescuers must reach the person in distress within a reasonable time, which means fire stations have to be located where the population is (IA, IH); the primary cause of closing down of smaller units has to be the absence of danger in the area (IC); „technological logic" should be approached through the prism of the public service user or to say, it is important that inhabitants of Estonia see rescue cars in their regions, be it professional or voluntary rescue crews (ID); bigger firefighting units get more benefit from new technologies as they have more calls and activities than in smaller stations (IE).

New technological solutions taken into use at the ERB have not caused big structural changes at the ERB according to the majority of the interviewees.
Only some moderate changes in structures due to new technological solutions implementation were mentioned i.e. positions moving from one unit to another unit of the organization due to the need to start to use new databases in a unit where most of the data processing is carried out (IB); before the existence of the personnel management and accounting ICT systems, the tasks were carried out differently than now with the assistance of modern ICT solutions and more employees were needed (IJ); with the establishment of SMIT detachment of IT-personnel from the ERB as well as separation of ERC from ERB due to the possibilities the new technological solutions offer this day (II).

3.2.3 Changes in tasks

ERB as a digitally governed network organization has several technological and organizational challenges in the understanding of the ERB interviewees. These challenges include the know-how of using the new technologies and creating a better training basis for learning to use new technological ICT solutions and devices (IC);
the golden mean between security and user-friendliness as in case of more mobility in work at ERB it is not very easy to solve the security issue (IE); guaranteeing technological/ICT security, while bringing new and innovative technological solutions in to the rescue area (IH); IT-riskless digi-safety of the ERB as ERB offers vital services to the population of Estonia (II); learning to operate with the gathered into the ICT systems data and constant involvement of the ERB employees into the new technological developments in the organization (IJ).
Changing technologies do not change the main task of the rescuer, which throughout the centuries has been to save human lives. Changing technologies make carrying out of rescuers tasks safer, i.e. their lives are better secured due to the use of thermo-cameras.
Rescuers task is not changing in a sense what to do, but rather how to do with the assistance of new technological equipment. (IH, II) On the other hand, it can be said that changing technologies change the tasks of the rescuers - add new tasks as when today rescue crew returns from the accident scene, rescuers are obliged to fill in the PÄVIS system about the accident related data. This task they did not have prior to the existence of the PÄVIS system (IJ).
Ten years ago there were no databases like ERB has today, nobody had to insert data into the databases and it was hard to follow what tasks are carried out and what not. Today everything is inserted into databases and all ERB employees works can be followed (IB). Tasks are changed due to the use of new technological solutions in in the process of the rescue works as many different technological devices are used and the utilization of these change the rescue works tactics, require new approaches and diverse work (IC). Implementation of GIS-112 system has changed the tasks of the ERB employees as earlier rescue unit leaders had to mark down the data received during their shift into a copybook, now the data is inserted electronically into the PÄVIS system and from there data is channelled to SOS and GIS-112 systems. Earlier the rescuers team

driving to the accident scene had to exchange data with ERC verbally through radio communication, now it is done through the button push electronically. (ID) Changing technologies have changed the tasks of the ERB employees as most processes are digitalized in the organization, paper documents have moved to computer and tasks have to be carried out in a new way. I.e. with papers there was no task to process and maintain the databases, now there is (IA, IC, IE, IJ).

Hence, it can be said that the changing technologies at the ERB do not change so much the essence of the tasks or the goal of the tasks for the ERB employees, but rather the ways the tasks were carried out in the past and are carried out at the present by transforming the way of implementation of the former existent tasks.

General viewpoint of the ERB interviewees was that the use of the new technological solutions and equipment has in great extent improved the performance of ERB tasks and requires novel type of work.

PÄVIS has remarkably improved the implementation of ERB tasks. One simple example is that if you are working at the ERB office, where you have also a fire station and you hear the sirens of fire engines going out to accident scene, you can immediately check out in the PÄVIS system to find out the information necessary for your work. Prior to such ICT solution, the information was spread via phone and orally and there was a need to interfere during the rescue activities to get the necessary information from the firefighters. Among other positive traits, PÄVIS system increases the pace of informing the population about accidents with a more detailed and precise information.

Fire safety self-control report environment is a fresh system, which simplifies the obligation to report about fire safety of the relevant organizations, but in the long run it is also aimed to improve upon the work of fire safety officials, who now do not have to go through anymore piles of documents, pdf-files or Excel tables, but can rather check through and give feed-back faster about the required information in the new internet environment and their related database. New technology is a catalyst at the ERB, assisting in doing previously carried out tasks in a better way. Positioning system GIS-112 assists in identifying the free available resources, location of the person in distress, how to reach him/her in the fastest possible way (IA, IC, ID). Thermo-cameras and

better uniforms assist in finding a victim in a way less endangering to the health of rescuers and faster and enable to carry out more efficient extinguishing work (IA, IC).

3.2.4 Changes in public officials

Common position of the ERB interviewees was that new technologies have changed the official at the ERB.

Officials of the ERB prior working only with pen and paper had to learn to use computer, different IT systems and solutions. Official must keep in mind that he/she cannot sit in the corner of the office, but technology has rendered him/her more available to the inhabitants. Officials have become more vulnerable in their work due to internet breaks and break downs in ICT systems when tasks cannot be carried out properly. (IA)

Since the last ten years it is a requirement stipulated in the job descriptions that employee has to know how to use modern technologies. While earlier than ten years ago, the technological knowledge of the ERB employees was rather weak. (IB)

Changing technologies have changed the employee of ERB as these assist in the implementation of the ERB tasks and employee of the ERB has become more technologically oriented (IH). Today the employee of the ERB has been changed as changing technologies require employees with higher and better educational background. Rescuer has to be strong, but more important today, clever, orientate in the world of innovations, be able to re-orientate after every 3-4 years as ability to re-orientate has to be stronger than years ago. (II)

Re-training and re-education are the main ways of improving upon the new technological knowledge of the ERB employees in order to maintain the already existing and trained good personnel as it is very expensive to reach the qualifications needed for the ERB employees and it is hard to find such people immediately from the labour market (IA, IC, IE, IH, II). It was although noted that ERB is also ready to hire new employees if someone is not ready, willing to learn new technologies (IA, IC).

It was noted by the interviewees that ERB might need new type of employees to improve upon the technological dynamics of the ERB. These new type of employees should know how to find and elaborate new technological solutions for the ERB to improve upon the technological dynamics of the ERB (IA); people with good ICT knowledge (IC); young people are faster learning new technological solutions and ERB has gone through the process of staff rejuvenation and this assists in the improvement of technological dynamics of the ERB (IE); more employees should deal with the issue of innovation to spread it inside the organization, to enhance the employees capacity to absorb new developments and implement these (II); employees who know how better to propose their thoughts related to the needs of technological developments in order to to improve upon the technological dynamics of the ERB (IJ).

More and more public organizations are reliant upon external ICT service providers. ERB is not an exception as for the ERB the external ICT expert is SMIT. ERB is at the present moment fully dependent upon SMIT in its ICT solutions.

In essence, it was considered to be a good solution to have a one, single ICT agency for all Ministry of Interior jurisdiction organizations like the ERB as: in such agency there is ICT knowledge, can assist ERB in ICT related problems and elaborate new ICT solutions for the ERB (IB); SMIT brings along economy of resources in the administrative field of the Ministry of Interior (IC); it is good that the corresponding know-how is inside the system (IE); it is a smart and reasonable solution that ICT solutions and their development of the Ministry of Interior jurisdiction organizations is drawn together under SMIT from the perspective of the state budget planning and financial resources concentration (IF); it is a wise solution as all Ministry of Interior jurisdiction organizations being all under SMIT enables to procure devices, solutions centrally, many office work technological solutions are the same for these organizations (IG); provision of the whole Ministry of Interior jurisdiction area organizations from one source with the ICT security is a good idea (II). It was noted that SMIT offers to the ERB good and fast ICT client service support (IA, IB).

On the other hand, it cannot be said that everything is perfect with having SMIT as an external ICT expert for ERB as: several ICT technological solutions i.e. creation of an up-to-date webpage took a long period of time to be solved appropriately (IA);

personnel working specifically on ERB new technological solutions is scarce and not all good new technological solution proposals by ERB to the SMIT are put into operation (IB, IC, IE; IH); development work on ERB specific new ICT solutions is very bureaucratic and time-consuming, which often leads to the situation where technologies have drawn away, are not relevant anymore by the time the new solution is available to the ERB (IH);

It was proposed that it might be a good idea if ERB could have more flexibility, the right also to purchase external (without SMIT) ICT solutions besides having the SMIT ICT solutions and support (IE, IH, IJ).

Good viewpoint of an external to ERB interviewee was that it is a question, can SMIT gather the ICT competences better than ERB would search for the ICT services offering companies itself. It can be that if ERB would have the possibility to search for the necessary competences from the ICT market itself, it would offer to the employees of ERB more bigger challenges and interesting work. It is a problem for the Estonian state to gather the ICT competences as the salary conditions are worse than at private companies and international corporations. (IK)

ERB is also reliant upon external experts like companies delivering fire engines, fire and rescue equipment (IA, IE, II). This cooperation is favouring the technological dynamics of the ERB as new technological equipment and engines are composed on the basis of the exact specifications of the ERB (IA) and better and innovative solutions are offered by these external experts (II). ERB is also reliant upon technological external experts offering to ERB different card application systems favouring the technological dynamics of the ERB (IH).

New ICT solutions enable to reposition certain jobs from the capitals to local areas, but it should be said that it has not drawn to ERB new personnel with necessary for the service know-how that could not be obtained without repositioning (IA). Yet, it has to be said that ERB has very many ERB Headquarters (Tallinn) employees who are not positioned in the capital, but in different smaller towns and who just for a couple of times in a week come to the meetings in Headquarters and most of their work is carried out from their hometowns with the assistance of new technological solution (IC).

With the assistance of new ICT solutions ERB has i.e. centralized the personnel services of ERB and personnel services staff is located all over Estonia (IH).

New technological solutions have made some traditional positions to vanish at the ERB. Organization has less secretarial positions than in the past. Before the opening of Estonia to the rest of the world, fire stations had telephonists-dispatchers to pick up emergency calls, whereas now there are no such positions left and tasks are carried out in a modern way by the ERC employees with the assistance of modern ICT solutions (IC, IH, II).

Due to the use of new technological solutions and uniting of smaller county ERC-s into bigger, regional ERC centres, the amount of employees at the ERC has diminished 50% since the times ERB had telephonists in all fire stations. At the same time, amount of the tasks of the ERC have grown per employee as they also process today the police and ambulance calls in addition to the fire and rescue calls. (II)

Also before the 1990-ies ERB had typists, now there are no typists as all employees „type“ their letters digitally themselves (IE). ERB had before SMIT its own IT-personnel on the spot, now ICT operations are carried out with the assistance of new technological solutions by SMIT from the distance (IH).

3.2.5 Technological change and savings

A question was asked from the interviewees whether they consider it possible to reduce the burden on ERB budget through the use of new technological solutions at ERB.

It turned out from the answers of the interviewees that use of new technological solutions at the ERB enable to make some savings and to carry out the tasks more efficiently and get more free time to carry out additional and important tasks for the offering of better public service to the population.

New technologies used at ERB assist in finishing the carrying out of reduplicated activities like paper data and digital data in parallel (IB). It also was said that new ICT systems enable to reduce the workload, fasten and make more efficient certain work processes (IA). Yet, applying of different new analysis software enables to reduce to some extent the burden on ERB budget and to make wiser decisions and to direct

finances to more appropriate tasks of ERB. Teleworking or video-conference opportunities of the ERB employees decrease upon the costs of operations, but do not enable to shut down the offices. Teleworking is very much appreciated by the employees (IA, IB) and enable to reduce the burden on ERB budget by creating the possibility of saving travel and accommodation costs to the meetings inside Estonia (IB, IC, IE). Video-conference system of the ERB assists remarkably in saving the operational costs, in the travel and accommodation costs which earlier would have been made to go to the meetings. Today all four rescue centres (in Tallinn, Tartu, Pärnu, Jõhvi) are connected to the video-conference system and meetings with the ERB headquarters in Tallinn are carried out without travel and accommodation costs between all necessary participants. (IC)

On one hand, it is possible with the assistance of teleworking technologies to decrease upon costs of operation like premises rent at ERB if personnel work more time from home offices. On the other hand, it requires bigger investments into security. Hence, saving upon costs of operation with the assistance of teleworking technologies is relative. (IG) To find out whether big part of ERB office work could be carried out from home offices with the assistance of telework and would it give remarkable savings, it should be tested systematically (IH).

Using mobile communication, e-mailing, internet, big database systems increase upon the organizational capacity and enable to save time (IB).

New ICT solutions and their administration costs are mainly financed by SMIT, which means the financial burden is mainly on SMIT. Expansion of the GIS-112 and SOS solutions to the police area, which is also under the jurisdiction of the Ministry of the Interior, enables to close down in the jurisdiction area similar, back-up ICT solutions which has positive effect upon the state budget. (ID) Also it was brought up that the biggest part of the ERB budget is wages and salaries fund and thus, new technological solutions cannot assist in reducing the ERB costs remarkably, but technology can assist in the reducing of the number of employees to some extent (IE, II). In the last twenty years the fire and rescue teams have become smaller, yet more operative and carrying out more tasks due to the use of new and better technological equipment and solutions. Hence, it can be said that technology has assisted ERB to reduce the number of rescuers as well as to carry out with a smaller number of employees more different tasks. (II)

It was mentioned that upon applying more smart technologies it is possible to reduce the number of employees, but it should be kept in mind that it is not possible to extinguish fires just with technologies (IG).

As there goes a saying time is money, having mobile working devices for the fire safety supervision inspectors and preventionists at site inspections and counselling, would enable to reduce the burden on ERB budget. New fire safety supervision inspectors notebooks, touch screen and ordinary, are under test period since November 2015 and decision of the application of specific notebooks is made in the I quarter of the year 2016.

New technologies have already enabled to give some parts of the ERB tasks to the inhabitants of Estonia, i.e. interactive home fire safety environment for home users or fire safety self-control report environment for the organizations. This enables to save the budget and direct the fire safety supervisions inspectors and consultants-prevention workers to visit objects with higher risks. New technological solutions enable to save time and money to identify the problems and to deal with the core of the problems. (IH)

It was told by an external interviewee that public service organizations where services can be more standardized can use more technologies and save upon people costs. Professional services like ERB where the decision making by people is very important, standardization is not possible to large extent and costs cannot be saved upon people as much as in case of standardisable services organizations like Estonian Road Administration issuing different licenses. (IK)

It is known that new technological solutions require big, initial and instant investments in order to have the savings upon the use of technological solutions in the future. For the ERB, ICT investments are implemented mainly by the SMIT.

ERB has to write down the actual ERB ICT needs and „sell“ these to SMIT (IC). The reality is that the technological needs and ideas of ERB are bigger than the present SMIT capabilities enable to process (IH). SMIT has elaborated a framework for the basic specification for new ICT solutions which has to be followed by the ERB and other jurisdiction area organizations and it is also checked by the SMIT analyst prior to ICT procurements (IB). Arrival of new ICT solutions to ERB depends greatly also on the skills of the ERB employees to write down the actual ICT needs (IA, IC). For the

process of development of new technological solutions for ERB specific needs, constant changes in the specifications have been a problem, but it is becoming ever less (IG).

ICT investments can be also applied from the EU funds via the Ministry of Economic Affairs and Communications, but it also goes through SMIT. (IC) ERB has not managed excellently so far in getting from SMIT or funding i.e. from the EU funds new available finances to start to use new technological equipment, ICT solutions. It should be kept in mind that in case of ERB technological equipment is as important as new ICT solutions as if even not more important. (II)
ERB has joint sharing of technological IT-resources with SMIT. In the opinion of the interviewees this enables to save time and money as several ICT solutions are the same for all jurisdiction area organizations (IA, IB, IC, IE) and ERB does not have the necessary competences (IJ). With the establishment of SMIT distribution of information has become safer and IT-security is now a priority (IB, IC, IE, IH, IJ).

It happens that new technological solutions are adapted, expenditures grow, technologies work weakly, yet it is cheaper to stay with such a solution than to re-orientate to a new one. JÄIS system has been through the years such an example; however JÄIS system base architecture has been rewritten by SMIT by October 2015 and hopefully will perform now more efficiently (IG). It has to be mentioned that before SMIT ERB had IT-experts inside the organization itself and they proposed the initial digital networking options of the organization. These were not the best ones, but still something to start with the technological development of ERB. Costs were made, user friendliness was not too high, but these initial office group work solutions enabled people to learn and enhance further technologically. (IE)

ERB ICT investment decisions are based on the mapped down technological needs of the ERB in accordance with the ERB strategy and in cooperation with SMIT (IJ). When a new solution is ordered, it should assist in improving the work performance. ERB as a public service organization has to think more in the light of improving its public services to the population. New webpage of the ERB was based also on the population

needs, as prior to launching it, inquiries were carried out to find out the needs of the population in relation to the new ERB webpage. (IA)
ERB technological investment decisions are mainly based on the needs of the ERB, but ancillary services of the ERB like bookkeeping, personnel services have to adopt ICT solutions which are in use in all of the public sector organizations of Estonia i.e. SAP – an ICT database-solution used by the personnel, financial and administrative units of the Estonian public service organizations. (II)

In the public service there are two types of organization. One is where it is very easy to measure the results, like e-Tax Board/e-customs with its inputs and outputs. In these organizations it is rather easy to get money for new technological developments and investments. The other type is the majority of public sector organizations, where clear input-output indicators do not exist. There it is harder to get money for new technological developments as it is more complex to explain the needs to the funders of developments. In general, the development challenges of public service organizations in Estonia are not interpreted through the technological solutions. Role of the Estonian governmental organizations in the technological development is much lower than it could be as organizations do not interpret their challenges. As it is hard to measure most of the activities of the Estonian public sector organizations, technologies today cannot assist much in reducing the employees in organizations along with the jump of productivity. Rather technologies can assist in getting better and more effective public services. (IK) ERB belongs to the group of public service organizations, where clear input-output indicators are hard to measure. Yet, it has to be mentioned that ERB is not alike all the Estonian public service organizations as ERB has a strategy which states the importance of technologies and all new technologies adapted by ERB must assist in better implementation of the ERB tasks and strategic goals.

3.2.6 Impacts on rules

Changing technologies have collided and collide sometimes with the old rules at ERB, but organization is flexible and old rules, regulation and laws are changed relatively

easily in Estonia (IA, IC, II). I.e. application of the documentation management system Postipoiss made to change the internal regulations of the ERB (IA). Also it should be mentioned that employees of ERB think about the existent rules already in the process of the preparation for new technological developments and initiate if necessary changes of rules in the first stage, so that changing technologies need not to collide with the old rules at the ERB (IB). Collision to the existent rules in relation with new ICT systems has been related to data collection, the Personal Data Protection Act (IJ). In case of the adaptation of the GIS-112 system, one article had to be changed in the Rescue Act and already existent SOS-system data was used and there was a need to make an amendment to Electronic Communications Act (Riigi Teataja 2016) which stipulates now the right of ERC to position the caller on a map and (ID).

At the ERB rules have been modified and made when new, multiple communication technology solutions in parallel at ERB have been used, not to causes contradictions in data and its management. It is a constant process where processing methodologies have been agreed upon for the analyst. The goal for making such rules is that different employees of ERB should not make analyses based on the same data and get different results. (IC)

When speaking about the new digital technology solutions and ICT safety, security and confidentiality issues are organized for the ERB by the SMIT (II), but there is still space for improvement (IJ). Safety classes are determined for all information systems used at the ERB by ISKE (three-level IT baseline security system) (Information System Authority 2012) (IC). Subordination of rights is set for access levels to the ERB databases as well as regulation stipulates the rights of operation with new social media channels used by the ERB (IH).

In case of E-governance always is current the question whether it is blurring the lines between different public sector organizations. On the question concerning the line blurring between ERB and other related public sector organizations, most interviewees said that E-governance is not blurring the lines between ERB and other public institutions (IC, IF, IG): as if a certain public service is needed, the inhabitant still turns

to a specific organization responsible for that certain public service (IB); as ERB has very specific and concrete public services which it has to offer to the population, like fire extinguishing (IE, IH); as ERB has been offering public fire and rescue services before E-governance and will continue to offer these services during the new technological era (II). Still, there were also some interviewees who considered that blurred lines are present to some extent between ERB and other related public institutions: as if a citizen goes to an Estonian citizen portal www.eesti.ee, which is aimed to get all the public services from one place, it can be considered as one melting pot where all public organizations are as one (IA); as often when when data collection, measuring at ERB is started in one specific field, it leads to another public organizations related fields of activities and it means there is a need and clearance of blurred fields between organizations and technology enables knowledge based approach (IJ).

3.2.7 ERB TDT and Process Model

Interviewees were asked whether the execute-control-optimize cycle of technologies is at place in ERB. It turned out that this is an issue which is not handled yet systematically at the organization (II).

ERB should assess the impact of used technological solutions/equipment and whether the calculated payoff period has been appropriate. This is carried out to some extent at the ERB, but the cycle of automatization-monitoring-analysis should be carried out better and followed by necessary optimization. (IC) It was stated that ERB has a long way to go in the technology monitoring and analysis process (IE) and that organization should make cost-benefit analyses of the technological solutions used (IG). It was mentioned that every field of activity of the ERB has the right to make proposals how to improve the technological solutions used or to propose new solutions to raise the quality of ERB work and services to the population. All such proposals can be forwarded to the IT-Councillor of the ERB who discusses the ideas, problems and proposals with the ERB ICT working group. (IH) Although, the technology Process Model implement-analyse-optimize is not employed consciously at the ERB at the moment, it is under a planning process (IJ).

From the positive side, operated by ERC GIS-112 system and used by the ERB, efficiency is monitored, analysed and in case of need optimized constantly from the moment of the start of the system employment by the ERC (ID).

3.3 Future use of ICT solutions and fire and rescue equipment

3.3.1 Possible new technological solutions improving the technological condition of the ERB

In order to find the answer to the main research question of the present thesis, interviewees were asked an assisting second sub question about new technological solutions for the improvement of the technological condition of the ERB. New for the ERB technological solutions, offered by the interviewees, were extensive, but all were aimed as a final goal towards offering better fire and rescue public service for the population of Estonia.

ERB has been thinking about the need to have for fire extinguishing operations the ColdCut System as it would enable to extinguish the fire in the room without entering it. ERB needs an IT solution which would enable to measure the impact of the use of different fire and rescue technological equipment in order to find out the level of the success of saving human lives by ERB. In order to reduce the time of the fire detection, more automatic fire suppression systems should be used in buildings as well as the implementation of e-call system should be put into use in Estonia to save more human lives in car accidents. (II)

Today it is possible to measure, evaluate and improve through the assistance of GIS-112 system information, how fast the emergency call is received, how fast fire engines are sent out, how much time it takes before the fire engine drives out from the fire station and arrives to the accident scene. Yet, there is a blank space after the arrival of fire engines to the accident scenes and for that reason, fire engine on-board camera, helmet camera or a special ICT solution for storing the accident scene data for the analysis, measurement and for effective actions is very important and should be developed.

Mobile positioning data system for carrying out more precise risk analysis has been under consideration, but so far has not been decided upon due to high financial inputs required. (IC)
New system PÄVIS offers a common possibility for all operative public services of Estonia to administer their operative resources. In order to provide the inhabitants of Estonia with even better operative public services, ERC is launching a new ÜHKIS ICT system, where besides the rescue and ambulance calls, police calls will processed. (ID)

In cooperation with the Government Office, topic of warning sms-es to the population have been under consideration, which could be of great assistance i.e. in case of extensive disasters or accidents to inform the population in the region about the exact steps to be undertaken (IA). Text messages to the population in specific region of Estonia with crisis situation in the future could assist in the improvement of the technological condition of the ERB, but this has not been a top priority topic in Estonia so far. Crisis management experts of the ERB are not yet at the level where they can prepare durable basic descriptions for the topic of text messages to the population and there are more bottlenecks in the topic. (IE)

Application of new, portable technological solutions related to JÄIS system and home visits by fire safety inspectors would improve upon the technological condition of the ERB as until today inspectors had to fill in the necessary data during fire safety inspections first in papers when inspecting the objects. A much better solution is the option to fill in databases digitally already at the object, not later from the papers into the databases at the offices. These mobile touch screen laptops are now under the test period at ERB. (IB, IG)

Another concern of the ERB is that it has today a scarce overview about the heating systems in the country. Improvement for the technological condition of the ERB in this issue would be a database, into which chimney-sweepers and potters would insert their activities, which have been carried out. (IB)

Fire prevention consulting is carried out at the present moment on the spot or with the assistance of rescue area prevention web-consultant, but in the future it has to be possible to carry out such consultations also online (reception hours via skype), by it saving the time and resources of ERB employees and the population of Estonia (IH).

Making of different statistics on the basis of data store has been under consideration as well. In the year 2015 ERB employees could access the databases and networks in their ERB PC-s outside ERB with the ID-card identification, but a new innovative solution AnyConnect is under inculcation by SMIT. This new solution is safe, yet does not need anymore the use of an ID-card. (IG)

Using of more sprinkler-systems in households as well as fire detection devices in combination with smart devices could have profound influence on the inhabitants' safety of Estonia (IH).

According to the ERB strategy it is possible to increase the safety of the population of Estonia by using skilfully the new technologies like new communication channels for prevention work, modern surveillance and alarm systems and new rescue equipment to save more human lives. One option foreseen in the strategy is to start to use Search and Rescue UAV-s (unmanned aerial vehicles), but according to the words of the Director General of the ERB, Mr Kuno Tammearu, it is too early to speak about the use of such new technological solution by the ERB. (Eesti Päevaleht, 22.oktoober 2015)

An external to ERB interviewee proposed that since ERB is responsible also for the water safety in the country, it would be good to have tentative automatical or semi-automatical warnings through app or push technologies if there is any danger to go to the sea, rivers and lakes.(IF)

Most of the new ICT solutions and technological equipment used today in the Estonian public service organizations are aimed mainly to improve the internal technological situation and processes of these organizations. The potentialities of technologies are much broader, i.e. how the public sector organization could try to get feedback from its service users in real time through the social media, algorithms. A smart home

technology is a field of technology where ERB might have high ambitions in the future by involving more prevention measures. (IK)

3.3.2 ERB technological development preconditions, pace reducers, accelerators and vision of the current technological situation

In order to find out which preconditions should be at place at the ERB for a successful technological development of the organization, interviewees were asked to answer a related question. It was said that more time should be given to the employees to think and discuss about possible and necessary new technological solutions (IA) and that an environment favouring adaptation of new technological solutions is important (IH); wise people and technical intelligence are important (IC) as well as well-weighed choices of technologies and careful designing of ICT functionalities (ID). Readiness of employees to learn about new technological solutions, equipment and keeping in mind that technology should support the unit process, not vice versa, are essential (IE, II).

Management of the technological development should follow a concrete vision, strategy, budget and the society has to be ready to accept the technological development of the public service organization (IF). Precondition for a successful technological development of ERB is also the will of employees to work on new technological solutions together, ERB and SMIT (IG). It was mentioned that the role of the ERB IT-Adviser should be to be responsible for the technological development process of the ERB and to bring the new technological development trends of the world to the ERB as well as to find out how these new solutions could assist upon improving the technological dynamics of the ERB (IH).

It is necessary to understand that in the planning process of technological developments, the proceeding should stem not from a specific task or function or structure, but rather from the objective of the organization. It is important to learn to associate the real needs with the bigger, overall picture of ERB development. All ERB technological developments should assist in saving more human lives, properties and environment. (IJ)

It is important that people working at ERB with development issues and know how to associate development with new technologies, have certain power (formal or informal) inside the organization and have the possibility to influence the decisions of the management of the ERB as well as have the capabilities to spread the knowledge and information inside the organization. Not less important are the fact how proactively ERB sees its future technological development and how well ERB reasons its needs for new technological solutions for the state financing decision makers. (IK)

Another subject related densely to the technological development of ERB and asked from the interviewees was, how they see the ERB technological development related organizations, as pace reducers or accelerators of the technological development.
SMIT in general was seen as an important and necessary for the technological development organization as has been established to facilitate the technological dynamics of ERB (IA, IC). SMIT facilitation concerns the ability of SMIT to handle the ICT security problems of ERB, render operative daily IT-support as well as bring ERB back to the earth if new ideas are too dashing (IE).
Yet, it was mentioned several times that there is space for better outputs from the side of SMIT (IA) as there is a lack of manpower resources to handle all technological solutions necessary for the technological development of ERB (IB, IE, IH, IG, II). This shortage is related to the problem that the ICT developers of Estonia are very busy at the Estonian ICT market and the amount of good ICT experts is not sufficient for the needs of Estonia. Most of the best Estonian ICT developers work for the big international companies and it is not easy to find good professionals for the developing of the specific ICT technological solutions of the Estonian public services, including the ERB. (II)

In addition, SMIT chain of technological decisions was referred as complicated and long-time (IH, II). A problem of „owner“ for each ICT technological solution at ERB was brought out as there have been cases of initiative lack from the ERB side. Better involvement of each other into the elaboration of new technological solutions for the ERB should be at place as without such involvement the new technological solutions for the ERB may turn out not as expected by the ERB from SMIT. (IG)

Ministry of the Interior was seen as a neutral actor by giving the basic task to ERB and expecting it to find the necessary solutions (IB). ERC, a public organization closely interlinked with the ERB through technological solutions in use, was seen as facilitating the technological dynamics of the ERB (IC, ID). Without GIS-112 solution there would not be digital maps in the rescue cars and another important bonus of the system for offering better public services to the population is that the same digi map is also in ambulance cars, which cooperate very closely with the rescuers in saving human lives. The same digi map will be exploited also in the police cars and through it cooperation between all three operative actors in the state will improve in the mission of saving more human lives. (IC, ID).

Main pace reducers in acquiring of new and top-technological equipment as well as IT-solutions were considered to be the lack of finances (IB, IC, IE, II, IJ). I.e. ERB has tried for several years to acquire the Cobra ColdCut System, but the finances are not sufficient for that (II). It also was mentioned that skills and awareness of the employees about the technological possibilities (IC), not breaking out from the comfort zone to search for new and better solutions due to the overly high workloads of the employees (II), developments in politics (IC) are pace reducers in the technological development of the ERB.

Another noted important pace reducer was the present inability of the employees of the ERB to visualize and put their tasks into one common ERB technological system (IJ). Estonian public sector organizations in overall do not interpret their development challenges through the technological possibilities and public service organizations in Estonia have by default a disperse attitude that it is not allowed to be mistaken for the public sector. Innovation, launching of new technological equipment, solutions involves always risk and since it is agreed that mistakes are not allowed, no major innovations are undertaken by the public service and new technologies are adapted only on a precondition that these are serviceable one hundred per cent. (IK)

To counterweight the pace reducers of the technological dynamics at the ERB, some accelerators were named by the interviewees. Namely, ERB is creating contacts for

technological cross sectoral cooperation and it is also fixed in the ERB strategy that ERB must have cooperation with research and development organizations in order to successfully implement the goals of ERB (IJ). Most of the interviewees considered technological cross sectoral cooperation between ERB, research and development organizations, entrepreneurs as a possible pace accelerator for the technological development of the ERB (IB, IF, IG, IH, II). Such cross sectoral cooperation was considered as a value added to the out of the box thinking dimension for the employees of the ERB as well as offering an opportunity to adapt new technological equipment and solutions to the ERB needs (IE). On the other hand, with certain discretion it was expressed that such cooperation may be clumsy as there is a need to communicate with many different sectors representatives simultaneously (IF). It was also said that in order to achieve successful technological cross sectoral cooperation for the ERB, some aspects of cooperation between ERB and SMIT should be rendered more flexible (IH).
It was pointed that ERB has not carried out sufficient technological cross sectoral cooperation with entrepreneurs, only in case of big technological procurements for rescue equipment and fire engines to make necessary specifications to the equipment. Estonian Academy of Security Sciences has researched for the ERB the application of a new fire nozzle, tactics of its use. In the future ERB intends to define better its needs and problems to research and development institutions. (IC)

Think Tanks were considered by the interviewees also as possible facilitators of technological development of the ERB (IE, IG, II, IJ). Think Tanks is a good idea for the acceleration of the technological development of ERB by creating external pressure, but external pressure should transform into technological changes inside the organization itself (IK).
ERB has participated in the activities of Think Tank „ Garage48“, where ERB wanted to concord, optimize the home dangers mapping test to the smart devices as well. Also it has been under consideration to complement the fire prevention test environment for homes with specific service providers who assist in improving upon the home safety situations. Unfortunately, at the present moment the private sector in Estonia is lacking the corresponding know-how (code-writers) and the idea will be tried out in the future. (IH) Yet, one important aspect was proposed by Think Tanks for the adaptation of the

new ICT solutions by the ERB, these new solutions have to correspond to the safety regulations and synchronize with the existent IT-systems of the ERB (II).
It has to be mentioned hereby also that ERB has been cooperating with Ajujaht (Brain Hunt) which is the biggest competition of business ideas in Estonia, where annually around 300 ideas are competing into a development and mentor program. On 5 October 2015, ERB and Ajujaht had a brainstorming called Hackathon to find solutions to the problems of the ERB. Author of the present thesis was among the participants of the Hackathon and found it a good idea to have such Think Tanks also in the future to enhance the new ideas for the technological development of ERB. The problems included among others were numerous false alarms of automatic fire suppression systems in Estonia, solutions for extinguishing of fires in fuel terminals, etc. Specialists from ERB, entrepreneurs and students of universities were brainstorming on the technologies related problematical issues of the ERB and tried to find new technological solutions to the problems. (Estonian Rescue Board 2016, 38) Idea of one team, a chimney carbon black sensor for the identification of need-based chimney sweeping, was presented and developed further at Tehnohack, where proposed solution won two awards and is still developed further.

ERB internal interviewees, knowing well the technological situation of ERB, were asked to evaluate on the scale of maximum ten points the level of technological development of the ERB in the last ten years in the section of other Estonian state institutions they have been related to. The average calculated rate of this evaluation is seven. As a problem it was brought out that some technological solutions are under development for a too long time and are not conformable upon maturation anymore (IA). It was said that ERB has a lot of technological developments, including the databases containing the necessary information from all over Estonia, but in comparison to the Estonian Police (IB) and Estonian Tax and Customs Board (IC), ERB has space for technological improvements. On the other hand, many foreign cooperation partners see the level of ERB technological development as rather high in comparison to their technological systems and equipment in use (ID) and ERB is technologically well updated by being very close to the technological development level of the Nordic

countries with its M-GIS navigation devices on fire engines and other new technological solutions in use (IE).

To add some external dimension to the topic of the vision of the current technological situation of the ERB, an Internal Auditor of the Ministry of Interior who carried out an audit „IKT arendusprotsessi ja valdkondlike juhtrühmade toimimine“ about the operation of ICT development process and field related steering groups, was contacted by the author of the present thesis. The goal of audit was to evaluate the efficiency and efficacy of the regulation of the ICT development activities in the whole area of jurisdiction, including at the ERB. On the basis of the information gathered from the ERB in the course of audit, it came out that ERB is predominantly pleased with the regulation of the ICT development activities and no big and important related to ICT developments problems were pointed out, except the need to change some laws like the Rescue Act in relation to the processing of emergency alerts in the PÄVIS system. It was also mentioned that cooperation with SMIT has continuously improved. (Ministry of the Interior 2015)

3.4 Summary

In this chapter, carried out interviews have been analysed in accordance with the ERB TDT, which proved to be a very good tool to find out about the technological condition of the ERB. It was possible to find out the answers to all ERB TDT components in course of the interviews. Moreover, future ERB technological dynamics enhancement ideas were proposed along with finding out the strengths and weaknesses on the way of the ERB technological dynamics.

Both internal and external IT operations are under constant development process at the ERB. Hard technologies play a crucial role in the technological development of the ERB by enabling faster and better life saving service to the population of Estonia and protect better the lives of the rescuers.

ERC and SMIT turned out to be the most important cooperation partners for the ERB ICT technological development. Some weaknesses were mentioned in cooperation between ERB and SMIT, like lack of top of the notch IT personnel at SMIT, long and

bureaucratic process chain for the elaboration of new ERB IT solutions, need of ERB to find „owners for the IT systems", but these and some more shortfalls have constantly improved. It was proposed that it might be good for the technological dynamics of the ERB if besides having SMIT as the main IT service provider, ERB could have some flexibility to hire also external IT experts on its own.
Operated by ERC GIS-112 system was named as one of the most important tool for the ERB activities.

Changes in technological solutions at ERB have positive impact on the citizen′s perspective in Estonia as i.e. new technological solution GIS 112 assists in faster rescue and saving more human lives in Estonia. Population of Estonia has several virtual services offered by the ERB, just to name some of them i.e. webpage of the ERB; interactive fire safety test environment; fire safety self-control report environment; e-learning course for voluntary firefighters; fire stations network map; ERB Facebook, YouTube, Twitter pages. Yet, some virtual services to the population should be developed further like fire safety supervision engineer-technical IT solutions, skype fire prevention consultations, and digital chimney-sweepers database.
Interviewees shared the view that ERB is a public service organization, which can make some of its public services to the population more comfortable by implementing internet-based services, but there always remain services in ERB which cannot be virtualized, i.e. fire and rescue operations. It also turned out that population of Estonia should be better informed by the ERB about the virtual services it offers to the population in order to gain more from the technological change.

IT technological solutions and equipment have gone through a big change for the ERB activities. Integrated nozzles, breathing apparatuses, hydraulic rescue equipment, thermo-cameras, compressed Air Foam System, GIS112 (M-GIS) system are assisting greatly the rescuers in their operations. From the office side, an internal prevention ICT module will assist soon the prevention employees, at place are PÄVIS and JÄIS systems; internet-based fire safety self-control report environment; Postipoiss (from 2016 Delta); teleworking solutions (video-conferences), Microsoft Outlook group work.

In the last years the ICT systems have been changed and improved constantly at the ERB, which requires constant learning from the ERB employees and readiness to learn about the new solutions is present at the organization. It was mentioned several times by the interviewees that it is easier to retrain the office personnel on new ICT solutions than the rescuers on new technological equipment and ICT solutions.
New technological solutions taken into use at the ERB have not caused big structural changes at the ERB according to the majority of the interviewees.

Changing technologies at the ERB do not change so much the essence of the tasks or the goal of the tasks for the ERB employees, but rather the ways the tasks were carried out in the past and are carried out now by transforming the way of implementation of the former existent tasks. Before databases there was no need to administer digital databases and hence it is a new task, which arrived along with the new technological solutions. All ERB office activities have moved from paper work to digital work. General viewpoint of the ERB interviewees was that use of the new technological solutions and equipment has improved the performance of ERB tasks and requires novel type of work.
New technologies have created new challenges for the organization, i.e. the need to create a better training basis for learning about new ICT solutions; balance between security and user-friendliness; learning to operate with the data gathered into the ICT systems; better involvement of the ERB employees into new technological developments at ERB.

Common viewpoint of the ERB interviewees was that new technologies have changed the official at the ERB as today employees of the ERB must work with digital databases instead of document files and there is a requirement in most of the job descriptions obliging employees to know and to use modern technologies. Also changing technologies require employees with higher and better educational background. Retraining is the main way of improving upon the new technological knowledge of the ERB employees. It was noted by the interviewees that ERB might need new type of employees to improve upon the technological dynamics of the ERB. These new

employees should know how to find and elaborate new technological solutions and be more innovation oriented.

New technological solutions have made some traditional positions to vanish at the ERB. I.e. secretarial positions are less as all employees are digitally educated and perform their secretarial duties for themselves; instead of telephonists-dispatchers at the fire stations, there are ERC employees using modern technological equipment; before SMIT, ERB had its own IT-personnel at sight, while now SMIT carries out all the necessary operations incl. help-desk from the distance with the assistance of modern technological solutions.

According to the understanding of the interviewees, it is possible to make some savings upon the use of new technological solutions at the ERB and to carry out the tasks more efficiently without reduplication; by getting more free time to carry out additional and important tasks. I. e teleworking enables to decrease upon the costs of operations, but does not enable to shut down the offices and requires more inputs to ensure the digi-security. The biggest part of the ERB budget is wages and salaries fund and thus, new technological solutions cannot assist in reducing the ERB costs remarkably, but technology has assisted and assists in reducing the number of employees to some extent. I.e. rescue teams have become smaller due to good new technological equipment. New technologies have enabled to give some parts of the ERB tasks to the inhabitants of Estonia, i.e. interactive home fire safety environment for home users or fire safety self-control report environment for the organizations.

Due to the fact that at the ERB decision making by people is very substantial to save human lives, costs cannot be saved to large extent by the dismissal of the employees by using new technological solutions.

To reap the benefits from the use of new technological solutions, investments to be made are big and instant. These ICT investments for the ERB are made by SMIT in cooperation with ERB. Timely arrival of new ICT technological investments to the ERB depends largely on the available resources of SMIT for the developments as well as on the skills of the ERB employees to write down exact specifications. There is still space for development from both sides to ensure better ICT dynamics of the ERB. Available EU funds should be more used for getting modern rescue equipment and devices.

Hence, it has to be said that ERB is a type of a public sector organization, where clear input-output indicators are hard to measure and it is harder to get money for new technological developments and technologies today cannot assist much in reducing the employees in organization along with the jump of productivity.

Changing technologies have collided with the old rules at the ERB, but organization is flexible and old rules, regulations and laws are changed timely in parallel with the initiation process of new technological solutions and done so relatively easily. In the opinion of the most interviewees E-governance is not blurring the lines between ERB and other related public sector organizations. Yet, there were some interviewees staying at an opposite viewpoint. I.e. the Estonian citizen portal www.eesti.ee is like a single melting pot from where to get all public services and i.e. when ERB starts data collections from one specific field, it leads to other public organizations related fields of activities and the lines between have to be cleared.

The Process Model or the execute-control-optimize cycle of technologies is not in use yet systematically at the ERB, but is rather implemented from time to time and now is under the planning process.

ERB has thought about the necessary possible new ICT solutions and fire and rescue equipment to offer better public service to the population of Estonia by improving the technological dynamics of the organization. Among new, necessary technological equipment listed were ColdCut System; more automatic fire suppression systems; e-call system to be implemented in Estonia; fire engine on-board camera, helmet camera or a special ICT solution for storing the accident scene data for the analysis, measurement and for effective actions; search and rescue UAVs; smart home technologies. Among necessary new ICT solutions for the organization were named the solution enabling to measure the impact of the use of different fire and rescue technological equipment; chimney sweepers and potters database; online fire prevention consultations; an ICT solution to get real time feedback from ERB service users; mobile positioning data system for carrying out more precise risk analysis; sms messages system to warn the population about crisis situations in the country; automatical or semi-automatical

warnings through app or push technologies if there is any danger to go to the sea, rivers and lakes.

In order to have successful technological development, some preconditions should be at place. According to the interviewees, necessary preconditions are: more time given to the employees to think and discuss about possible and necessary new technological solutions; wise people and technical intelligence; well-weighed choices of technologies and careful designing of ICT functionalities; preparedness of employees to learn about new technological solutions and to work on new solutions together; new technological solutions stemming from the objectives of the organization; knowledge how to associate development with new technologies; formal or informal power of the ERB Development Department employees inside the organization as well as their possibility to influence the decisions of the management of the ERB and their capabilities to spread the knowledge and information inside the organization itself; proactive vision of the ERB on its future technological development; strong and skilful reasoning of the ERB needs for new technological solutions for the state financing decision makers.

ERB technological development related organization SMIT was seen in general as assisting force in the technological development of ERB, but there is still space for cooperation improvements. Ministry of the Interior was seen as a neutral actor by giving the basic task to ERB and expecting it to find the necessary solutions, while ERC was seen as a clear facilitator of the technological dynamics of the ERB.

Main pace reducers in acquiring of new and top-technological equipment as well as IT-solutions was considered to be the lack of finances; sills and awareness of the employees about the technological possibilities; developments in politics; present inability of the employees of the ERB to visualize and put their tasks into one common ERB technological system; silent agreement of the Estonian public sector not to be allowed to be mistaken, while innovation, launching of new technological equipment, solutions involves always risk;

As a possible accelerator for the ERB technological dynamics was named the technological cross sectoral cooperation between ERB, research and development organizations, entrepreneurs. So far, ERB has not carried out sufficient technological cross sectoral cooperation with entrepreneurs, only in case of big technological procurements for rescue equipment and fire engines to make necessary specifications to

the equipment. Cross sectoral cooperation with the Academy of Security Sciences is well-established. Think Tanks were considered by the interviewees also as possible facilitators of the technological development of the ERB by creating external pressure, which then has to be transformed into technological changes inside the organization itself.

IERB interviewees estimate the level of the technological development of the ERB at the present moment above the average, with a clause that there still is space for technological improvements.

In this chapter of the thesis all interviews have been scrutinized in accordance with the ERB TDT framework and the next step is getting into discussion, comparing the empirical results with the applied ERB TDT, finding out possible differences between practice and theory and stating the answers to the research questions.

4. DISCUSSION

When taking a close look at the ERB TDT framework used and data received through empirical research, it should be mentioned that *shifts in citizen's perspective due to the use of new technological solutions* by ERB have taken place and are taking place. New fire and rescue equipment and ICT solutions offer better and faster lifesaving capabilities to the population of Estonia and time is a key issue when saving human lives, properties and environment. New ICT solutions and social communication channels like ERB Facebook environment offered to the population by the ERB, assist in the raise of fire safety awareness of the population in Estonia and are making the life of inhabitants more comfortable, time saving and safe.

Remarkable *shifts in service provider's perspective* have taken place through the application of modern fire and rescue equipment, new ICT and teleworking solutions. Empirical findings have proved the validity of the theory that new ICT solutions enable to carry out work also from outside the offices, spread easily the information as well as diminish upon the operational costs and improve the capabilities. Theoretical notion of getting a more versatile pool of employees when reallocating offices to rural areas with the assistance of new technological solutions as well as closing down of smaller units and maintaining single bigger units to serve „professional, financial, technological logic" did not hold place in relation to the practice of the ERB.

It should be noted that it is hard to separate from each other the shifts in citizens and service providers perspective as these two are very much interlinked to each other.

When speaking about *changes in tasks* variable of the ERB TDT framework upon arrival of technological change, it empirically holds place that ERB is turned more and more into digitally governed network organization and is facing new challenges. Tasks are carried out in a new way, but essence of the tasks remains the same.

Changes in public officials variable of the ERB TDT model is in concord with the empirical results from the ERB. Retraining is the main way of improving the organization technological knowledge. A personnel is and has to be better educated. External experts like SMIT and fire and rescue equipment companies play a big role in the technological dynamics of the organization. Traditional positions at the ERB have diminished, i.e. secretaries and some vanished, i.e. telephonists-dispatchers, typists.

Technological change and savings variable of the ERB TDT model approved to be in harmony with the empirical results to some extent. ERB interviewees did not speak about the big launching costs of new technological solutions, but understand the opportunity for certain financial savings through the use of new technological solutions as well as believe in the saving of time and increase of the efficiency of ERB activities by using new technologies. Problem is to find sufficient available finances for technological development of the organization.

Impacts on rules variable of the ERB TDT model is in general in accordance with the empirical findings. With the arrival of new technologies, rules need to be changed and it is not a problem for the ERB as organization is sufficiently innovation minded and flexible in its activities. Upon arrival of multiple communication technology solutions in parallel at ERB, rules are changed, not to cause contradictions in data and its management. ICT safety and confidentiality are ensured to the ERB by SMIT. From the empirical studies it remained hazy whether E-governance is blurring or not the lines between ERB and other related public institutions, but majority of interviewees remained at their understanding that E-governance is not blurring the lines.

It has to be said that the *Process Model of the ERB TDT* is not established yet systematically at the ERB. Hence, this theory and practice are not in accordance. Although, it has to be mentioned that according to empirical data received, it is already under the elaboration process.

Hypotheses of Milakovich and West stated in the Introduction chapter did held place only partly in this case study as deficiency of political volition and managerial know-how for the application of new technological solutions were not pointed out as main obstacles on the way of technological dynamics in the ERB, but finances were recognized as pace reducers in the technological development of the ERB.

The main research question of the present thesis was tried to be answered with the assistance of two sub questions through carrying out interviews. The answers to the sub questions showed that ERB has used and uses for internal as well as external purposes

numerous technologies, which have improved upon the technological dynamics of the organization remarkably by saving time, offering the possibility to carry out the tasks carried out earlier more effectively, reducing the time to reach the persons in distress, improving upon the safety of the rescuers in operations. Several new technological solutions have been lately considered by the ERB for the improvement of the technological condition of the ERB. To name just some of them, application of Cobra Cold Cut System, better or new virtual prevention and fire safety supervision services for the population of Estonia.

To answer the main research question, how the application of new technological solutions has impacted a public service, including delivery, use and institutional aspects, on the case of ERB, interviews based on the ERB TDT model by using the form of an exploratory case study were carried out. The TDT ERB model applied in the present thesis, turned out to be a valuable tool in finding out about the technological dynamics of the ERB. To sum up in brief the answer to the main research question, it can be said that the application of new technological solutions has impacted the activities and public services offered to the population by ERB remarkably by opening new ways of delivering public services to the population. New technological solutions, incl. virtualization enable faster and better for the population services, enable employees of the ERB to carry out more work for the same time by using new ICT solutions, and have increased the organization openness to new technological solutions.

Present technological development condition of the ERB evaluated with the rate of seven points on the scale of maximum ten points, speaks a lot about the actual technological situation at the organization. Graded above the average as a lot is already done in the process of technological dynamics at the ERB, there still is room for the improvements for offering the best public services to the population of Estonia.

The next or the last chapter of the present thesis points out the strengths and weaknesses of the present technological dynamics of the ERB, advises some future prospects for better technological dynamics of the ERB and finally, evaluates the case study itself.

5. CONCLUSION

Technological condition of an Estonian public sector organization, namely the ERB has been studied in the present thesis. Three out of its five main fields of activities rescue works, prevention work, fire safety supervision have been scrutinized in the light of technological development and appropriateness of technological change of the organization has been tried to put through test in this paper. The main research question of the present thesis of how the application of new technological solutions has impacted a public service, including delivery, use and institutional aspects, on the case of ERB, has been tried to be answered in this thesis through carrying out a qualitative research with the assistance of semi structured interviews with multiple interviewees and the ERB TDT framework. As a result of the combination of gained empirical and used theoretical data in the present thesis, it can be said that the application of new technological solutions, both internal and external, have greatly impacted the activities and institutional aspects of the ERB and its services to the population. Application of new ICT technological solutions and equipment for the delivery of the fire and rescue service to the population, are making the ERB services to the population more comfortable, less time-consuming and enable faster and better life saving capabilities.

To be able to find the answer to the main research question, also two sub-questions were studied. Firstly, how and what technology has ERB used so far for internal and external purposes. It turned out that ERB uses up to date ICT-solutions as well as top of the notch equipment, but there still is space for the technological development to better fulfil the strategic goals of the ERB and to offer the best possible fire and rescue service to the population of Estonia. Secondly, a question was set, what new technological solutions have been lately considered for the improvement of the technological condition of the ERB. Empirical research showed that ERB has thought about some possible new technological solutions for the improvement of the technological condition of the ERB. But not only new ICT solutions and equipment procurements are important for the technological dynamics of the ERB. Also activities like technological training inside the organization, better cooperation with the main ICT service provider to the ERB SMIT and enhancement of the knowledge of the ERB employees how to link new technological solutions and strategic goals with each other are as much substantial.

Changes at the ERB due to the application of new technological equipment and new ICT solutions have been remarkable since the restoration of the Republic of Estonia and the digital revolution in the world. World Wide Web has boosted the activities of the ERB and a lot of necessary for the population of Estonia safety information can today be gained from the webpage of the ERB as well as from social environments like Facebook. New digital technological solutions have enabled to have comprehensive and interlinked to each other databases at the ERB. Digital networking, teleworking and video-conference opportunities have improved the technological dynamics of ERB considerably .ERB with its openness towards new technological solutions and its strategy, with one of the highest population trust numbers among public sector organizations in the country, modern fire and rescue equipment i.e. thermal imaging cameras and top of the notch fire engines, ICT solutions like GIS-112 system enabling better life saving capabilities and last but not least, the obligation to have smoke detectors in households, is in its technological development on a right path. Readiness of the application of CobraColdCut, UAV technologies and other already available innovative technological solutions at the world market, is present in the organization. Application of these is a question of the nearest years and depends upon the financial possibilities in the country. General majority of the ERB employees is prone to accept new technological solutions and equipment for the facilitation and improvement of their job. Studied in this thesis three fields of activities of ERB are fields or ERB where a lot of technological improvements have been already made to offer better fire and rescue services for the population of Estonia through the use of new technological solutions. According to one objective of the ERB strategy, out of date technologies are modernized. One remarkable proof of accomplishment of this strategical goal is the procurement of technologically top of the notch 83 new technical units, specifically assembled in accordance with the needs of the ERB in the coming years.

In the opinion of the author of the present thesis, technological situation of the ERB is good on basis of the gathered empirical data with the assistance of ERB TDT framework. Although, it has to be admitted that by eliminating some shortcomings, technological dynamics of ERB would improve further. Process Model has to be started to implement systematically in order to assess the impact of used technological solutions/equipment and to find out whether the calculated payoff period has been

appropriate. Better new technologies training measures should be established. ERB should inform the population more about its virtual services offered to the population as well as about technological equipment used for the saving of more human lives, properties and environment and carry out a virtualization influence inquiry.

For the improvement of ERB technological dynamics and for the offering of better public service to the population, information concerning heating systems, fire and water accidents prevention consulting and fire safety supervision service related to construction control should be turned into virtual services. From the ERB internal activities viewpoint, in order to get the best results out of the PÄVIS system which is interlinked to the GIS-112 system, rescuers should learn to use it better and user-friendliness and retrieval system should be improved by SMIT in cooperation with the ERB. Also, balance between ICT systems user-friendliness and security has to be improved; possibility for the ERB to involve different technological external experts as councillors into the topic of enhancement of new specific technological solutions besides having the SMIT ICT services, should be implemented; ERB employees must learn how to operate with the gathered into the ICT systems data and have to be constantly involved into the new technological developments in the organization. Cooperation between ERB and SMIT has improved, but this process has to be enhanced further. Finally, technological cross sectoral cooperation should become more important and implemented by the ERB and available EU funds should be utilized more effectively for the improved ERB technological dynamics.

To assess the case study itself, some relevant issues should be discussed.

As mentioned already at the very beginning of this thesis, the thesis did not cover all main five fields of activities of the ERB due to time limits and security reasons. Hence, there might be a need for an extended research in the future, by including also the two left out topics ERB is also responsible for, the crisis management and explosive ordnance detection, in order to get a more complete technological dynamics picture of the ERB. In addition to the five main fields of activities, ERB has also auxiliary fields of activities like personnel services, bookkeeping, using their own technological ICT solutions and which are undoubtedly important for the organization as a whole. Auxiliary fields of the ERB could be included as well into the future studies. Also, it should be mentioned that the sampling of external interviewees was rather small to draw

concrete and final conclusion about the population knowledge in the issue. However, as the external interviewees were technologically oriented persons in the Estonian society, it can be already said that ERB has to promote more its available virtual services to the population of Estonia in order to gain better results in its work. It also should be accented that due to the fact that technological development of fire and rescue institutions is scientifically poorly researched, no generalizations can be made. More research should be carried out also about the technological development of public service in general.

This thesis has given its input into the scarce amount of researches carried out in the topic of technological change in public services and notably in the area of the fire and rescue service. Hence, author of the present thesis has tried to fill in the gap in literature describing the technological state of the art for institutions like the one studied, the ERB. Knowing more about the technological condition of a public institution and related scientific approaches and frameworks, should enable better preparedness for actual forthcoming technological changes. Smart and effective solutions have been already put at a test by the ERB, but could and should be applied and not less important, tested, even more to ensure the fastest professional assistance for the inhabitants of Estonia for improving the safety in country.

To conclude this thesis, often new technological solutions are considered to be the charm for the public service problems. By following the rules of New Public Management, we try to cut off the public service costs and to do more with a smaller amount of money by trying to improve the management and restructuring the organization. (Hood 1991, 15) In the opinion of the author, technological change is not a charm for the public service problems, but rather the charm is new and analysed technological solutions supporting the implementation of the ERB strategic goals hand in hand with strong management and well trained and competent employees of the ERB. In order to be technologically successful and offer the best possible fire and rescue public service in Estonia, ERB has to go along with the fast technological change flow in the world, learn and implement the best available and possible new solutions.

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7. LIST OF INTERVIEWEES

Interviewee A (IA). Former Head of Department, ERB (2015, July 28). Personal Interview

Interviewee B (IB). Head of Division, ERB (2015, July 29). Personal interview

Interviewee C (IC). Former Head of Department, ERB (2015, August 5). Personal interview

Interviewee D (ID). Director General of an organization X (2015, August 6). E-mail interview

Interviewee E (IE). Expert, ERB (2015, August 7). Personal interview

Interviewee F (IF). Technological journalist, newspaper X (2015, August 26). Personal Interview

Interviewee G (IG). Head of Field at organization X (2015, September 1). Personal interview

Interviewee H (IH). Head of Department, ERB (2015, September 2). Personal interview

Interviewee I (II), Management Member of the ERB (2015, September 14). Personal interview

Interviewee J (IJ), Advisor of the ERB (2015, September 16). Personal interview

Interviewee K (IK), Senior Researcher at university X (2015, September 30). Personal interview

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[i] Smoke detector, small, yet crucial for the population fire safety technological device was elaborated in 1965 in the USA (Bukowski 2001, 3). The development and use of technological solution called fire detection sensors for the fires in high rise buildings in the world started after the fire in a high rise building in New York in 1967 (Johnsen 1976, 22).

[ii] eCall technology is a technological solution which creates data communication connection between a car in accident and the Emergency Response Centre (ERC). This modern technological solution enables a car in accident to forward itself a message about an accident to the ERC for the faster arrival of rescuers,

ambulance, police by mentioning all necessary details: place of accident, type of car and other relevant and necessary information. (European Commission 2015)

[iii] Thermal imaging cameras (TIC) are important technological devices for the fire and rescue services. These devices increase the sight for the rescuers in difficult operational conditions of fires and when the single available indicator of the material is the superficvies temperature as well as its „emissivity". This holdable in hands technological solution enhances the rescuers performance effectiveness by dropping their time for response by utilizing the „infrared (IR) radiative heat transfer". (Rowe 2009, 1-2) TIC is offered by numerous innovative technological companies of the world and is stilll enhanced further to improve upon its technological performance and possibilities. An innovative German company Orglmeister Infrarot has elaborated a technological solution, a PYROsmart system which is to use cameras even for the purpose of preventing fires by detecting in an early stage sites which may start a fire (FLIR Automation 2015).

[iv] Unmanned Air System (UAS) or drones are necessary for public security services including fire and rescue services which are in a need of real-time situation snap to take the right operational decisions and respond to the events (Tikanmäki 2011, 34). In addition to most widely known fire accidents, tasks of fire and rescue services involve also observation and reaction to force majeures related accidents, fires in forests, calamities at nuclear stations, coastal and inland water accidents, explosives related accidents and drones are a perfect solution to get fast snaps from the accident scenes without endangering needlessly the lives of rescuers in the first stage of rescue operations (*Ibid.* 49, 51, 67).

[v] The Cobra ColdCut technology is the world champion in the Cutting Extinguishing area and applied in around 30 countries of the world. Main benefits of this technology are the possibility to extinguish the flames safely outwards, need for a small amount of water, highly chilling down the temperatures in fires, preclusion of air enrapture. All in all this modern technological solution enhances firefighters security, represses and limits the spread of fire, enables to minimize the damages to properties by extinguishing water. (ColdCut Systems 2015)